Yolo County General Plan

County Infrastructure Conditions

The County of Yolo | December 6, 2006

DESIGN, COMMUNITY & ENVIRONMENT

in association with
Coastland Civil Engineering

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EXECUTIVE SUMMARY

This report presents an overview of existing water, wastewater and drainage infrastructure conditions in Yolo County, and explains general approaches and attendant issues to serving new development, as background information in support of the Yolo County General Plan Update.

A. Countywide Conditions

1. Water

The cities of Davis, West Sacramento, Winters and Woodland, the unincorporated communities of Esparto, Knights Landing, Madison, and Yolo, and the North Davis Meadows and Wild Wings developments have public water systems. The El Macero, Willowbank and Royal Oaks Mobile Home Park developments are connected to the City of Davis municipal water system. The two mobile home parks in Dunnigan each have a private water system, as do the Rio Villa public housing project in Winters and the Davis Migrant Center. The Cache Creek Casino and Resort also has a private water system. The rest of the county relies on private on-site wells.

Whether public or private systems, Yolo County's domestic water supplies are mostly from groundwater. Most wells draw from the shallow aquifer, although wells are increasingly tapping the deeper aquifer due to subsidence and contamination. Subsidence, a result of overdraft of the shallow aquifer, is a significant concern southeast of Dunnigan and, to a lesser degree, throughout other parts of the county. Contamination of groundwater with coliform, nitrates, fuel from leaking underground storage tanks, and naturally-occurring minerals is also an issue in some areas. Although use of the deeper aquifers partly addresses subsidence and contamination, recharge of the deeper aquifers may take thousands of years, and deeper wells are more costly to develop and where not properly constructed can provide direct pathways for contaminants to move into deeper aquifers.

Groundwater is generally of high enough quality that treatment is rare. Many wells in the county produce "hard water". Chlorination at the well

head is sometimes used for coliform contamination, as in Madison. Nitrates are often filtered, as in private wells in Dunnigan. Coliform and nitrates are primarily a consequence of failing, underperforming and/or over-concentration of septic systems, as well as over-fertilization of crops.

New County regulations, contained in Title 7, Chapter 1, Section 7-1.04 of the Yolo County Code, require fire sprinkler systems in all new residential development and new non-residential buildings over 5,000 square feet in floor area or over 25 feet or three stories in height. Most existing water systems do not operate at pressures sufficient to operate a fire sprinkler system for commercial structures and every community in the county needs to upgrade its water system to meet the new requirements.

New low density development at one unit per acre or less has historically been served by individual private wells. In new areas with both wells and septic systems, County requirements contained in Title 6, Chapters 5 and 8, of the Yolo County Code would result in maximum densities of one unit per 1.5 acres. Development at higher densities, either as infill or as new subdivisions on outlying parcels, would require new shared or community water systems, and either the creation of a new managing entity, such as a community service district (CSD), or expansion of the responsibilities of an existing entity. The Yolo County Environmental Health Division discourages the use of private shared systems, because there are inadequate provisions for testing and monitoring, and for assessment of maintenance fees, and accountability is hard to enforce.

Groundwater is a water supply source for some new development but aquifer capacity, subsidence and water quality issues might require that surface water supplies be considered for significant new growth. West Sacramento is the only community in the county that relies on surface water. Woodland, Davis and the University of California, Davis are trying to obtain Sacramento River water for domestic use. To use surface water supplies, water rights or water supply contracts would need to be negotiated, and treatment, conveyance, storage and distribution systems developed.

2. Wastewater

Private on-site septic systems are the most common method of wastewater treatment in the unincorporated county. Individual septic systems typically require lot sizes of 0.8 to 1 acre. In areas where wells are used for domestic water supply, 1.5-acre lots may be necessary. Septic systems may be possible on lots as small as ½-acre, although such densities are not likely to be achievable for new subdivisions of many lots, given County requirements. Regulation and monitoring of numerous individual systems can be challenging. Systems can fail causing localized contamination. Concentrated use of septic systems contributes to high nitrate levels in groundwater, a serious concern in parts of the county such as Dunnigan.

The use of septic systems is expected to be substantially affected by the pending regulations intended to implement California Assembly Bill 885 of 2000 (AB 885). Adoption of the regulations is understood to be imminent. The Yolo County requirements for septic systems will need to be adjusted to meet the new AB 885 regulations. AB 885 requires the State Water Resources Control Board (SWRCB) to develop statewide regulations for on-site wastewater treatment systems. As of July 2006, final regulations have not yet been adopted, although their adoption is understood to be imminent. The draft regulations include depths to groundwater, setbacks from surface waters, and monitoring and maintenance requirements to achieve discharge limits for biological oxygen demand, suspended solids and total nitrates.[1] The AB 885 regulations are also expected to address the use of supplemental treatment, such as filtration and ultraviolet light disinfection, which is a possible way of achieving higher development densities that still use septic systems, although at five to fifteen times the cost of conventional systems. The Yolo County requirements for septic systems will need to be adjusted to meet the new AB 885 regulations.[2]

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[1] State Water Board, 2005, PowerPoint presentation for the State Water Board Workshop Information Item Meeting held December 9, 2005.

[2] Yolo County Health Department website, http://www.yolocounty.org/org/health/eh/general/sewagedisposal.asp, August 1, 2006.

Community systems can be used for higher densities. Community systems allow lower unit cost, the use of advanced technologies that attain a higher level of treatment, more control of desired locations and types of development, and more site planning flexibility. Although community systems can be managed by a private entity, a homeowner association may not have adequate technical, managerial and financial capacity. The Yolo County Environmental Health Division discourages the use of shared systems without an entity that can assess maintenance fees. All existing community systems in unincorporated Yolo County are managed by a County Service Area (CSA) or Community Service District (CSD). A CSA is a special district administered directly by the County. A CSD is a special district with an independent elected governing board that is separate from the County. Secondary treatment is provided by the Esparto, Madison and Knights Landing CSDs. Tertiary treatment is provided by the Wild Wings CSA. The El Macero and North Davis Meadows CSAs are connected to the City of Davis municipal wastewater system, as is the Royal Oaks Mobile Home Park. The Cache Creek Casino and Resort has a private tertiary wastewater treatment system. The tow mobile home parks in Dunnigan each have a private wastewater treatment system, as do the Rio Villa public housing project in Winters and the Davis Migrant Center.

Municipal wastewater systems currently serve Davis, West Sacramento, Winters and Woodland. Wastewater treatment plants commonly provide primary and secondary treatment, and some provide tertiary treatment to meet increasingly stringent wastewater discharge standards of the State Regional Water Quality Control Board. The cities would not be able to serve development in the unincorporated county except where the development is within the sphere of influence of the city and annexation is anticipated.

Disposal of treated wastewater is usually by discharge to a water body, by evaporation/percolation, or by irrigation of farmland and ornamental landscaping. In order to meet increasingly stringent water quality standards, tertiary treatment is now commonly required for discharges to water. Reclaimed

water from wastewater treatment facilities is sometimes used for irrigation of agricultural fields and landscaping. Where human contact is possible, e.g., golf courses and ornamental landscaping, or human consumption, i.e., food crops, tertiary treatment is needed to achieve the water quality standard. For other uses, such as fodder crops, secondary treatment with disinfection is adequate.

Development at densities of approximately one unit per acre or less could be served by individual septic systems. In areas served by well water, densities as low as one unit per 1.5 acres may be necessary to meet County requirements. Development at densities above one unit per acre would require shared septic or pond systems. For more significant development, a town-wide system could be developed, which would require a new managing entity, such as a CSD or CSA.

3. Storm Drainage and Flood Control

Drainage facilities are generally limited in the unincorporated county. Storm water runoff typically flows from paved surfaces or on-site swales to roadside ditches, and then to nearby waterways. Water also collects in low spots, where it eventually evaporates. Localized flooding frequently occurs. Storm water detention basins serve recent subdivisions in Esparto and Knights Landing, as well as the Wild Wings development. The El Macero CSA is connected to Davis' storm water system.

Many of the county's extensive drainage and flood control levees and canals are in poor condition and require improvements that often exceed the capacity of local districts.

Drainage facilities for development densities of two units per acre or less might reasonably consist simply of on-site ditches to convey water to existing roadside ditches. Drainage for denser developments would likely consist of curbs and gutters and an on-site collection network that conveys runoff to on-site detention basins, which moderate flows to existing off-site channels.

Management of these facilities would require expansion of the responsibilities of an existing entity or the creation of a new agency.

B. Clarksburg

1. Water

Clarksburg has no community water system and no CSD, and is served by individual private wells. Wells do not require treatment. The Clarksburg Fire District uses a water tanker and can also pump water from the Sacramento River and local irrigation canals.

Infill development at densities above about one unit per acre would require a new water system. New "green field" development beyond the existing town limits is prohibited due to Clarksburg's location within the Primary Zone of the Delta Protection Area. The high water table makes groundwater a good option but adjacent Sacramento River surface water could also be considered.

2. Wastewater

Wastewater is treated by individual on-site septic systems. Due to the high local water table, septic systems need to be above ground in a mound system. Any future infill development at densities greater than about one unit per acre would require a new shared system.

3. Storm Drainage and Flooding

Storm drainage flows to roadside swales and low spots, and to irrigation canals. Localized flooding can be a problem. Reclamation District 999 provides limited drainage and levee maintenance for the Clarksburg area. The levees need repairs that exceed the maintenance budget of the district. New development would likely require new storm drain facilities.

C. Dunnigan

1. Water

Dunnigan property owners rely primarily on individual private wells. There are private, shared water systems serving multiple residences in the Old Town area, where lots are smaller, and in the two mobile home parks. The Dunnigan Water District (DWD) serves agricultural customers with irrigation water from the Tehama-Colusa Canal but does not supply domestic water.

Land subsidence is a significant problem southeast of Dunnigan. Nitrate contamination is also a concern in Dunnigan, particularly in the Old Town and Hardwood Subdivision areas. Studies suggest that septic systems and ineffective large-flow pond systems may be contributing factors. Nitrate filtration devices are installed on some wells.

New development at densities above about one unit per acre would require a new water system. The DWD has indicated it could potentially provide domestic water. Due to the nitrate problems, wells may need to be drilled deeper and be sealed where they pass through the contaminated shallower aquifer. As an alternative to wells, surface water supplies could be considered. Surface water from the Tehama-Colusa canal through the DWD is one possibility. Additional surface water supply authorizations would need to be secured and treatment, conveyance, storage and distribution systems would need to be developed.

2. Wastewater

There is no community wastewater system in Dunnigan. Most wastewater is treated by private septic systems, many of which may be a cause of nitrates in groundwater. There are nine private, on-site wastewater pond treatment systems operated by commercial and industrial facilities and the mobile home 55 park. These ponds provide minimal and unreliable treatment, fail to achieve secondary treatment levels, and have the potential to contaminate the groundwater with nitrates, coliform and other bacteria.

Since no wastewater system exists in Dunnigan, development at densities greater than one unit per acre would require a new community system.

3. Storm Drainage and Flooding

Drainage collects in roadside swales and low spots. Localized flooding is a common and recurring problem. New development would likely require new storm drain facilities.

D. Esparto

1. Water

The Esparto CSD's domestic water supply comes from four wells. The water distribution pipes in the town core are too small to maintain acceptable fire flows and need to be replaced with larger pipes. With recent upgrades, the water system can accommodate an estimated total of 925 connections, approximately 75 more connections than exist today. However, the CSD has agreements with pending new developments to continue to provide improvements to the system that would accommodate future growth.

2. Wastewater

Esparto's wastewater system is composed of clay pipes, which allow infiltration and inflow of drainage water into the sewer system, increasing total demand on collection and treatment facilities. Sewage is treated at the wastewater treatment plant in two facultative ponds and then disposed in six percolation/evaporation ponds. The treatment plant is being expanded with two additional ponds and aeration equipment. After the expansion, the facility will still have over 30 acres on which to expand. With the addition of the two ponds, the treatment plant will provide capacity for development currently under construction. Development beyond that will require additional pond construction, which can occur until all of the facility's 59 acres is used or more land is acquired for further expansion.

3. Storm Drainage and Flooding

Storm drainage and flood control service in Esparto is provided by the Madison-Esparto Regional CSA. Stormwater runoff in the older part of Esparto is collected in roadside ditches and in a limited system of undersized pipes and discharges into Lamb Valley Slough. The roadside ditches are subject to flooding. New in-fill construction is required to put in curbs and gutters to better regulate storm water flow. Funding through the Safe Routes to School Program has also replaced some of the roadside ditches in the older part of town. New subdivisions include curbs and gutters, as well as storm water detention basins that hold the water until peak flows in the ditches and sloughs has passed. The potential for capacity enhancement of Lamb Valley Slough is severely restricted by adjoining development and existing bridges.

Major subdivisions would continue to require a network of on-site collection pipes or ditches that would convey runoff to on-site detention basins that would moderate flows to Lamb Valley Slough. Alternatively, the Esparto CSD is exploring the possibility of a community detention basin. Better routine maintenance of Lamb Valley Slough would reduce flood hazards.

E. Knights Landing

1. Water

The Knights Landing CSD provides water and wastewater services. Water supply comes from three wells. Nearly all remaining water capacity will be used by developments currently under construction. The undersized water distribution system needs expansion to provide adequate commercial fire flows. The water supply is untreated. Bacterial contamination has occurred and chlorination may be required in the future. New development would require wells, storage facilities and distribution infrastructure to be added to the existing system. Larger pipes in the distribution system and deeper wells are recommended.

2. Wastewater

The wastewater treatment plant provides secondary treatment by aeration and disposal to evaporation/percolation ponds. The plant is at capacity. The planned addition of nine more acres of treatment and disposal ponds will accommodate an additional 115 homes and 39 commercial/industrial connections. Additional wastewater treatment capacity can continue to be provided incrementally. The Knights Landing CSD has land on which to add additional treatment and disposal ponds.

3. Storm Drainage and Flooding

The Yolo County Public Works Department maintains drainage facilities in streets, excluding State highways, which are maintained by Caltrans. Reclamation District 730 maintains other drainage facilities in the area. The Colusa Basin Drainage District, State Reclamation Board and Knights Landing CSA maintain the area's levees, which, like levees throughout the region, are older and in need of repairs that exceed the maintenance budgets of the districts.

The drainage system consists of roadside swales and a limited pipe collection network that conveys water into irrigation canals and the Sacramento River. Drainage also simply collects in roadside swales and low spots where evaporation eventually occurs. If new development were to occur in Knights Landing, it would likely require new storm drain facilities. One example is the approved White Subdivision, which will use a pump station to dispose of drainage to the Colusa Basin Drain.

F. Madison

1. Water

The Madison CSD provides water and wastewater services to the community. Madison's three wells have a combined capacity of 3,000 gpm; current domestic demand is 400 gpm. The water distribution system is severely limited in capacity such that, despite an ample supply from the wells, existing fire flows

do not meet requirements. The new deeper well draws water from a cleaner aquifer. Well water is treated by chlorination.

2. Wastewater

Madison's wastewater system is composed of clay pipes, which allow infiltration and inflow of drainage water into the sewer system, increasing total demand on collection and treatment facilities.

The treatment plant is severely over-capacity. The Central Valley RWQCB has issued a cease-and-desist order pending improvements and a Revenue Plan for the CSD. The planned improvements will only meet current demands. The plant would need to purchase land and construct more ponds to accommodate any new growth.

3. Storm Drainage and Flooding

The Madison-Esparto Regional CSA maintains drainage facilities in Madison. Stormwater runoff is collected in roadside ditches and discharges into the Madison Drain, which empties into Willow Slough. Madison is located near several sloughs and flooding is frequently a problem. Infiltration and inflow from storm drainage enters the sewage system adding demand to that system.

Infill development in Madison would require on-site ditches to convey water to existing roadside ditches. New peripheral development in Madison would require on-site storm drain detention and possibly construction of a new flood control basin to extend the time of release of storm water into existing channels. As the entire town of Madison is within a flood plain, flood protection measures are required for any new and/or infill development.

G. Monument Hills

Water and wastewater service in the Wild Wings portion of Monument Hills is provided by the Wild Wings CSA. No additional capacity was included in these systems beyond what is needed to serve the Wild Wings development.

Drainage for Wild Wings is conveyed to the detention ponds in the adjacent golf course, which are designed to hold the 100-year flood run-off, and is time-released to the Moore Canal, which drains to Cache Creek. The remainder of Monument Hills has septic systems and wells and lacks municipal services. Any new development at densities above about one unit per acre would require new water, wastewater and drainage systems.

H. Yolo

1. Water

The Cacheville CSD provides water service in Yolo. The existing system is adequate for the current demand and has additional capacity. The main well could support approximately 300 additional connections and the back-up well could serve 25 additional units. Water quality meets drinking water standards, although the water is not treated. Fire flows are adequate.

2. Wastewater

There is no community wastewater service in Yolo. Wastewater treatment and disposal is by individual septic systems. Additional development would be limited to a density of about one unit per acre if septic systems were used or a small community system would need to be developed.

3. Storm Drainage and Flooding

The Yolo County Public Works Department provides storm drainage. Pipes convey water from curb drains to a discharge pipe into Cache Creek.

I. Davis

The City of Davis provides water, wastewater and drainage services to its residents, and to the adjacent unincorporated communities of El Macero, Willowbank, North Davis Meadows and Royal Oaks through out-of-area service agreements.

The community of North Davis Meadows owns its own on-site water and drainage facilities, while its wastewater system ties into the City's facilities. The development's homeowner association contracts with the City to operate and maintain its on-site facilities and for use of the City's off-site facilities. El Macero is directly tied into the City's water, wastewater and drainage systems. Willowbank, a lower-density community of 1-acre lots, is connected to the City's water system but relies on individual private septic systems and on roadside swales and ditches for drainage. The Royal Oaks Mobile Home Park also ties into the City's water, wastewater and storm drain systems.

1. Water

Water for Davis, and for El Macero and Willowbank, comes from wells. Current demand is met by the existing well network. The City continues to add wells as needed to serve new development. Deeper wells have been developed to solve naturally-occurring mineral contamination, which generally affects shallower aquifers.

Davis, together with Woodland, UC Davis and the Yolo County Flood Control and Water Conservation District (YCFCWCD), are trying to obtain water from the Sacramento River to replace the use of wells. This would require water treatment as well as new pipelines to these four users.

2. Wastewater

The city's wastewater treatment plant has a capacity of 7.5 mgd maximum dry weather flow and 12.6 mgd wet weather flow. Current dry weather demand is 5.4 mgd, leaving 2.1 mgd of unused capacity. The treatment plant discharges to Willow Slough or the Davis Wetlands. The Davis Wetlands further treat the wastewater before discharging into the Yolo Bypass. Major treatment plant upgrades are needed to meet increasingly tighter discharge requirements, if the City is to continue to discharge into the Yolo Bypass.

3. Storm Drainage and Flooding

Davis' storm drain network drains to a series of detention ponds which function as wetlands that screen large material for removal and allow controlled release into the Willow Slough Bypass and ultimately the Yolo Bypass.

J. West Sacramento

1. Water

The source of the city's water supply is the Sacramento River. The water treatment plant has a capacity of 58 mgd and demand in 2004 of 13.1 mgd. The water treatment plant is expected to have adequate capacity for buildout of the city. The treatment plant has been proposed as the treatment facility for the Davis-Woodland-UC Davis-YCFCWCD surface water project.

2. Wastewater

West Sacramento's sewage collection system and treatment facility are planned to undergo a major reconfiguration, including the closing of the wastewater treatment plant, so the City can connect to the Sacramento Regional Sanitation District new 19-mile Lower Northwest Interceptor, which will convey wastewater from nearly 200,000 households in the Sacramento region to a regional treatment plant. West Sacramento's share of the project's capacity will be a peak of 40 mgd.

3. Storm Drainage and Flooding

West Sacramento is located in the natural floodplain of the Sacramento River and is protected by levees. Reclamation District 900 provides flood control and storm drainage, and maintains 14 miles of levees. North of the Sacramento Deep Water Ship Channel, drainage is conveyed through pipes that drain into the Ship Channel or the Sacramento River. In the still-developing Southport area, much of the storm water runoff is collected in roadside ditches that are subject to flooding.

K. Winters

1. Water

Winters' water supply comes from five wells, each with capacity to supply the entire city. The City also uses underflow waters from Putah Creek gravel beds. Fire flow pressures are adequate. The water supply has moderate nitrate levels, but not requiring well head treatment. New development would require additional wells.

2. Wastewater

The wastewater treatment plant is at capacity. The City of Winters is exploring funding options for a second phase expansion of the treatment plant, to a capacity of 1.2 mgd.

3. Storm Drainage and Flooding

Winters is plagued by flooding from Chickahominy and Moody Sloughs, located north of the city. Drainage is collected in a pipe network, conveyed to the Rancho Arroyo Detention Pond, then into Putah Creek.

L. Woodland

1. Water

Woodland operates 21 wells that draw from an intermediate aquifer. In 2005, the capacity of the wells was over 38,500 acre-feet and demand was 17,800 acre-feet. Water from the wells meets drinking quality standards. Fire flows are adequate. The City plans to develop new wells in the intermediate and deep aquifers to serve new development. The City projects sufficient capacity in the groundwater aquifer for planned development through 2020. Woodland, together with Davis, UC Davis and the YCFCWCD, is also trying to obtain surface water allowances from the Sacramento River to replace the use of wells.

2. Wastewater

Average dry weather flow at the wastewater treatment plant is about 6.8 mgd versus a design capacity of 10.4 mgd. The treatment plant is completing a major upgrade to provide tertiary treatment. Treated effluent is discharged into a channel that drains to the Tule Canal and eventually into the Yolo Bypass. The City also owns and operates an Industrial Wastewater Treatment Plant that treats wastewater from a tomato processing facility.

3. Storm Drainage and Flooding

Woodland is surrounded by waterways, however, the northern and eastern areas are particularly subject to flooding from Cache Creek. In newer parts of the city, runoff is collected by a storm drain system. In older parts of the city, valley gutters, gutter culverts and inverted siphons convey water to drainage inlets. Drainage is conveyed from west to east along four trunk mains that discharge into open channels that flow to three pump stations. Detention ponds are located at several points within the system to moderate flow along the channels. The pump stations discharge into a channel that discharges directly into the Yolo Bypass.

1 INTRODUCTION

This report presents an overview of existing water, wastewater and drainage infrastructure conditions in Yolo County as background information in support of the Yolo County General Plan Update. The report is based on work completed by Coastland Civil Engineering, Inc., in July thru September 2006.

A. Background and Purpose

The purpose of this report is to summarize existing water, wastewater and drainage resources, facilities, practices and issues in Yolo County for consideration in a comprehensive update of the Yolo County General Plan. The key objectives of the report are to:

- Provide an overview of existing water, wastewater and drainage systems that serve non-agricultural uses in the unincorporated county, including a summary of county-wide infrastructure conditions and issues;
- Explain general approaches and attendant issues to providing water, wastewater and drainage service to new development;
- Provide a planning-level analysis of the amount and type of growth that might be supported by existing infrastructure or system improvements.

B. Scope of Report

In addition to an overview of county-wide conditions, the report provides an overview of water, wastewater and drainage in the unincorporated communities of Clarksburg, Dunnigan, Esparto, Knights Landing, Madison, Monument Hills and Yolo, and in the incorporated cities of Davis, West Sacramento, Winters and Woodland. This report covers all Community Service Districts and centrally-operated utility systems in Yolo County, as well as all locations where urban development is considered under the four General Plan alternatives.

The other communities in the county, including Brooks, Capay, Guinda, Rumsey, West Plainfield and Zamora, are not addressed in this report because they rely on individual private wells and on-site private septic systems for domestic use, and because they are not considered for significant growth within the General Plan alternatives. Similarly, infrastructure and services for University of California (UC) Davis, the Rumsey Rancheria (including the Cache Creek Casino and the Capay Hills Golf Club) and other isolated industrial and recreational uses are also not discussed, since these private facilities serve specific developments and would be unlikely to be expanded to serve more general development, and are in locations that are not considered for significant growth within the General Plan alternatives.

While water and drainage service in the county is provided for both agricultural irrigation and domestic use, this report focuses on infrastructure for non-agricultural uses. The special districts that serve agricultural uses are described only to the extent that they now also serve urban uses or could serve such uses in the future.

C. Methodology

This report provides a broad overview based on existing data, field reviews and interviews; no new technical engineering studies or field measurements were conducted. Due to the limited published data and limited staff at some service districts, there are some areas with a notable lack of information. The report identifies these data gaps.

The following specific tasks were performed in preparing this report:

- Relevant facilities plans, data and other documents were gathered from the County, LAFCO, the Cities and the various service districts. Documents reviewed include the Yolo County General Plan; the General Plans of the unincorporated communities of Clarksburg, Dunnigan, Esparto, Knights Landing and Madison; the Monument Hills Specific Plan; the Water Resources Association of Yolo County's Integrated Water Re-

sources Management Plan; and the Delta Protection Commission's Land Use and Resource Management Plan for the Primary Zone of the Delta.

- Interviews were conducted and questionnaires were sent to County, City and local service district utility managers.
- Field reviews were performed for the cities of Davis and Woodland, and the unincorporated communities of Dunnigan, Knights Landing, Yolo and Zamora.

D. Report Contents

This report includes the following sections.

- The Executive Summary.
- Chapter 1 is this introduction, which presents the purpose, scope and methodology of the report.
- Chapter 2 provides an overview of water, wastewater and storm drainage conditions, issues and options that apply throughout much or all of county.
- Chapter 3 provides specific discussion about infrastructure conditions in individual communities.

2 COUNTYWIDE CONDITIONS

This chapter provides an overview of water, wastewater and storm drainage conditions, issues and options that apply throughout most or the entire county. More specific discussion about infrastructure conditions in individual communities is provided in the next chapter.

A. Background

Historically, Yolo County has sought to preserve farmland and open space by directing most growth to the four incorporated cities in the county, thereby providing for comparatively modest growth in the unincorporated area. Existing infrastructure conditions reflect this principle in that services in most parts of the county are generally decentralized and rural in character, with reliance on individual wells and on-site private septic systems. There is more coordinated provision of infrastructure, although still at a relatively basic level, in some of the county's unincorporated towns.

B. Utility Providers

Water, wastewater and drainage services in unincorporated Yolo County are provided by various community service, water, drainage and reclamation districts. Some of these districts are single purpose and others provide multiple services. Some cover one individual community, while others cover vast agricultural service areas, as well as towns.

- **Community Service Districts (CSD).** CSDs, governed by a board elected by their service area, may provide a variety of services, including: water, wastewater, drainage, street lighting, parks and other services. Yolo County has four CSDs: Cacheville CSD (serving Yolo), Esparto CSD, Knights Landing CSD and Madison CSD.
- **County Service Areas (CSA).** CSAs, like CSDs, provide a range of services in Yolo County. The difference between CSDs and CSAs is that the Yolo County Board of Supervisors is the governing body of all CSAs. The county has many CSAs, including the Madison-Esparto Regional

CSA which provides drainage, and the Wild Wings CSA, which provides water and wastewater services. The North Davis Meadows CSA provides sewer, water and landscaping maintenance. The El Macero and Willowbank CSAs provide sewer and/or water to these communities through the City of Davis. The Snowball CSA maintains Sacramento River levees around Knights Landing. There are a total of nine CSAs in Yolo County.

- **Yolo County Flood Control and Water Conservation District (YCFCWCD).** The YCFCWCD, an independent special district, provides irrigation water to a large service area encompassing the Central County and Capay Valley. Its governing body is appointed by the Board of Supervisors.
- **Reclamation Districts.** Reclamation Districts reclaim and protect swamplands and lands subject to overflow, and also provide drainage, levee maintenance and irrigation services. There are 13 reclamation districts in the county, with independent governing bodies.
- **Water Districts.** Water districts provide water, wastewater and drainage services. Dunnigan Water District and Yolo-Zamora Water District are the only water districts in the county and are run independently. The Rumsey Irrigation District is also a water district and has an agreement with the YCFCWCD regarding Cache Creek surface water.
- **Cities.** The four incorporated cites of Davis, West Sacramento, Winters and Woodland serve their resident populations. Davis also provides various services to the unincorporated communities of North Davis Meadows, El Macero, Willowbank and Royal Oaks.
- **UC Davis.** UC Davis maintains a domestic water system for its population, a utility water system and a field teaching and research water system. The campus operates its own wastewater treatment plant that employs tertiary treatment and discharges to Putah Creek.
- **Rumsey Band.** This Native American tribe owns and operates the Cache Creek Casino and Resort outside of Brooks, as well as a small community of tribal housing. The tribe manages its own water, wastewater and drainage systems.

C. Water

This section provides an overview of existing conditions and issues as they relate to water provision county-wide.

1. Water Supply

Yolo County's domestic and agricultural irrigation water supplies originate from several surface water and groundwater sources; a limited amount of reclaimed water is also in use. The primary sources of surface water are Clear Lake and its Cache Creek outlet, Lake Berryessa and its outlet Putah Creek, and the Sacramento River. Groundwater comes from private and public wells located throughout the county.

a. Surface Water

Natural and human-made waterways provide surface water in Yolo County, supplying approximately 66 percent of the county's overall water demand in non-drought years, of which almost all is used to irrigate the county's farms and orchards.[3] Of all the areas in the county with domestic water systems, only West Sacramento currently relies on surface water supplies for domestic use, although Woodland, Davis, and UC Davis are in the process of trying to obtain Sacramento River water for domestic use. The City of Winters obtains its domestic water supply from Putah Creek through gravel bed intake wells using its appropriative rights to the Putah Creek underflow.

Although they are generally used to serve agricultural users at present, surface water sources could provide water supply to meet domestic water needs. To allow for future domestic use, water rights or water supply contracts would need to be negotiated, and treatment, conveyance, storage and distribution systems developed.

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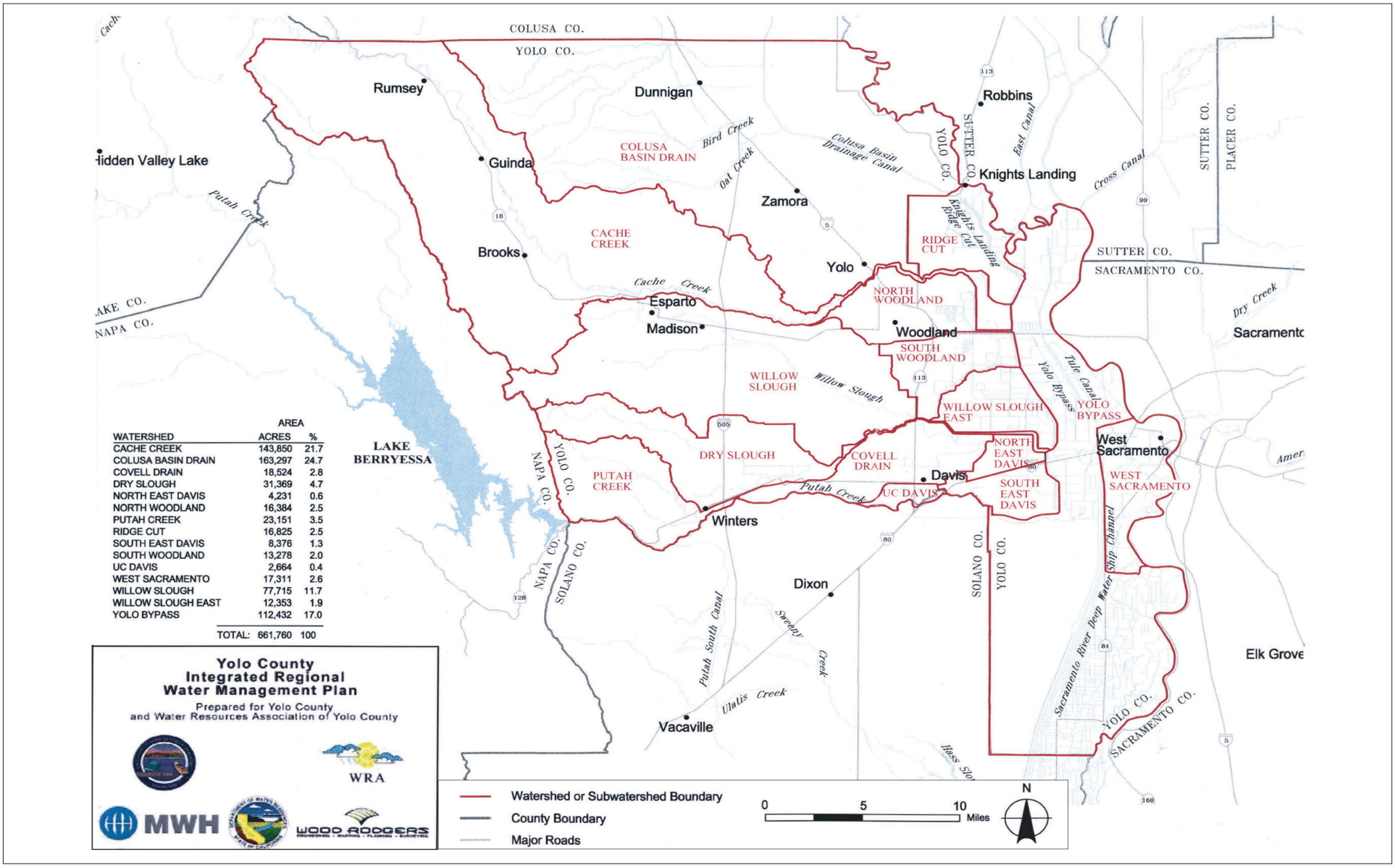
[3] In drought years the county relies more heavily on groundwater supplies, with surface water supplying 56 percent of demand. Water Resources Association of Yolo County, 2005, *Yolo County Integrated Regional Water Management Plan, Background Data and Information Appendix*, Tables 5-5 and 5-6.

Figure 1 shows the major watersheds and surface water features in Yolo County. The major natural surface waters of Yolo County include Cache Creek, Putah Creek, Willow Slough and the Sacramento River.

- **Cache Creek** is the outfall of Clear Lake, which is located in Lake County 50 miles northwest of Yolo County. The north fork of Cache Creek includes the 200,000-acre-foot Indian Valley Reservoir, also located in Lake County, which supplies irrigation water in drought years and is a source of groundwater recharge. An extensive canal system carries waters from Cache Creek at the Capay Diversion Dam to farms in the western and central areas of Yolo County.
- **Putah Creek** begins in Lake County, flows through Napa County and the Lake Berryessa Reservoir into southern Yolo County, and eventually into the Yolo Bypass. The City of Winters obtains its domestic water supply from Putah Creek through gravel bed intake wells using its appropriative rights to the Putah Creek underflow.[4]
- **Willow Slough** drains most of the central part of Yolo County between Cache Creek and Putah Creek. Because of natural levees formed through deposition of sediment along Cache and Putah creeks, local runoff flows away from the creeks through a complex network of sloughs and small drainage channels that eventually consolidate into Willow Slough before discharging into the Yolo Bypass.
- The **Sacramento River** delimits Yolo County's eastern border and is California's largest river, conveying natural flows as well as federal Central Valley Project and State Water Project water. The cities of Davis and Woodland, UC Davis and the YCFCWCD have recently undertaken a project to withdraw water from the Sacramento River, treat it at the West Sacramento water treatment facility, and pipe it to users in Davis, Woodland and UC Davis, with the YCFCWCD using the remainder.

[4] Dudek & Associates, 2005, *Municipal Service Review and Sphere of Influence Study Yolo County Public Water and Reclamation Districts*, page 27.



Source: Jones & Stokes, 2005, Yolo County General Plan Update Background Report.

FIGURE 1

MAJOR WATERSHEDS AND SURFACE WATERS

In addition to these natural sources, an extensive network of sloughs, irrigation canals and drainage ditches, owned and operated by various different public water and flood control districts, serve to distribute water, and provide flood control and drainage functions. Surface water from irrigation canals is also used by some fire districts for firefighting in areas where adequate water storage and distribution systems do not exist. Major slough and canal facilities include:

- The **Yolo Bypass**, a 41-mile-long, several-mile-wide leveed floodplain that carries flood flows from the Sacramento River to the Sacramento Delta. Its tributaries include Cache Creek, Putah Creek, Willow Slough and the Knights Landing Ridge Cut.
- The **Tehama-Colusa Canal** transports water south from Tehama County into Yolo County, terminating near Dunnigan. It delivers irrigation water to federal Central Valley Project contractors, including the Dunnigan Water District.
- The **Colusa Basin Drain** conveys irrigation return drainage from the Tehama-Colusa Canal and drainage from the Dunnigan Hills to the Knights Landing outfall that discharges to the Sacramento River.

b. Groundwater

Yolo County has an abundant supply of groundwater, which provides approximately 34 percent of the county's overall water supply in non-drought years.[5]

Groundwater in Yolo County is accessed through wells, which can be either private or public. In most unincorporated areas, a single private well serves one or several homes or businesses; if one well serves multiple parcels, a simple piping system interconnects them. Due to the costs and management is-

[5] In drought years the county relies more heavily on groundwater, which supplies 44 percent of demand in drought years. Water Resources Association of Yolo County, 2005, *Yolo County Integrated Regional Water Management Plan, Background Data and Information Appendix*, Tables 5-5 and 5-6.

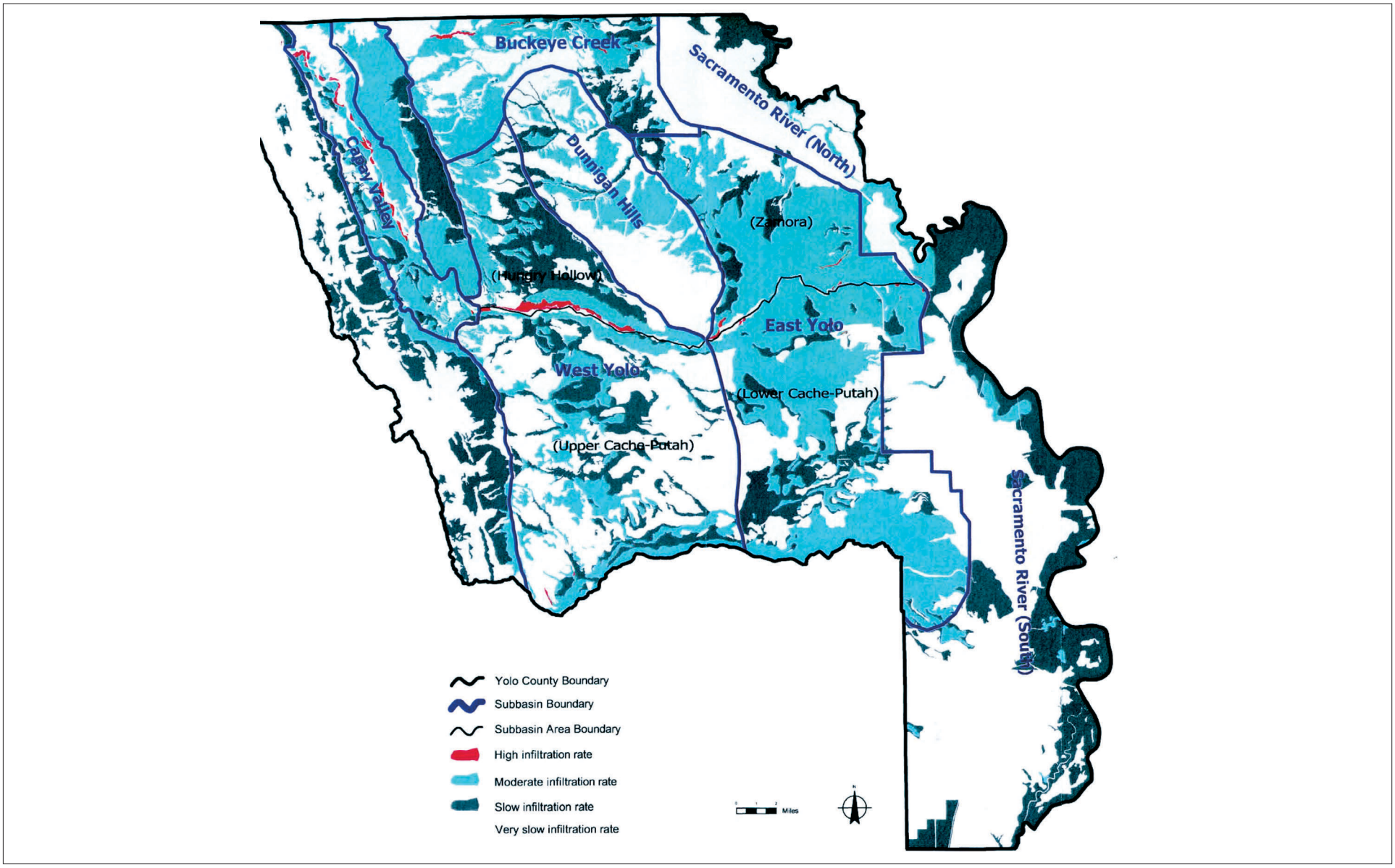
sues associated with shared wells, this type of water service is generally only workable at densities of two units per acre or less. Caution must be used where groundwater wells are used in close proximity to septic systems. Where septic systems are used near wells, the Yolo County Environmental Health Division requires that septic tanks be at least 50 feet, and leachfields at least 100 feet, from private wells, and that both septic tanks and leachfields be at least 100 feet from public wells.[6] California Assembly Bill 885 of 2000 (AB 885), discussed more fully in Section 2.D.1.a, will greatly affect these spacing requirements upon its implementation. Where individual private wells and septic systems are used, lower densities of at least one unit per 1.5 acres are common.

Groundwater is also taken through public or municipal wells. The cities of Davis, West Sacramento, Winters and Woodland, the unincorporated communities of Esparto, Knights Landing, Madison, Yolo and North Davis Meadows, and the Wild Wings development have public water systems. These systems vary widely, in number of wells (from 2 wells in Yolo to 26 in Woodland) and number of service connections (from 163 connections in Yolo to over 20,000 connections in Davis).

The county's groundwater is generally found in either a shallow aquifer or a deep aquifer. Most existing wells draw from the shallow aquifer, although wells serving domestic needs are increasingly tapping the deeper aquifer due to issues of subsidence and contamination, which are discussed below.

The county has six groundwater sub-basins, which are shown in Figure 2. The East Yolo sub-basin, which covers the eastern portion of the county from south of Dunnigan to Davis, is most relevant to this report. Most of the population of Yolo County resides within this sub-basin. It supplies irriga-

[6] Sarazin, Bruce. Director, Yolo County Environmental Health Division. Personal telephone communication with Coastland Civil Engineering regarding the County's April 1994 Guidelines to the Planning, Installation, and Maintenance of Septic Systems in Yolo County. August 10, 2006.



Source: Jones & Stokes, 2005, Yolo County General Plan Update Background Report.

FIGURE 2

GROUNDWATER SUB-BASINS

tion water to the Yolo-Zamora area and all of the water supply of Woodland, Davis and UC Davis. The other five sub-basins are the Capay Valley, Buckeye Creek, Dunnigan Hills, West Yolo and Sacramento River sub-basins.

Recharge of aquifers typically occurs along the streambeds of creeks and canals. Recharge occurs naturally, and also through reservoir releases, such as the release of stored water from the Indian Valley Reservoir into Cache Creek during low flows periods. The YCFCWCD has chosen not to line its extensive canal system in order to further recharge. Anywhere where standing water is allowed to percolate into the soil contributes to aquifer recharge.

Several issues face the county in its use of groundwater. First, land subsidence due to overdraft of the shallow aquifer is a significant concern in the East Yolo sub-basin and, to a lesser degree, throughout other parts of the county. Subsidence can cause permanent loss of aquifer capacity when upper soil layers collapse. Subsidence can also compromise wells, irrigation canals, levees and highways. The greatest amount of subsidence, approximately four feet, has occurred east of Zamora, where irrigation needs are supplied exclusively from groundwater because no surface water sources exist.[7]

In addition to subsidence, contamination of groundwater is also an issue in many parts of the county. Coliform, nitrates and fuel from leaking underground storage tanks are the primary concerns. Boron, mercury, arsenic and other soil minerals are naturally occurring contaminants that leach into streams (along Cache Creek). Coliform and nitrates are a consequence of failing, underperforming and/or over-concentration of septic systems (Dunnigan). Nitrate contamination is also associated with over-fertilization of agricultural crops throughout the County. Although groundwater supplies in the county generally meet current drinking water standards, levels of nitrates, arsenic and salinity are rising and, in some areas, appear to have the

[7] Dudek & Associates, Inc., 2005, *Municipal Service Review and Sphere of Influence Study Yolo County Public Water and Reclamation Districts*, page 2.

potential over time to render this source of drinking water unsafe for drinking in the future.

Although use of the deeper aquifers addresses some of the issues of subsidence and contamination, their use is not without concern. Recharge of the deep aquifers may take thousands of years, whereas shallower aquifers may take only decades or hundreds of years to recharge. Deeper wells are more costly to develop than shallow wells. If not properly constructed, the well shaft of a deep aquifer well provides a direct pathway for contaminants to move into the lower aquifers.

For these reasons, groundwater does not have an unlimited potential to meet the county's domestic water needs. If demands were to increase substantially, then other outside sources of water might be needed, as has been the case in other parts of the state.

c. Reclaimed Water

Reclaimed water from wastewater treatment facilities is sometimes used for irrigation of agricultural fields and landscaping. The State regulates specific uses of reclaimed water. The level of prior treatment determines how the reclaimed water can be used. Tertiary treatment is generally required for human contact, e.g., golf courses and ornamental landscaping, or human consumption, i.e., food crops. Secondary treatment may be adequate for other uses, such as fodder crops.[8] The tertiary treatment plants in Wild Wings and the Cache Creek Casino and Resort discharge water to their golf courses. The City of Davis discharges its water into natural wetlands for biological treatment.

The Regional Water Quality Control Board (RWQCB) also greatly limits waste discharges to land. Where land discharge is allowed, it is closely regulated in order to protect groundwater resources. Nitrate removal is required

[8] State Water Resources Control Board Water Standards: Title 22 Chapter 4 http://www.waterboards.ca.gov/centralcoast/BasinPlan/BP_text/chapter_4/Chapter 4.htm#_Toc3102176

in many cases where percolation is to groundwater basins that are used for domestic water supply, although secondary treatment may be sufficient depending on soil conditions.[9]

2. Domestic Water Treatment

Treatment of domestic water supplies in Yolo County varies. Groundwater supplies are typically of high enough quality that treatment is rare. Treatment costs vary depending on what compound needs to be controlled. Low cost treatment includes Chlorination, used at the well head for coliform contamination, as in the community of Madison. Higher cost treatment includes nitrate filtration, as is done in private wells in Dunnigan. Arsenic levels in the Wild Wings development's water supply may increase to levels requiring treatment over the next few years. The water from many wells in the county is high in calcium and magnesium ions. Such "hard water" is safe to drink but results in pipe scale and short service life of appliances. Commonly-used sodium-based water softeners are used to address this problem, but they can lead to saltwater intrusion into the aquifer and eventually render groundwater unfit for drinking.

Surface water must be extensively treated prior to municipal use. West Sacramento is one of the few communities that draws and treats water from the Sacramento River for domestic use. This water is processed at the water treatment plant in West Sacramento, which performs sedimentation, filtration and disinfection processes prior to distribution to users. Future use of surface water for domestic supply in other areas would similarly require more extensive water treatment than is currently used for groundwater supplies.

3. Domestic Water Storage and Distribution

Domestic water storage and distribution systems exist on a limited basis in unincorporated Yolo County, as a component of private shared systems or community systems operated by local CSDs. Such systems generally consist

[9] State Water Resources Control Board Water Standards: Title 22 Chapter 4 http://www.waterboards.ca.gov/centralcoast/BasinPlan/BP_text/chapter_4/Chapter 4.htm#_Toc3102176

of at-grade or elevated tanks located in the midst of population centers. Domestic water within these systems is typically delivered with simple low pressure distribution systems consisting of mains, laterals and metered connections. The individual water systems are described in Chapter 2 of this report.

4. Fire Flow

Since there are few domestic water systems in the unincorporated county, firefighting must rely on other means of water supply. In much of the unincorporated county, fire districts use tanker trucks and pumping trucks that draw from irrigation canals, since adequate water storage and distribution systems do not exist. The cities of Davis, West Sacramento, Winters and Woodland, and the unincorporated communities of Esparto, Knights Landing, Madison, and Yolo, as well as the Wild Wings development in Monument Hills, have distribution systems with hydrants.

New County regulations contained in Title 7, Chapter 1, Section 7-1.04 of the Yolo County Code require the installation of fire sprinkler systems in all new residential development and in new non-residential development over 5,000 square feet in floor area or over 25 feet or three stories in height. However, most existing water systems do not operate at pressures sufficient to maintain fire flows for non-residential development, and every district in the county that provides domestic water currently needs to upgrade its water system to meet the new requirements. In most cases, adequate fire flows could be accomplished by increasing well production, storage capacity and the capacity of distribution pipes, or some combination of these improvements.

D. Wastewater

This chapter provides an overview of county-wide conditions and issues concerning wastewater treatment.

1. Wastewater Treatment

In Yolo County, wastewater is handled by individual on-site private septic systems, by wastewater treatment facilities provided by independent service districts, and by private wastewater and water systems serving multiple users. Additionally, the Cities of Davis, West Sacramento, Winters and Woodland operate municipal treatment plants serving many thousands of users, including, in the case of Davis, some unincorporated parts of the county.

a. Individual On-Site Wastewater Treatment

Individual on-site private wastewater treatment systems (septic systems) are the standard method of wastewater treatment in most of the unincorporated areas of the county. These systems typically consist of a treatment system (septic tank) for collection, settling and digestion of wastes and a disposal system (leachfield) for dispersal and absorption of septic tank effluent into the soil.

The effectiveness of individual septic systems is highly dependent on infiltration for the leachfield. Soils conditions or the presence of a high water table, such as is found in Clarksburg, may preclude or reduce the feasibility of septic systems. A high water table can reduce the effectiveness of the soil treatment, can be a conduit for contamination of the aquifer, and can cause the disposal field to fail. The County requires a minimum of five feet of separation between leachfield depth and groundwater (Yolo County Code Title 6, Chapter 5).[10] While such constraints make use of individual septic systems challenging, alternative on-site technologies like pressure-distribution leachfields and/or a mounded system on top of the natural grade, can often be used to overcome them. However these systems require large amounts of land to locate adequately sized systems.

Although individual private on-site septic systems have been successfully used to support low-density residential development in the county, the use of such

[10] Sarazin, Bruce. Director, Yolo County Environmental Health Division. Personal telephone communication with Coastland Civil Engineering. August 10, 2006.

systems has presented concerns. Regulation and monitoring of numerous individual systems can be challenging for local agencies. Older systems that are poorly installed, located or maintained can fail causing backflow or localized contamination that can over time make local groundwater unfit for drinking. And, as previously discussed, concentrated use of individual on-site systems contributes to elevated nitrogen concentrations in groundwater, a serious concern in several parts of the county, including Dunnigan, Madison and North Davis Meadows.[11]

Individual septic systems typically require about 0.8 to 1 acre. Depending on soil conditions, depth to groundwater, and the site-specific application of various setbacks required by the Yolo County Environmental Health Division, septic systems may be allowed on lots as small as ½-acre.[12] In areas where wells are used for domestic water supply, 1.5-acre lots may be necessary. Yolo County Environmental Health Division setback requirements, adopted by the County in 1994 pursuant to Title 6, Chapter 5, Article 6 of the Yolo County Code, are presented in Table 1. The use of septic systems on lots as small as ½-acre may be possible for individual infill lots, but is not likely to be achievable for new subdivisions, given the County's requirements.

The use of septic systems is expected to be substantially affected by the impending adoption of regulations pursuant to California Assembly Bill 885 of 2000 (AB 885). AB 885 requires the State Water Resources Control Board (SWRCB) to develop statewide regulations for on-site wastewater treatment systems. As of July 2006, final regulations have not yet been adopted, although their adoption is understood to be imminent. The draft regulations include depths to groundwater, setbacks from surface waters, and monitoring

[11] Hendrix, Donita. Manager, Dunnigan Water District. Personal telephone communication with Coastland Civil Engineering. June 12, 2006.

[12] Sarazin, Bruce. Director, Yolo County Environmental Health Division. Personal telephone communication with Coastland Civil Engineering. August 10, 2006.

TABLE 1 **YOLO COUNTY SEPTIC SYSTEM SETBACK REQUIREMENTS**

	Distance from Septic Tanks (feet)	Distance from Dispersal Field (feet)
Foundations	10	10
Property Lines	25	50
Domestic Wells	50	100
Public Wells	100	100
Flowing Streams	50	100
Seasonal Streams and Drainage Ditches	25	50
Cut/Fill Banks	50	100
Lakes and Reservoirs	100	200

Source: Sarazin, Bruce. Director, Yolo County Environmental Health Division. Personal telephone communication with Coastland Civil Engineering regarding the County's April 1994 Guidelines to the Planning, Installation, and Maintenance of Septic Systems in Yolo County. August 10, 2006.

and maintenance requirements to achieve discharge limits for biological oxygen demand, suspended solids and total nitrates.[13] The AB 885 regulations are also expected to address the use of supplemental treatment, such as filtration and ultraviolet light disinfection, which is a possible way of achieving higher development densities that still use septic systems, although at five to fifteen times the cost of conventional systems. The Yolo County requirements for septic systems will need to be adjusted to meet the new AB 885 regulations.[14]

[13] State Water Board, 2005, PowerPoint presentation for the State Water Board Workshop Information Item Meeting held December 9, 2005.

[14] Yolo County Health Department website, http://www.yolocounty.org/org/health/eh/general/sewagedisposal.asp, August 1, 2006.

b. Shared or Community Systems

Shared or community systems are typically shared between two or a few owners with maintenance provided by the owners. These systems can be managed by a homeowner association or a CSD or CSA. The Yolo County Environmental Health Division discourages the use of shared or community systems without an entity that can assess maintenance fees. All community systems in Yolo County are managed by a CSA or CSD, including the communities of Esparto, Knights Landing, Madison and Yolo, and the CSA that serves the planned development of Wild Wings in Monument Hills. Shared and Community systems must meet the County requirements per Title 6, Chapter 5, Article 3 of the Yolo County Code.

c. Large-Flow Systems

A large-flow system differs from a community system in that it involves a single large user such as a large commercial development, a school or a mobile home park. Large-flow systems can use any form of treatment technology, including septic systems and pond systems. Such systems serve a number of developments in the county, for example, the Country Fair Mobile Home Park in Dunnigan and the Cache Creek Casino and Resort in Brooks. Large-Flow systems must meet the County requirements per Title 6, Chapter 5, Article 3 of the Yolo County Code.

d. Municipal Wastewater Treatment Systems.

Municipal wastewater treatment systems currently serve Davis, West Sacramento, Winters and Woodland. Municipal wastewater treatment systems can be distinguished from community systems in that they are typically managed by a City and commonly serve many thousands of users. These systems collect wastewater from individual properties and convey it by gravity flow or using pumps and pressurized force mains to a centralized wastewater treatment plant, where waste is commonly treated, stored and disposed of in ponds.

Wastewater treatment plants commonly provide primary and secondary treatment, while some provide tertiary treatment. Primary treatment consists of mechanical processes to reduce oils, grease, fats, sand, grit and settleable solids. Secondary treatment degrades the biological content of the sewage (human waste, food waste, soaps and detergent) using naturally occurring biota in a system of ponds. Some wastewater treatment systems provide tertiary treatment to raise the effluent quality to meet increasingly stringent wastewater discharge standards. Tertiary treatment processes include filtration, nutrient removal, wetlands and disinfection with chlorination or ultraviolet light. Municipal systems must meet the County requirements per Title 6, Chapter 5, Article 3 of the Yolo County Code.

2. Wastewater Discharge

Disposal of treated wastewater is usually by discharge to a water body, by evaporation/percolation, or by land application, which is usually spray field irrigation of farmland. The discharge of treated effluent to waterways has become an increasing issue in recent years. Increasingly stringent water quality standards have been applied to wastewater discharges, to the extent that water discharged into natural waterways is often cleaner than the receiving waters. Indeed, drinking water standards are less stringent than the waterway discharge standards, and even groundwater that meets drinking water standards, after it is used for domestic purposes and undergoes wastewater treatment, may not meet waterway discharge standards.

As previously discussed for reclaimed water, alternatives to discharging treated wastewater effluent to waterways include using it to irrigate agricultural lands and ornamental landscaping; capturing it for use in industrial processes; direct injection to recharge aquifers (generally discouraged in Yolo County); or discharge to wetlands, which further clean the effluent. Relying on the less contaminated deeper aquifers for domestic water supply in turn also results in cleaner wastewater that is more easily treated and disposed since contaminants in the water supply eventually end up in the wastewater flows. Finally, additional processes such as evaporation/percolation ponds

for disposal can be added to existing treatment facilities, but depending on the availability of land, this can be an expensive option.

The National Pollutant Discharge Elimination System (NPDES) program controls water pollution by regulating point sources that discharge pollutants into waters. Point sources are discrete conveyances such as pipes or man-made ditches. A NPDES permit is required for all discharges to water. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need a NPDES permit. However, industrial, municipal and other facilities must obtain permits if their discharges go directly to surface waters.

The NPDES permit program is administered by the State. The Central Valley RWQCB issues NPDES permits for water discharges. In order to meet increasingly stringent water quality standards, tertiary treatment is now commonly required for discharges to water. Secondary treated water can be discharged into surface waters without any additional treatment provided the wastewater can be diluted by a factor of 20:1. Land discharge and reclamation options must be explored before applying for a NPDES permit.[15]

E. Storm Drainage and Flood Control

Many areas in the eastern part of Yolo County are at elevations near or below sea-level, and many of the county's communities are located next to water courses that are prone to flooding.

Outside the cities, formal drainage facilities serving developed areas, such as storm drains, and dedicated or combined storm drain/sewage pipe systems, are generally limited to new development and are often non-existent in the older areas of existing towns. Excess runoff from heavy rainfall flows from

[15] Marshal, Jim. Senior Water Resources Control Engineer, Central Valley RWQCB. Personal telephone communication with Coastland Civil Engineering. August 13, 2006.

paved surfaces or on-site swales to roadside ditches, and then to nearby sloughs, canals or other waterways. Water also collects in low spots, where it will eventually evaporate. Due to the lack of local facilities, localized flooding frequently occurs in many parts of the county in periods of heavy rainfall.

Despite the lack of local storm drain facilities, levees and canals used for regional drainage and flood control purposes are extensive in the county. A number of on-going threats affect the levee and canal system and add to its maintenance needs, including land subsidence, invasive species, stringent pollution controls and public use. Maintenance must also comply with all relevant Federal and State permit requirements, particularly with regards to water quality and habitat protection. Land subsidence destroys the integrity of levee and canal walls and poses the potential for wall failure as well as diminishing the carrying capacity of the channel. Growth of invasive plant species within the canal system has led to instances of localized flooding as the channels become choked with vegetation that reduces their capacity. Unlined canals leach naturally occurring contaminants such as nitrates, selenium, boron and mercury, which are subject to increasingly stringent water quality regulations. Water quality deterioration from boating exhaust emissions and fuel wastes, and structural damage to levees from heavy traffic loads on levee roads, are also problems.

F. Considerations Regarding Infrastructure Operations and Maintenance

This section discusses general considerations for the implementation and management of infrastructure systems, particularly those that would be needed in the future to support new development.

1. Private Systems

As discussed above, much of Yolo County's unincorporated non-agricultural development is currently served by on-site, private infrastructure facilities, such as individual wells and private septic systems. Such systems are practical and appropriate for low density and dispersed development on large parcels.

Ongoing reliance on private individual systems would allow for development to occur only at low densities and in limited amounts. Private wells and septic systems generally only serve densities of one unit per acre or less. Issues of land subsidence, shallow groundwater contamination and water quality, County standards and impending State regulations pursuant to AB 885 may further constrain the number and potential concentration of individual private systems. Monitoring and regulation of private systems is difficult, resulting in many systems that do not meet modern engineering standards, and which may present public health or environmental concerns.

2. Community Systems

Community systems can be used where higher densities preclude use of individual on-site systems. Because the systems are shared the cost per user is less. These systems must have personnel to operate and maintain the facilities. Community systems can be operated by either a private entity such as a homeowner association or by a CSD or other special district.

As compared to private individual septic systems, community systems allow more control to support desired locations and types of development. By taking advantage of economies of scale, community systems enable the use of technologies that attain a higher level of treatment. Community systems also provide more flexibility in site planning. Development of facilities off-site can allow clustered development in rural areas or infill with small parcel sizes in urban areas. Off-site facilities can also be more carefully located to minimize environmental impacts or respond to site constraints. For these reasons, community systems are desirable for development densities above the one unit per acre that can be served by private systems.

Although community systems can be managed by a private entity, such as a homeowner association, many local governments and regulatory agencies favor public entities to manage such systems. For example, according to a recent study of on-site wastewater treatment and disposal completed for Butte County, the RWQCB strongly supports the formation of a public entity to manage community systems in the county, whether it is a single entity or an

entity for each system. The report notes the RWQCB's concern that homeowner associations may not have adequate technical, managerial and financial capacity to effectively operate a larger scale system.[16] Also, as previously noted, the Yolo County Environmental Health Division does not support shared systems without an entity that can assess maintenance fees.

3. Municipal Systems and Out-of-Area Service Agreements

Municipal systems are large-scale community systems operated by a City or County. The cities may be able to support development in the unincorporated county through out-of-area service agreements but only if the development is within the sphere of influence of the city and annexation is anticipated.[17] Examples of existing out-of-area service agreements include those for North Davis Meadows, El Macero and Willowbank, next to the city of Davis. These communities are discussed with Davis in Section 3.I below.

[16] Questa Engineering Corporation, 2006. *Onsite Wastewater Program Evaluation Butte County.*

[17] Yolo County LAFCO website, August 14, 2006. http://www.yolocounty.org/lafco/Forms-policies/Out%20of%20Agency%20Service%20Review/service%20review.htm

3 COMMUNITY AREAS

This chapter addresses infrastructure conditions in each of seven unincorporated communities in the county, and also at the edges of each of the incorporated cities. It includes analysis of existing infrastructure systems and capacities, and of the amount and type of growth that could be supported in the future, using existing or moderately expanded systems.

A. General Considerations

In general, infrastructure in the unincorporated areas is old and deteriorating, with severe capacity limitations. Facilities in Esparto and Knights Landing, which are operated by local CSDs, are in better condition and have been undergoing improvements and incremental expansions to accommodate recent, ongoing and proposed development in those communities. These communities have received growth and have in turn been able to contemplate and implement incremental facilities improvements to accommodate growth. As indicated in the sections below, the other unincorporated communities have more limited and older systems.

Given these conditions, most new development at densities greater than one unit per acre in the unincorporated county would require new infrastructure to serve it. This section considers the basic service parameters for new infrastructure, which would be applicable in all of the unincorporated communities discussed below.

a. Water

Low density development at approximately one unit per acre or less could generally be served by individual private wells, as occurs in much of the unincorporated county today. In areas served by wells and septic systems, County spacing requirements would result in maximum densities of approximately one unit per 1.5 acres. In some cases, shared private wells might also be appropriate, but individual studies would be needed to determine precise design and operating characteristics, such as the number and capacity of wells and pipes, and the distribution system layout. A homeowner association could

potentially be established for new subdivisions with shared wells and distribution systems. However, the Yolo County Environmental Health Division does not support private shared systems, because of concerns regarding inadequate provisions for testing and monitoring of such systems and for assessment of maintenance fees. Accountability is hard to determine and enforce. Shared wells would generally be appropriate for developments at densities of one or two units per acre depending on aquifer depth and capacity.

Development at higher densities, either as infill development on existing smaller lots in the center of a town or as new subdivisions on outlying parcels, would require shared water facilities such as treatment, conveyance, storage and distribution systems. Management of such a domestic water system would require either the creation of a new managing entity, such as a CSD, or expansion of the responsibilities of an existing entity. Additional study would be needed in each individual community to determine precise design and operating characteristics, such as the number and capacity of wells and pipes, and the distribution system layout.

In most of the county, groundwater would be a viable option to supply some new development. However, the limitations of aquifer capacity, subsidence, and water quality issues might require that surface water supplies be considered to support significant new growth. In order to develop surface water supplies for domestic use, water supply contracts would need to be renegotiated. The Sacramento River and the Tehama-Colusa Canal have potential to be used as surface water sources for new development.

b. Wastewater

Development at densities of approximately one unit per acre or less could generally be served by individual septic systems, as is currently the case in most of the unincorporated county.

Development at densities above one unit per acre would generally need to rely on shared septic or pond systems, either making use of existing facilities or developing new shared facilities. In areas served by well water, densities as

low as one unit per 1.5 acres may be necessary to meet County spacing requirements. For pond systems, there are no limits on the density of development, provided adequate land is available for treatment facilities. The adequacy of existing systems to serve additional demands would need to be evaluated on a case-by-case basis. A new CSA or other public entity would need to be established to assess fees and manage the system.

For more significant development, a town-wide wastewater collection and treatment system could be developed. There are a number of possible treatment methods for a municipal system. A pond system is a common method and would be appropriate for this region. Pond systems already exist and could potentially be expanded in Esparto, Knights Landing, Madison, Davis, Woodland, West Sacramento and Winters. Although pond systems require more land than other types of systems, land costs and availability in the area generally make them economically-viable options. Expensive tertiary treatment would be necessary at most of these facilities to use the reclaimed waters. The use of irrigation fields to dispose of treated wastewater could help by reducing the need for disposal using the existing evaporation/percolation ponds, thus freeing them up to use in treatment, and reducing the amount of land needed at a typical pond system.

Management of a new municipal wastewater system in any given community would require either the creation of a new managing entity, such as a CSD or CSA, or expansion of the responsibilities of an existing entity.

c. Storm Drainage and Flooding

New development would be required to implement post-construction best management practices (BMPs) to control the volume, rate, and potential pollutant load of stormwater runoff.[18] Title 8, Chapter 3 of the Yolo County Code requires one foot of freeboard above Base Flood Elevation (i.e., the flood elevation for the 100-year storm event) for new residential construction.

[18] Section 10-9.303 of the County of Yolo Stormwater Ordinance, Ordinance Number 1352, July 25, 2006

Drainage facilities for development at densities of two units per acre or less might reasonably consist simply of on-site ditches to convey water to existing roadside ditches.

Construction activities that disturb one or more acres of land are required to comply with the Statewide National pollutant Discharge Elimination System (NPDES) general permit. A NPDES permit regulates stormwater leaving a construction site. To satisfy the requirements of the NPDES a Strom Water Pollution Prevention Plan (SWPPP) must be developed. The SWPPP lists what Best Management Practices (BMP) policies will be used during the construction phase. Drainage for larger developments would likely consist of curbs and gutters within some development areas and a network of on-site collection pipes or ditches that convey runoff to on-site detention basins, which in turn moderate flows to existing off-site channels.[19] Management of these facilities would require expansion of the responsibilities of an existing entity or the creation of a new agency. Revised grading practices and construction materials can also be incorporated into site drainage to achieve a condition of no net increase to off-site drainage systems. New subdivisions are incorporating detention basins within their communities. These basins require maintenance by a CSA or CSD.

B. Clarksburg[20]

All non-agricultural development in Clarksburg is served by individual private wells and septic systems. The community of Clarksburg has no CSD to manage water, sewer, or storm drainage.

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[19] County of Yolo Improvement Standards Section 11 Stormwater Quality, Erosion and Sediment Control, August 1, 2006

[20] Information for Clarksburg was obtained from the Clarksburg General Plan (2001) and personal communications with Bob Webber, Director of Reclamation District 999, on June 12, 2006. Reclamation District 999 operates the canal and levee systems that provide local irrigation water and flood control.

1. Water

Clarksburg's domestic water supply comes from groundwater. Property owners rely on their own private wells. The water table is high, making wells an effective means of water supply.[21] Wells in the area do not require treatment. There is no community water storage or distribution network. The Clarksburg Fire District uses a 4,200 gallon water tanker for firefighting water supply. When those supplies are not enough, the department can pump water from rivers and local irrigation canals.[22]

Reclamation District 999, also known as the Netherlands District, provides irrigation water to the surrounding agricultural region, as well as limited drainage, levee maintenance and flood control. Irrigation water is provided through diversions from the Sacramento River, Elk Slough and the Deep Water Ship Channel. This District's canal system dates from the 1920s. System piping is rusty and in need of replacement in many areas. Reclamation District 999 does not supply domestic water.

Given that no domestic water system exists in Clarksburg, any infill development at densities above about one unit per acre would require a new water system. Clarksburg lies within the Primary Zone of the Delta Protection Area. New "green field" development beyond what is already zoned is prohibited. Such a system would need to follow the parameters outlined in Section 3.A.1, above.

The high water table in the Clarksburg area makes groundwater a good option to supply new development. Nonetheless, surface water supplies could also be considered, particularly since the Sacramento River is immediately adjacent to the town.

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[21] Yolo County Planning and Public Works Department, 2001, *Clarksburg General Plan*, December 2001, Yolo County, pages 31 and 32.

[22] Yolo County Planning and Public Works Department, 2001, *Clarksburg General Plan*, December 2001, Yolo County, page 33.

The recently approved proposal for redevelopment of the Old Sugar Mill properties will include community water and sewer services via a CSA and a homeowner association will manage the drainage facilities. The County and the applicant have explored the idea of combining the water system with a possible future community water system to serve the existing town, in place of the current individual wells.[23] In order to extend community water service from the Sugar Mill to the Town of Clarksburg, one additional well, distribution piping, and additional storage would be required.[24]

2. Wastewater

No publicly operated wastewater treatment facilities exist in Clarksburg, and so all wastewater is treated by private individual on-site septic systems. Due to the high local water table, septic systems need to be located above ground in a mound system.

Future infill development at densities greater than about one unit per acre would require a new shared system. The parameters for such a system are described in Section 3.A.2, above.

A municipal treatment facility would need to accommodate the groundwater conditions in the area. Nevertheless, there are large areas of agricultural land in the Clarksburg area that could feasibly allow for disposal via spray fields.

The wastewater system for the Old Sugar Mill Specific Plan would not have any excess capacity to serve other development in Clarksburg.

3. Storm Drainage and Flooding

There are no detention basins or surface drainage pipe networks in Clarksburg. Storm drainage flows to roadside swales and low spots, where it evaporates or percolates into the ground, or flows into the irrigation canals, which

[23] *Old Sugar Mill Specific Plan Recirculated EIR*, November 2005, pages 1-1 to 1-11.

[24] *Old Sugar Mill Specific Plan Recirculated EIR*, November 2005, pages 1-1 to 1-11.

can be pumped to prevent flooding. Localized flooding can be a problem during heavy rains.

Reclamation District 999 provides limited drainage, levee maintenance and flood control services to Clarksburg and the surrounding area. The District operates 12 pump stations that discharge irrigation tailwater and stormwater runoff from the irrigation canal system back into the Sacramento River and the Deep Water Ship Channel. The District also maintains 33 miles of levees in the area for flood control. The levees are in need of repairs that exceed the current maintenance budget of the district.[25] The U.S. Army Corps of Engineers recently repaired the section of levee alongside the Old Sugar Mill properties.[26]

If new edge development were to occur in Clarksburg at densities exceeding one unit per acre, new storm drain facilities would be required. Additionally, new construction practices would need to be developed following the parameters indicated in Section 3.A.3, above.

C. Dunnigan[27]

Dunnigan is served by individual private wells. Private community wells are used by commercial development and by the County Faire Estates Mobile Home Park. Wastewater facilities for the region are typified by septic systems, with some small pond facilities. The Dunnigan Water District provides irrigation water from an entitlement from the Tehama-Colusa Canal.

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[25] Bob Webber. Director, Reclamation District 999. Personal telephone communication with Coastland Civil Engineering. June 12, 2006.

[26] Environmental Science Associates, 2004. *Old Sugar Mill Specific Plan Draft Program Environmental Impact Report.*

[27] Information for Dunnigan was obtained from the Dunnigan General Plan (2001) and personal communications with the Dunnigan CSD.

1. Water

Dunnigan's domestic water supply comes from groundwater, although the two mobile home parks have separate private water systems. Property owners rely on private wells, mostly individual wells serving single parcels. There are several private, shared water systems serving multiple residences in the Old Town area of the community, where lots are smaller.[28]

Nitrate contamination is a concern in the Dunnigan area, particularly in the Old Town area. The Yolo County Department of Environmental Health Services has tested private wells in the past for nitrate and coliform. High nitrate levels were detected in the Old Town area in studies conducted in 1982 and 1993. The nitrate contamination was not traced to a single source but both studies suggest that old and ineffective on-site sewage disposal systems may be contributing factors. Domestic and commercial agricultural practices may also contribute.[29] Nitrate filtration devices are now installed on wells.[30]

The Dunnigan Water District (DWD) serves 120 agricultural customers in the area around Dunnigan with irrigation water from surface sources. The DWD has a contract with the Bureau of Reclamation for 19,000 acre-feet of water annually and uses approximately 14,000 acre-feet annually. Peak use is typically 3,500 acre-feet per month (in July) with 2,000 acre-feet in other summer months.[31] The Bureau of Reclamation has cut Dunnigan's allocation by 25 to 40 percent in times of severe drought. The DWD's water supply comes from the Tehama-Colusa Canal. The local system is comprised of three turnouts on the canal that feed into a 26-mile distribution network of 6-inch to 48-inch

[28] Yolo County Planning and Public Works Department, 2001, *Town of Dunnigan General Plan*, February 2001, Yolo County, page 47.

[29] Yolo County Planning and Public Works Department, 2001, *Town of Dunnigan General Plan*, February 2001, Yolo County, page 49.

[30] Yolo County Health Department. Personal communication with Coastland Civil Engineering. June, 2006.

[31] Hendrix, Donita. Manager, Dunnigan Water District. Personal telephone communication with Coastland Civil Engineering. June 12, 2006.

pipes and metered connections. The DWD operates one pumping plant at the turnout near Road 2. Completed in 1981, the system is reportedly in good condition. There are no known major problems or deficiencies and no major capital or replacement projects are planned at this time.[32] The DWD does not supply domestic water but in some cases does act as a water purveyor. For example, the Ritchie Bros. Auction Yard purchases its fire flow water supply from the DWD. The DWD does maintain a water distribution pipe network. The Dunnigan Fire District uses a water tanker truck and two pumping trucks, which use water drawn from the DWD irrigation canal system.[33]

Land subsidence due to overdraft of the shallower aquifer is a significant concern in the county, and areas southeast of Dunnigan have been some of the worst affected. Since surface water diversions from the Tehama-Colusa Canal for irrigation water began in 1981, groundwater levels have risen up to 20 feet in the Dunnigan area.[34] Subsidence problems may also persist and worsen due to continued and increasing use of already overdrawn shallow groundwater supplies.

Given that no community domestic water system exists in Dunnigan, any new development at densities above about one unit per acre would require a new water system. Such a system would need to follow the parameters outlined in Section 3.A.1, above. The need for a community-wide water system has been discussed in the past; however, no proposals have been developed. The DWD has indicated that it could potentially provide domestic water to urban uses in the future.

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[32] Hendrix, Donita. Manager, Dunnigan Water District. Personal telephone communication with Coastland Civil Engineering. June 12, 2006.

[33] Yolo County Planning and Public Works Department, 2001, *Town of Dunnigan General Plan*, February 2001, Yolo County, page 47.

[34] Yolo County Planning and Public Works Department, 2001, *Town of Dunnigan General Plan*, February 2001, Yolo County, page 58.

Due to the nitrate problems, which may persist and worsen with continued proliferation and deterioration of septic systems, wells may need to be drilled deeper and be sealed where they pass through the contaminated shallower aquifer. Deeper wells are more costly to develop and, as discussed in Chapter 2, draw from deeper aquifers which are much slower to recharge.

As an alternative to the use of wells, surface water supplies could be considered, particularly for development of significant numbers of new units. Surface water diversion from the Tehama-Colusa canal is one possibility. As an alternative, a combination of groundwater supplies from deeper aquifers and surface water from the Tehama-Colusa Canal could be used to meet the needs of new development.

To provide a viable domestic source, additional surface water supply authorizations would need to be secured and treatment, conveyance, storage and distribution systems would need to be developed. Glenn and Colusa Counties currently divert less water from the Tehama-Colusa Canal than their permits allow.[35] The DWD could apply for authorization to increase its diversions as long as upstream users continue to underutilize their allocations. Additional study would be needed to identify how many domestic users could be served by additional diversions from the Canal. Alternatively, other surface water sources or service by a different entity could be explored. Maintaining a secure water supply in times of drought would be an important consideration if surface water supplies were to be relied upon as a primary water source.

2. Wastewater

No community sewage treatment facilities exist. Most wastewater is treated by private septic systems, many of which are old and may be a cause of nitrates in the groundwater.

[35] Hendrix, Donita. Manager, Dunnigan Water District. Personal telephone communication with Coastland Civil Engineering. June 12, 2006

There are nine small, private, on-site wastewater pond treatment systems operated by commercial and industrial facilities and the County Faire Estates Mobile Home Park in Dunnigan. Of the nine, only the Ritchie Bros. Auction Yard uses lined ponds. According to a recent proposal to the County, the County Faire Estates system does have capacity to serve commercial development along Road 8. These ponds provide minimal and unreliable treatment, fail to achieve secondary treatment levels, and have the potential to contaminate the groundwater with nitrates, coliform and other bacteria.[36]

Since no publicly managed wastewater treatment system exists in Dunnigan, any future development at densities greater than about one unit per acre would require a new community system. The parameters for such a system are described in Section 3.A.2, above. The DWD is not allowed to provide wastewater services according to its definition as a water district.[37] A new CSD or CSA would need to be established to provide community wastewater service.

3. Storm Drainage and Flooding

There are no detention basins or surface drainage pipe networks in the Dunnigan area. Drainage collects in roadside swales and low spots where evaporation and infiltration eventually occurs. Localized flooding is a common and recurring problem. Roadside ditches are maintained by the Yolo County Planning and Public Works Department.

Existing irrigation canals that receive stormwater flows are generally in good condition; upgrades may not be required for limited development at low densities.

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[36] Ann Olfson, Water Resources Control Engineer for Land Disposal, Yolo County Environmental Health Department. Personal telephone communication with Coastland Civil Engineering. August 8, 2006.

[37] Per LAFCO definition http://www.yolocounty.org/lafco/Special %20Districts /Index.htm #ALLCSA

If new development were to occur in Dunnigan, it would likely require new storm drain facilities, which would require developing a community system following the parameters indicated in Section 3.A.3, above.

D. Esparto[38]

The Esparto CSD provides domestic water and wastewater services for the community, and irrigation water to the surrounding area. The Esparto CSD appears to have well-functioning water and wastewater systems and adequate technical, managerial and financial capacity to continue to accommodate new development through incremental expansion of its existing systems.

1. Water

The Esparto CSD's domestic supply system consists of four municipal wells with approximately 860 water connections. Well #1 has a capacity of 260 gallons per minute (gpm). The capacity of Wells #4 and #5 are both 750 gpm. Well #6 produces 435 gpm.[39] Preliminary testing for Well #7 proposes that another 750 gpm well is possible.[40]

One additional well was abandoned due to fuel contamination from an unspecified source. The extent of the plume is unknown and so any new wells located near the site of the abandoned well would need to be tested to ensure the plume had not reached that location.[41] Three separate electric grids supply power to the wells, and one of the wells has an emergency generator to

[38] Information for Esparto was obtained from the Esparto General Plan (1996), the Esparto 1996 Facilities Plan Update (2003), and the current (2006) draft updated Esparto General Plan.

[39] Louden, Ron. Manager, Esparto CSD. Personal telephone communication with Coastland Civil Engineering. August 3, 2006.

[40] Louden, Ron. Manager, Esparto CSD. Letter to the Yolo County Board of Supervisors. September 15, 2006.

[41] Esparto 1996 Facilities Plan Update, PSOMAS, May 2003, Table 4-2, pg 4-3.

ensure reliable operation. The CSD prohibits the use of private wells to provide potable water if services are available from the CSD.[42]

Existing underground water mains in Esparto vary in size from 6 to 12 inches in diameter. Booster pumps with 3,000-gallon hydro-pneumatic tanks were recently added to the wells, and a 500,000-gallon storage tank was constructed to ensure adequate fire flows. Even so, the water distribution pipes in the town core are too small to maintain acceptable commercial fire flows and need to be replaced with larger pipes.[43]

Water quality is generally considered good, although total dissolved solids exceed recommended levels. Chlorine is added to the water supply at the well head.[44]

With recent upgrades, the water system can accommodate an estimated total population of about 925 connections, approximately 75 more connections than exist today.[45] Growth at the edges of the town would also require additional distribution infrastructure to tie into the existing distribution system.

2. Wastewater

Esparto's wastewater system, constructed in the late 1960s, consists of 6-inch, 8-inch and 10-inch clay pipes. The clay pipes allow infiltration and inflow of drainage water into the sewer system. The inflow of drainage water into the wastewater pipe network increases total demand on the system and treatment

[42] Yolo County Planning and Public Works Department, 2006, *Draft Esparto General Plan*, Yolo County, pages 56 and 57.

[43] Yolo County Planning and Public Works Department, 2006, *Draft Esparto General Plan*, Yolo County, page 56.

[44] Louden, Ron. Manager, Esparto CSD. Personal telephone communication with Coastland Civil Engineering. August 3, 2006.

[45] Louden, Ron. Manager, Esparto CSD. Personal telephone communication with Coastland Civil Engineering. August 3, 2006.

facilities.[46] Sewage flows under gravity east to lift pumps at the head of the treatment facility. New sewer mains have been installed to reach new developments. An upgrade and expansion of the lift station is currently underway to improve workplace safety for CSD staff by eliminating the need for confined space entry.

Sewage is treated at the wastewater treatment plant in two facultative ponds and then disposed in six percolation/evaporation ponds. The 28-acre treatment plant is being expanded to provide two additional ponds. The expanded plant will incorporate aeration equipment that can be transferred to the six ponds to enhance the treatment efficiency of the facultative ponds. After the expansion, the facility will still have over 30 acres on which it could expand treatment capacity. The facility currently has room to provide a total of 59 acres of treatment and disposal facilities of which 25 acres is used as a spray field.[47]

The wastewater treatment plant is capable of meeting current demands. The addition of the two ponds will provide capacity for development currently under construction. Development beyond what is currently under construction will require additional pond construction, which can occur until the 59-acre limit is achieved. Continued increases in demand would require further facility upgrades or the acquisition of additional land for further expansion. The District has acquired much of the land needed for facility expansion but construction of the needed facilities would require substantial capital investment.

To implement aeration, the existing percolation/evaporation ponds must be retrofitted with liners that will prevent percolation, reducing effluent disposal capacity. However, additional percolation/evaporation ponds could be constructed to correct this capacity issue. As an alternative to use of disposal

[46] Louden, Ron. Manager, Esparto CSD. Personal telephone communication with Coastland Civil Engineering. August 3, 2006.

[47] Louden, Ron. Manager, Esparto CSD. Personal telephone communication with Coastland Civil Engineering. August 3, 2006.

ponds, recycled water can be used to irrigate non-food crops and ornamental landscaping.

Additional wastewater collection and treatment capacity can continue to be provided incrementally in Esparto in pace with and funded by new development. Aeration equipment can be added to more of the existing ponds to increase capacity without acquiring more land. Continued expansion may ultimately require acquisition of additional land beyond the 59 acres currently owned by the CSD.

3. Storm Drainage and Flooding

Storm drainage and flood control service in Esparto is provided by the Madison-Esparto Regional CSA. Stormwater runoff is collected in roadside ditches and in a limited system of undersized pipes in the older sections. New subdivisions have underground pipe networks. What does not evaporate or percolate into the ground eventually discharges into Lamb Valley Slough. The roadside ditches are subject to flooding during heavy storms. The potential for capacity enhancement of Lamb Valley Slough is severely restricted by adjoining development and existing bridges.

Infill development would simply require on-site ditches to convey water to existing roadside ditches. Major subdivisions would continue to require a network of on-site collection pipes or ditches that would convey runoff to on-site detention basins that would moderate flows to Lamb Valley Slough. Alternatively, the Esparto CSD is exploring the possibility of a community detention basin. More information on these strategies is found in Section 3.A.3 of this report.

E. Knights Landing[48]

The Knights Landing CSD provides water and wastewater services to a 137-acre service area that roughly coincides with the town.[49] Storm drainage and flood protection are provided by four different agencies: the Yolo County Public Works Department, Reclamation District 730, the Knights Landing Ridge Drainage District (KLRDD) and CSA #6 (Snowball CSA).

1. Water

The Knights Landing CSD water supply comes from three wells. A well on Railroad Ave produces 745 gpm, the Ridge Cut well produces 1,156 gpm, and the West Third Street well provides 1,500 gpm. Each well has a 5,000-gallon hydro-pneumatic tank that is used to pressurize the pipe network.[50] The Railroad Avenue well also has a second 5,000-gallon tank. Not including fire protection demand, either well can supply the community's current average daily demand of 167 gpm and peak demand of 694 gpm. The three existing wells today could serve a total of about 390 connections, not including fire protection demands.

Housing development projects currently under construction will add 76 units. Nearly all the remaining water capacity will be used by these developments.

The existing looped distribution network built in 1970 consists of 6-inch pipe and is undersized. Existing non-residential fire flows do not meet current

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[48] Information for Knights Landing is from the Knights Landing General Plan (1999) and the Knights Landing Wastewater and Infrastructure Analysis (1995). Yolo County Planning and Public Works Department, 1992, *Comprehensive General Plan for the Town of Knights Landing*, Yolo County, page II-9.

[49] Yolo County Planning and Public Works Department, 1992, *Comprehensive General Plan for the Town of Knights Landing*, Yolo County, page V-4.

[50] King, Warren. Maintenance Superintendent, Knights Landing CSD. Personal telephone communication with Coastland Civil Engineering. August 1, 2006.

requirements and the pipes are in need of expansion to provide adequate pressures for fire flows.[51]

Although water from the municipal wells is high in iron and manganese, the current water supply is untreated. Additionally, the water from these wells is high in calcium and magnesium, causing a "hard water" condition.[52] Bacterial contamination has occurred periodically at each well and chlorination may be required in the future.

New development would require wells, storage facilities and distribution infrastructure to be added to the CSD's existing system. Any future development in Knights Landing will require the installation of larger pipes in the distribution system. Deeper wells are recommended to produce higher quality water and reduce possible aquifer overdraft and subsidence. Subsidence has occurred near the town, which the County monitors.

2. Wastewater

The Knights Landing sewage collection system flows under gravity in 4-inch diameter service lines flowing into six-, eight-, and 10-inch diameter vitrified clay pipe mains that convey into the 12-inch diameter gravity outfall pipe that enters the wastewater treatment plant.[53] The wastewater treatment plant is located on 52 acres on the southeast side of the town, adjacent to the Knights Landing Ridge Cut, surrounded by agricultural land under Williamson Act contract.[54] The facility provides secondary treatment by aeration and disposal to evaporation/percolation ponds. In 1999, sewage flows were approximately

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[51] Yolo County Planning and Public Works Department, 1992, *Comprehensive General Plan for the Town of Knights Landing*, Yolo County, page II-9.

[52] Laugenour and Meikle Civil Engineers, 1995, *Knights Landing Wastewater and Water Infrastructure Analysis*, page 4-6.

[53] Laugenour and Meikle Civil Engineers, 1995, *Knights Landing Wastewater and Water Infrastructure Analysis*, page 4-6.

[54] *Knights Landing Community Services District Municipal Services Review and Sphere of Influence*, Yolo County Local Agency Formation Commission, July 2006, pgs 16-18.

0.219 mgd with a peak flow of 0.545 mgd, and the treatment facility was at 92 percent of capacity, with the ponds overloaded during peak periods.[55] Development since 1999 has used up all extra capacity in the system.[56]

The CSD has purchased 31 acres of land adjacent to the existing treatment plant to expand the facility. On this site, the CSD is currently constructing two ponds to accept the capacity of the 76 units currently under construction. Aeration equipment can be added to the existing ponds and the new ponds to increase capacity.[57] The planned future construction of an additional nine acres of disposal and treatment ponds is expected to provide capacity for an additional 115 homes and 39 commercial/industrial connections.

Additional wastewater collection and treatment capacity can continue to be provided incrementally in pace with and funded by new development. The existing wastewater treatment plant has land on which to add additional treatment and disposal ponds. Aeration equipment can be added to the existing ponds to increase capacity without acquiring more land. Continued expansion may ultimately require acquisition of additional land beyond that currently owned by the CSD. The Williamson Act contract for the parcel surrounding the treatment plant expires in 2015. Land for further treatment plant expansion may be appropriated at that time. Disposal by sprayfields on surrounding farmland could also reduce the need for additional ponds and land acquisition.[58]

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[55] Laugenour and Meikle Civil Engineers, 1995, *Knights Landing Wastewater and Water Infrastructure Analysis*, page 2-1.

[56] *Knights Landing Community Services District Municipal Services Review and Sphere of Influence*, Yolo County Local Agency Formation Commission, July 2006, pgs 16-18.

[57] Janess, Richard. District Engineer, Laugenour and Meikle Civil Engineers. Personal telephone conversation with Coastland Civil Engineering. August 2, 2006.

[58] Yolo County Local Agency Formation Commission, July 2006, *Knights Landing Community Services District Municipal Services Review and Sphere of Influence*, pages 16-18.

3. Storm Drainage and Flooding

Knights Landing is surrounded by major waterways, including the Sacramento River, the Colusa Basin Drain and the Knights Landing Ridge Cut. The Yolo County Public Works Department maintains drainage facilities in streets, excluding State highways, which are maintained by Caltrans.[59] Reclamation District 730 maintains other drainage facilities in the area. Multiple reclamation districts maintain the area's levees, which, like levees throughout the region, are older and in need of repairs that exceed the maintenance budgets of the districts. The Knight Landing Ridge Drainage District maintains approximately 13 miles of levees along the Ridge Cut and overlaps Reclamation District 730. The CSA is responsible for maintenance on the Sacramento River levee from Knights Landing to the Fremont Weir. The Colusa Basin Drainage District is responsible for the levee from the outfall to the Ridge Cut.

The Yolo County Public Works Department provides storm drainage for the community. The system consists of roadside swales, as well as a collection of 18-inch, 24-inch and 30-inch pipes with inlets along sections of Fourth and Sixth Streets, connecting to a 30-inch pipe along Railroad Avenue and discharging to the ditch that parallels County Road 116.[60] The limited pipe distribution network conveys water into the irrigation canals and out to the Sacramento River. Drainage also collects in roadside swales and low spots where evaporation eventually occurs. This method of surface drainage often results in localized flooding.

If new development were to occur in Knights Landing, it would likely require new strorm drain facilities, and detention basins, which would need to be developed following the parameters indicated in Section 3.A.3, above.

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[59] Yolo County Local Agency Formation Commission, July 2006, *Knights Landing Community Services District Municipal Services Review and Sphere of Influence*, pages 16-18.

[60] Yolo County Planning and Public Works Department, 1992, *Comprehensive General Plan for the Town of Knights Landing*, Yolo County, pages V-4 and V-5.

Construction of these systems has been field verified. If development were to occur in other locations, additional drainage pipes would be needed. The recently approved White Subdivision will have an underground pipe network to convey storm drainage to a detention basin to collect storm drainage and then construct a pump station to pump the drainage into the Colusa Basin Drain.[61]

F. Madison[62]

The Madison CSD provides water and wastewater services to the community. The Madison-Esparto CSA maintains drainage facilities.

1. Water

Madison's domestic water connections are supplied by two wells, with a third well under construction. The two existing wells have capacities of 800 gpm and 700 gpm, respectively, and the third will have a proposed maximum capacity of 1,500 gpm. The park well (800 gpm) is the primary water supply for 135 units in the community and the 90-unit migrant farm worker housing facility. The second well (700 gpm) is a back-up well and is used for fire protection pressures. Current domestic demand is 400 gpm.

The water system, installed in the 1960s, includes 6-inch pipe distribution mains and a 3,500-gallon reservoir. The 6-inch existing water distribution lines severely limit the capacity of the system.

Existing fire flows do not meet current requirements. The supply provided by the secondary well does not provide adequate fire pressures even when used in conjunction with the primary well due to the size of the network pip-

[61] Information provided by David Morrison, August 15, 2006.

[62] Information for Madison was obtained from the Madison General Plan (1974), the Madison Fire Protection District Municipal Service Review (2004), and personal communications with Andy Anderson, the Madison CSD maintenance manager.

ing. Pressure losses within the pipe network will also limit the effectiveness of the third well which is to begin production in December 2006.[63] The fire department maintains two tanker trucks, one with 4,000 gallons and the second with 2,000 gallons. There are no current plans to upgrade the pipe network.

The two existing wells are relatively shallow, approximately 175 feet deep, and are known to contain nitrates. Well water is treated by chlorination. The new well will be over 800 feet deep.

2. Wastewater

The wastewater collection system, installed in the 1960s, consists of 6-inch, 8-inch and 10-inch clay pipes. The clay pipes lead to high infiltration and inflow of drainage waters into the sewage system.[64]

Sewage is treated and disposed of in ponds at a treatment plant located east of the community, next to the migrant worker housing. The migrant facility is a major source of summer inflows into the treatment plant. The plant has seven evaporation/percolation ponds to treat 45,000 gpd in the winter and 65,000 gpd in the summer, but is presently severely over-capacity. Raising the walls on the first three ponds, which are 6 to 12 inches lower than the walls of the other ponds, would add capacity. Three new monitoring wells would be added to the plant to determine ground water quality and elevation. The screen at the head works for the plant is in need of maintenance. The Central Valley RWQCB has issued a cease-and-desist order for the plant pending these improvements and for the CSD to compose a Revenue Plan. State and

[63] Anderson, Andy. Madison Community Services District. Personal telephone communication with Coastland Civil Engineering. July 28, 2006.

[64] Hinrichs, Dan. Engineering independent contractor to the Madison CSD Personal telephone communication with Coastland Civil Engineering. August 8, 2006.

County Community Development Block Grant (CDBG) funds have been approved to construct improvements to the wastewater treatment ponds.[65]

Two additional ponds are planned to increase capacity, but to date only one of the ponds, Pond #7, has been completed, due to inadequate funding. The recent addition of the one pond does not meet the needs of the approximate 550 current residents. A second pond would provide additional capacity if it is constructed, but will only meet current demands. Therefore, even more ponds would be needed to accommodate new growth. The plant is land-locked and would need to purchase land to expand facilities. Land would also be needed for disposal purposes.[66]

3. Storm Drainage and Flooding

Storm drainage facilities in Madison are the responsibility of the Madison-Esparto Regional CSA. Stormwater runoff is collected in roadside ditches and what doesn't evaporate or percolate into the ground eventually discharges into the Madison Drain, which empties into Willow Slough. The roadside ditches are subject to flooding during heavy storms.

Madison is located near several sloughs. Willow Slough overflows to the west and north; Cottonwood Slough overflows to the south; and both converge at an undersized culvert under Interstate 505, which backflows into Madison from the east. Last winter, back-flows from the drainage ditch at the migrant housing overflowed into the sewer manhole. Infiltration and inflow from

[65] Hinrichs, Dan. Engineering independent contractor to the Madison CSD Personal telephone communication with Coastland Civil Engineering. August 8, 2006.

[66] Hinrichs, Dan. Engineering independent contractor to the Madison CSD Personal telephone communication with Coastland Civil Engineering. August 8, 2006.

storm drainage enters the sewage system during heavy rains adding demand to that system.[67]

Infill development in Madison would require on-site ditches to convey water to existing roadside ditches. New peripheral development in Madison would require on-site storm drain detention and possibly construction of new detention basins to extend the time of release of storm water into existing channels.[68] More information on these strategies is found in Section 3.A.3 of this report.

G. Monument Hills[69]

Water and wastewater service in the Wild Wings portion of Monument Hills is provided by the Wild Wings CSA, which formed in 2004.[70] The CSA serves the 337-unit Wild Wings development and the adjoining golf course. Storm drainage in Wild Wings is the responsibility of the Wild Wings homeowner association and the golf course. No additional capacity was included in these systems beyond what is needed to serve the Wild Wings development. The remainder of Monument Hills is zoned for 5-acre parcels with private individual septic systems and wells. The remaining areas are not served by a community system.

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[67] Hinrichs, Dan. Engineering independent contractor to the Madison CSD Personal telephone communication with Coastland Civil Engineering. August 8, 2006.

[68] March, 2005, *Madison-Esparto Regional County Service Area Final MSR/SOI Municipal Service Review Sphere of Influence (2005)*, pages 17-24.

[69] Information is from the Specific Plan Monument Hills Special Study (1984), which covered Wild Wings, the Watts-Woodland Airport Comprehensive Land Use Plan 1992 Update (1988), the Wild Wings County Service Area Final MSR/SOI (2003), and the 2002-2007 Yolo County General Plan Housing Element (2003).

[70] Wild Wings County Service Area Final MSR/SOI (2003), pages 1-24.

1. Water

Wild Wings' water supply comes from two wells that have a capacity of approximately 3,000 gpm.[71] Each well has an above-ground storage tank (364,000 gallons), two booster pumps, a hydro-pneumatic tank, and chemical feed equipment.[72] This system was specifically designed to serve the Wild Wings development. Although the system has additional capacity, the policy of the CSA and the County is that the Wild Wings development is not to share its services with the surrounding areas.

Although fire flows are unknown, the proposed operating pressure for the system is in the range of 45-65 pounds per square inch (psi) and residual pressures should meet the 20 psi minimum required for fire protection. Storage facilities have enough capacity to meet the development's needs.

Outside of Wild Wings, residents in Monument Hills and the Watts-Woodland Airport rely on individual on-site private wells. Given that no domestic water system exists in Monument Hills, any new development at densities above about one unit per acre would require a new water system. Such a system would need to follow the parameters outlined in Section 3.A.1, above.

2. Wastewater

Wild Wings' wastewater is collected in a gravity–flow pipe network that conveys flows to a treatment plant located at a low elevation next to the maintenance facility for the golf course. Water from the facility is blended with surface water and groundwater and used to irrigate portions of the golf course and some landscaped areas.[73] The system adequately serves Wild Wings. Additional capacity was included in the system beyond what is needed to serve

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[71] Meredith Stephens Socioeconomics, 1984, *Specific Plan Monument Hills Special Study*, page 52.

[72] 2003, *Wild Wings County Service Area Final MSR/SOI*, pages 1-24. Confirmed by Davis, Bill. Superintendent, Wild Wings Golf Course. Personal telephone communication with Coastland Civil Engineering. August 8, 2006

[73] 2003, *Wild Wings County Service Area Final MSR/SOI*, pages 12-13.

Wild Wings, however extension of service to the surrounding areas would require changes in CSA and County policy. Outside Wild Wings, property owners in the Monument Hills area rely on individual private on-site septic systems.

Since no centralized wastewater treatment system exists in portions of Monument Hills outside Wild Wings, any future development in this area at densities greater than about one unit per 1.5 acres would require a new shared system. The parameters for such a system are described in Section 3.A.2, above.

3. Storm Drainage and Flooding

Surface drainage in Wild Wings is by arrangement between the golf course and the Wild Wings homeowner association. Drainage for the housing development is conveyed to the detention ponds in the golf course through a pipe network. The detention ponds are designed to hold the 100-year flood runoff.[74] From the detention basins, water is time-released to the Moore Canal, which drains to Cache Creek.

Stormwater runoff in the Monument Hills area outside Wild Wings is collected in roadside ditches where it eventually evaporates or percolates into the ground. Storm water flows in small local drainages until it reaches Willow Slough. The roadside ditches are subject to flooding during heavy storms.

On-site drainage systems would be required for other major developments, similar to other developed areas within the county, such as Davis. These would likely consist of a network of on-site collection pipes or ditches that convey runoff to on-site detention basins that moderate flows to off-site channels. More information on these strategies is found in Section 3.A.3 of this report.

[74] Davis, Bill. Wild Wings Golf Course Superintendent. Personal telephone communication with Coastland Civil Engineering. August 8, 2006.

H. Yolo[75]

The Cacheville CSD provides water service to the community of Yolo. There is no community wastewater service in Yolo. The Yolo County Public Works Department provides drainage facilities.

1. Water

The source of Yolo's water supply is groundwater. The CSD has two wells. One well provides 700 gpm and the other well provides 200 gpm. The main well has two 5,000-gallon hydro-pneumatic tanks. The second well is for back-up use only. The community system has 149 residential and 14 commercial connections.

Water quality for these wells meets drinking water standards, although the water is not treated. The distribution system consists of 6- to 8-inch diameter pipes. Fire flows for the area are considered adequate but additional development would require study to determine the impact on existing pressure. The existing system is adequate for the current demand with capacity to spare. The main well can support approximately 300 additional connections. The back-up well has the capacity to serve 25 additional units.

2. Wastewater

There is no community wastewater service in Yolo. Wastewater treatment and disposal is by individual septic systems. Additional development would be limited to a density of about one unit per acre if septic systems were used or a small community system would need to be developed and managed by the CSD or a new CSA.

[75] Information for Yolo is from Horgan, Tom. Laugenour & Meikle Civil Engineering. Personal telephone communication with Coastland Civil Engineering. August 2, 2006

3. Storm Drainage and Flooding

The Yolo County Public Works Department provides storm drainage for the community. The drainage system was constructed in the 1980s and uses a network of pipes ranging from twelve- to 36-inch diameter pipes. These pipes convey water from curb drains located throughout the community to a discharge pipe into Cache Creek.[76]

I. Davis[77]

The City of Davis provides water, wastewater and drainage services to its residents, and to the adjacent unincorporated communities of El Macero, Willowbank[78], North Davis Meadows[79] and Royal Oaks through out-of-area service agreements.

The community of North Davis Meadows owns its own on-site water, wastewater and drainage facilities, while the wastewater system is tied into the City's facilities. The development's homeowner association contracts with the City to operate and maintain its on-site facilities and for use of the City's off-site facilities. El Macero is directly tied into the City's water, wastewater and drainage systems. Willowbank, a lower-density community of 1-acre lots, is connected to the City's water system but relies on individual private

[76] Information for Yolo is from Horgan, Tom. Laugenour & Meikle Civil Engineering. Personal telephone communication with Coastland Civil Engineering. August 2, 2006

[77] Information for Davis was obtained from the City of Davis/ UC Davis Joint Water Supply Feasibility Study (2002), the City of Davis Department of Public Works Status Report on Municipal Wastewater Treatment Facilities (2003), the Annual Water Quality Report (2005) and phone conversations with superintendents with the Davis Department of Public works.

[78] 2002, *Draft City of Davis/UC Davis Joint Water Supply Feasibility Study,* pages 1-3.

[79] Shay, Bob. Drinking Water Superintendent. Personal Communication with Coastland Civil Engineering. July 27, 2006.

septic systems and on roadside swales and ditches for drainage.[80] The Royal Oaks Mobile Home Park is tied into the City's sewer, water and drainage systems.

1. Water

Water for Davis and adjoining areas comes from 21 wells. Nineteen of the wells are located throughout Davis and two are located in El Macero. The well depths vary from 300 to 1,800 feet[81] and water use in 2001 was 15,000 acre-feet. By 2040 water use is expected to be 26,300 acre-feet. Current demand is met by the existing well network. The City continues to add wells as needed to serve new development.

Water is distributed through a 175-mile network of 4- to 14-inch pipe.[82] The communities of El Macero and Willowbank, as well as Royal Oaks, are directly connected to this pipe network. The City of Davis has no central treatment or distribution facility and uses chlorine in the form of sodium hypochlorite for disinfection.[83]

Fire flows in Davis are adequate. Wells affected by manganese have been kept in service to provide fire protection. A four-million-gallon tank was built in 2003 to store water for fire protection. Another four-million-gallon fire water storage tank project is underway east of Mace Boulevard and north of Interstate 80.[84]

Naturally-occurring mineral contamination may eventually make the City's wells unusable. High manganese levels were recently found in two wells, a

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[80] *Yolo County Stormwater Management Program (SWMP) Planning Document*, March 2003 Updated October 2004, Larry Walker and Associates, pg 1-4

[81] http://www.city.davis.ca.us/pw/water/pdfs/2005_waterqualityreport.pdf

[82] 2002, *Draft City of Davis/UC Davis Joint Water Supply Feasibility Study*, pages 1-3.

[83] http://www.city.davis.ca.us/pw/water/pdfs/2005_waterqualityreport.pdf

[84] Shay, Bob. Drinking Water Superintendent. Personal Communication with Coastland Civil Engineering. July 27, 2006.

shallow well and a deep well.[85] Deeper wells have been developed to solve recurring contamination from naturally-occurring manganese, nitrates, selenium and chromium, which generally affect aquifers at higher elevations. Similarly, UC Davis currently uses deep aquifer wells to supply its water needs. The long-term sustainable yield of the deep aquifers is a concern because recharge of these aquifers can take thousands of years and the aquifers are not as plentiful. Land subsidence has been a minor concern in Davis.

Davis, together with Woodland, UC Davis and the YCFCWCD, are trying to obtain 40,000-58,000 acre-feet of water per year from the Sacramento River to replace the use of wells. Any remaining water not used by these three main partners will be given to the YCFCWCD for use. This would require the construction of a new water treatment plant or expansion of the West Sacramento water treatment plant (West Sacramento relies on surface water from the Sacramento River) as well as new pipelines to these four users.[86]

2. Wastewater

Davis has an extensive pipe network that leads to a 42- to 48-inch trunk sewer line, that in turn empties into a 66-inch trunk line that enters the City's wastewater treatment plant. The treatment plant uses a combination of aerated, oxidation, Lemma ponds, overland bacteria treatment, and chlorination/dechlorination to treat a maximum dry weather flow of 7.5 mgd and a wet weather flow of 12.6 mgd. Current dry weather demand is 5.4 mgd, leaving 2.1 mgd of unused capacity. The treatment plant discharges to Willow Slough or the Davis Wetlands. The Davis Wetlands further treat the wastewater before discharging into the Yolo Bypass.[87]

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[85] http://www.city.davis.ca.us/story/index.cfm?story=manganese

[86] Davis Woodland Water Supply website http://www.daviswoodlandwatersupply.com/watersupply/pdfs/Davis_public_meeting_5-22-06.pdf, pgs 10-20

[87] City of Davis website-Wastewater Treatment Plant Details & Layout http://www.city.davis.ca.us/pw/water/WPCP.cfm,

Davis is facing increasingly tighter standards by the Central Valley RWQCB and the EPA for the levels of contaminants in its wastewater discharges into natural surface waters. Major upgrades are needed to the existing treatment plant to meet the discharge requirements if the City is to continue to discharge into the Yolo Bypass. Nitrates, toxics, salinity, and pathogens all need to be removed.[88] Even after changing processes and raising the efficiency of the treatment plant, salinity would continue to be an issue. The City is considering several approaches to the salinity issue. One proposed solution is to obtain a permit to discharge into the Sacramento River. The low salinity of the river can absorb the City's discharge without harming water quality in the river. Another solution described above is to develop surface water supplies from the Sacramento River to replace well waters that have high salinity.[89] Using wastewater discharge to irrigate fodder crops has also been proposed. However, reclaimed water increases salinity in the groundwater over time. Additionally, at the current treatment plant demand of 5.4 mgd, 2,700 acres would be needed to recycle the entire municipal discharge.[90]

3. Storm Drainage and Flooding

Davis' storm drain network drains to a series of detention ponds located in west and north Davis, and near the downtown core area.[91] The detention ponds function as wetlands that screen large material for removal and allow controlled release into the Willow Slough Bypass. The South Davis Drainage Ditch, an open ditch riparian corridor, receives storm water from the entire Davis area south of Interstate 80, including El Macero and Willowbank, flows east to the El Macero Pump Station, and into the Yolo Bypass. As storm drainage travels down the Yolo Bypass a diversion into the Davis Wetlands provides additional water to maintain the wetland facilities. The Yolo By-

[88] City of Davis Department of Public Works, 2003, *Status Report on Municipal Wastewater Treatment Facilities*, pages 1-6.

[89] City of Davis Department of Public Works, 2003, *Status Report on Municipal Wastewater Treatment Facilities*, pages 1-6.

[90] City of Davis Department of Public Works, 2003, *Status Report on Municipal Wastewater Treatment Facilities*, pages 1-6.

[91] City of Davis Website http://www.city.davis.ca.us/pw/ppp/intro.cfm

pass is the ultimate outlet for water from the Davis Wetlands and the Willow Slough Bypass.[92]

New peripheral development in Davis would likely require on-site storm drain detention and possibly construction of new detention basins to extend the time of release of storm water into existing off-site facilities.

J. West Sacramento[93]

The City of West Sacramento provides water, wastewater and drainage services to its residents.

1. Water

The source of the City's water supply is the Sacramento River. Diversions are made at the Bryte Bend Water Treatment Plant located upstream of the confluence of the Sacramento and American Rivers. The water treatment plant is currently well under capacity, with a capacity of 58 mgd or 21 billion gallons per year. Approximately 13.1 mgd or 4.8 billion gallons per year were treated in 2004.[94] The Bryte Bend Water Treatment Plant is expected to have sufficient capacity for build out of the city. The treatment plant has been proposed as the treatment facility for the Davis-Woodland-UC Davis-YCFCWCD surface water project.

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[92]Larry Walker and Associates, 2003 (updated 2004), *Yolo County Stormwater Management Program (SWMP) Planning Document*, pages 1-4.

[93] Information in this section is from the *West Sacramento Water Quality 2005 Consumer Confidence Report*, the *City of West Sacramento Water Master Plan Update Master Plan Report* (2005) and a telephone conversation with Eric Edgar of the City of West Sacramento Fire Department on July 31, 2006.

[94] Carollo Engineers, 2005, *City of West Sacramento Water Master Plan Update Master Plan Report*, pages ES-1 to 18.

Waters from the Sacramento River are highly treated before entering the distribution system. The water retains the high hardness from the river.

The City has six distribution system storage reservoirs and two clearwells at the water treatment plant. These facilities provide 19.3 million gallons of storage. Additional storage is provided by the use of groundwater.[95] A new storage facility is finishing construction in the Bridgeway Lakes region of Southport and should be functioning by the end of 2006.[96] The distribution system operates at a pressure of 55 psi.[97]

Fire flows in the Southport area provide adequate pressure but lack sufficient storage. Areas north of the Sacramento Deep Water Ship Channel have sufficient storage for current needs but new development will require additional storage facilities. The Southport area is currently over four million gallons short of existing storage needs.[98] In remaining agricultural areas of Southport, the City uses a 2,000-gallon fire truck and Clarksburg's 4,000-gallon tanker truck provides additional response. The fire department also has two 250 gpm pumps and a 150 gpm portable pump that can draw water from any body of water.[99]

2. Wastewater

West Sacramento's sewage collection system and treatment facility are planned to undergo a major reconfiguration, including the closing of the wastewater treatment plant, so that the City can connect to the Sacramento Regional Sanitation District Lower Northwest Interceptor, which is expected

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[95] Carollo Engineers, 2005, *City of West Sacramento Water Master Plan Update Master Plan Report*, pages 5-2 to 5-8

[96] Edgar, Eric. City of West Sacramento Fire Department. Personal telephone communication with Coastland Civil Engineering. July 31, 2006.

[97] *West Sacramento Water Quality 2005 Consumer Confidence Report*.

[98] Carollo Engineers, 2005, *City of West Sacramento Water Master Plan Update Master Plan Report*, pages ES-1 to 18

[99] Edgar, Eric. City of West Sacramento Fire Department. Personal telephone communication with Coastland Civil Engineering. July 31, 2006.

to be completed in 2007. Remaining agricultural areas in the still-developing Southport area still use individual septic systems.

The City wastewater collection system consists of gravity sewers varying in size from six- to 42-inch pipe, with seven dry pit pump stations, three lift stations, and twelve- to 30-inch force mains. Wastewater is conveyed through the gravity system to the pump stations and pumped to the City's wastewater treatment plant on South River Road north of the Ship Channel. Five pumps and two lift stations serve the area north of the Ship Channel and two pumps and one lift station serve Southport.[100]

The combined capacity of the pump stations is 25 mgd. Average flows in 2002 were 5.5 mgd, and peak wet weather flows during 1997, an El Niño year, were 15.3 mgd. For much of the existing sewage pipe network, the maximum flows are less than half the pipe capacities.[101] Pipes vary from vitrified clay pipe (VCP) to reinforced concrete pipe (RCP) in older sections of the city to new polyvinyl chloride (PVC) pipe in areas where repairs or expansions have been made. Pipe sizes range form 6- to 8-inch collection lines to 10- to 12-inch gravity lines to 15- to 30-inch force mains.[102] Many of the pipes are aging and need replacement.

The current system has infiltration and inflow problems in many areas north of the Ship Channel, allowing groundwater and storm drainage to enter the wastewater system. This results in greater than normal demands at the wastewater treatment plant. Many of the pump facilities are aging and need replacement.

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[100] City of West Sacramento, 2003, *Wastewater Master Plan and Connection to the Lower Northwest Interceptor*, pages 1-1 to 3-1.

[101] City of West Sacramento, 2003, *Wastewater Master Plan and Connection to the Lower Northwest Interceptor*, page 4-1.

[102] City of West Sacramento, 2003, *Wastewater Master Plan and Connection to the Lower Northwest Interceptor*, pages 5-1 to 6-1.

The wastewater treatment plant's existing capacity of approximately six mgd does not meet the demand for the projected additional population of 40,000 and 15,000 new housing units.[103] The City plans to close the treatment plant and instead discharge all of its wastewater to the Sacramento Regional County Sanitation District's new 19-mile Lower Northwest Interceptor, which will convey wastewater to a regional treatment plant. The Lower Northwest Interceptor project will serve nearly 200,000 households in the Sacramento region with a peak wet weather flow capacity of 200 mgd. West Sacramento's share of this capacity will be a peak of 40 mgd.

3. Storm Drainage and Flooding

West Sacramento is located within the natural floodplain of the Sacramento River and is protected by levees. Reclamation District 900 and the West Sacramento Area Flood Control Agency provide flood control and storm drainage, and operate and maintain the pumps, canals and levees.[104] Between 1998 and 2002, the U.S. Army Corp of Engineers and the State spent over $32 million to improve 5 miles of levees along the western edge of the city.

North of the Ship Channel, drainage is conveyed through pipes that drain into the Ship Channel or the Sacramento River. In Southport, much of the storm water runoff is collected in roadside ditches and, what does not evaporate or percolate into the ground, eventually discharges into the Sacramento River or the Deep Water Ship Channel. The roadside ditches are subject to flooding during heavy storms. New peripheral development in West Sacramento would require on-site storm drain detention and possibly construction of new detention basins to extend the time of release of storm water into existing off-site facilities.

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[103] Bessette, Mike. Associate Engineer, City of West Sacramento. Personal telephone communication. July 31, 2006.

[104] Dudek & Associates, 2005, *Municipal Service Review and Sphere of Influence Study Yolo County Public Water and Reclamation Districts*, page 40.

K. Winters[105]

The City of Winters provides water, wastewater and drainage services to its residents.

1. Water

The source of Winters' water supply is a combination of wells and surface water. The City uses underflow waters from Putah Creek gravel beds at the rate of 1.5 cubic feet per second. The City does not have rights to divert water directly from Putah Creek.[106] The City has five wells that draw water from two separate aquifers at depths ranging from 150 to 480 feet deep. Well #6, which began production in 1995 has a backup engine. In 2000 the City purchased a mobile, backup generator for the other wells.[107] Each well has the capacity to supply the entire city. Existing demand is 1,145 gpm capable of serving 1,900 units.[108] A new well, Well #7 is scheduled to begin production in 2006-2007.[109]

The water distribution system maintains an operational pressure of approximately 60 psi via several pumps located throughout the city.[110] Mains vary in size from 6-inch to 12-inch in diameter. The City of Winters is currently scheduled to replace 3,825 feet of 6-inch mains, 7,250 feet of 12" mains, and 10,050 feet of 8-inch mains before the end of 2008. [111] Fire flow pressures are

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[105] Information in this section is from the *Yolo County General Plan Update Background Report (2005)*, the *2005 Water Quality Report* (2005), and the *General Plan Update (1999)*.

[106] *Yolo County General Plan Update Background Report*, 2005, pages 2-17.

[107] Winters Community Development Agency 2003-2008 Implementation Plan, Appendix A

[108] *2005 Water Quality Report*, page 1.

[109] City of Winters- 2006/7 Active Capital Improvement Projects http://www.cityofwinters.org/pdf/Project%20List%2006%2007.pdf

[110] *The City of Winters General Plan Policy Document (1992)*, page II-28.

[111] Winters Community Development Agency 2003-2008 Implementation Plan, Appendix A

adequate. There are few areas in the distribution system without 60 psi of static pressure.[112]

The water supply has moderate levels of nitrates, but not at levels requiring well head treatment.

If residential development occurs around the city, then additional wells will be required. The City of Wnters will add wells to the community system, pending approval of recently proposed development.[113]

2. Wastewater

Wastewater is collected in a pipe network with mains varying in size from 8-inch to 30-inch in diameter. The pipes convey wastewater to the pump at the wastewater treatment plant, which is at capacity. Proposals to expand the capacity at the treatment plant include a plan to increase the capacity of the treatment plant to 1.2 mgd.[114] Currently, Winters has an expansion project for the treatment plant scheduled to occur in the 2006-2007 fiscal year.[115] The City also has sewer pump projects that will be performed as required with the wastewater treatment plant upgrades.

3. Storm Drainage and Flooding

Winters is plagued by flooding from Chickahominy and Moody Sloughs, located north of the city.[116] Drainage is collected via a pipe network and conveyed to the Rancho Arroyo Detention Pond. The pond maintains wetlands that drain into Putah Creek.

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[112] Chruchman, Matthew. Winters Fire Department. Personal telephone communication with Coastland Civil Engineering. August 1, 2006.

[113] *Development Agreement By and Between The City of Winters and GBH-Winters Highlands, LLC*, May 2006, pages 30-42.

[114] *Development Agreement By and Between The City of Winters and GBH-Winters Highlands, LLC*, May 2006, pages 30-42.

[115] City of Winters- 2006/7 Active Capital Improvement Projects http://www.cityofwinters.org/pdf/Project%20List%2006%2007.pdf

[116] Parsons Engineering, 2004, *City of Winters 2002 housing Element*, page 16.

Much of the planned residential development is within the 100-year flood plain of the sloughs. Fees are collected from developers to add drainage and flood control facilities. These facilities include upgrades to the existing community detention pond. New peripheral development in Winters would require on-site storm drain detention and possibly construction of new detention basins to extend the time of release of storm water into existing channels.

L. Woodland[117]

The City of Woodland provides water, waste water and drainage services to its residents.

1. Water

The source of the Woodland's water supply is groundwater. The City owns and operates 21 wells that draw from an intermediate groundwater aquifer located 200 to 600 feet below ground. In 2005, the capacity of the wells was over 38,500 acre-feet and demand was 17,800 acre-feet.[118] The City plans to develop new wells in the intermediate and deep aquifers to serve new development until the number of wells reaches 29.[119]

The city has one elevated, 300,000-gallon water tank, located in Camerena Park. The tank is used to maintain pressure to the distribution system, which is comprised of pipes ranging in size from 2 to 12 inches in diameter.

Water from the wells meets drinking quality standards but is high in magnesium salts, which causes the water to be hard to very hard. Selenium and bo-

[117] Information in this section is from the *City of Woodland Urban Water Management Plan* (2005), personal telephone communication with Stephanie Frank, Administrative Secretary, City of Woodland Public Works Engineering Department, and the *City of Woodland Storm Water Management Program* (2004).

[118] *City of Woodland Urban Water Management Plan 2005*, pages 2-1 to 2-7.

[119] *City of Woodland Urban Water Management Plan 2005*, pages 1-1 to 2-7.

ron have been found in measurable concentrations and nitrate contamination has occurred near several wells. Since detection of non-fecal coliform bacteria in some wells in 1993, sodium hypochlorite (bleach) is added at the well head.[120]

Fire flows are adequate to meet current demand. However, additional development will require the expansion of water mains and additional pumps and/or storage facilities to maintain acceptable fire pressures.

The City projects sufficient capacity in the groundwater aquifer for planned development through 2020. Woodland, together with Davis, UC Davis and the YCFCWCD, is also trying to obtain surface water allowances from the Sacramento River to replace the use of wells.

2. Wastewater

Wastewater is collected in a gravity flow system from a high point at County Road 98 to the treatment plant located east of County Road 102. Average dry weather flow at the wastewater treatment plant is currently about 6.8 mgd.[121] The facility is designed to handle 10.4 mgd of dry weather flow and 23 mgd of wet weather flow. The treatment plant is completing a major upgrade to provide tertiary treatment by filtration and ultraviolet light disinfection. Treated effluent from the facility is discharged into a channel that drains to the Tule Canal and eventually into the Yolo Bypass.[122]

The City also owns and operates an Industrial Wastewater Treatment Plant that treats wastewater from a tomato processing facility. This facility uses aerated ponds and the water is recycled by site application.[123]

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[120] 2002, *City of Woodland MSR/SOI*, , page 20.

[121] *City of Woodland Urban Water Management Plan 2005*, pages 8-1 to 8-5.

[122] *City of Woodland Urban Water Management Plan 2005*, pages 8-1 to 8-5.

[123] *City of Woodland Urban Water Management Plan 2005*, pages 8-1 to 8-5.

3. Storm Drainage and Flooding

Surrounded by waterways, Woodland is subject to flooding. The areas north of Kentucky Avenue and east of County Road 102 are located in 100- to 500-year floodplains.[124]

Woodland's drainage system consists of 84 miles of drainage piping, 14 miles of open drainage channels, seven stormwater retention ponds and three storm water lift stations. In newer parts of the city, runoff is collected by the storm drain lateral system, which consists of regularly-spaced inlets to pipes ranging in size from 12 to 24 inches in diameter. Older parts of the city are not directly served by a lateral system. In these areas, valley gutters, gutter culverts and inverted siphons convey water to drainage inlets. In storm events, the capacity of these structures is often exceeded.[125]

Water enters the trunk main system and is conveyed from west to east along four trunk mains ranging in size from 30 to 84 inches in diameter. These mains discharge into open channels that flow to three pump stations. Detention ponds are located at several points within the system to moderate flow along the channels. Two pump stations are located north of East Main Street and one is located on the south side of East Main Street. The pump stations discharge into a channel located between the new and the original south levee of the Cache Creek Settling Basin. The channel flows from west to east and discharges directly into the Yolo Bypass.[126]

New peripheral development in Woodland would likely require on-site storm drain detention and possibly construction of new detention basins to extend the time of release of storm water into existing off-site facilities.

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[124] 2002, *City of Woodland General Plan Policy Document*, Part I, page 12.

[125] 2004, *City of Woodland Storm Water Management Program*, page 1-5.

[126] 2004, *City of Woodland Storm Water Management Program,* pages 1-5 to 1-7.