# APPENDIX 4.6

## HYDROLOGY

# Hydrology Report

## INTRODUCTION

This section describes the existing and planned hydrology, drainage, and water quality conditions in the area of the Proposed Flying J Travel Plaza at the southwest corner of Interstate 80 (I-80) and Pedrick Road in the City of Dixon, California. The 27-acre parcel proposed for development is the northern portion of a larger 60-acre parcel adjacent to both I-80 and Pedrick Road. The proposed development includes a 17,683 square foot travel plaza with gas station, convenience store, fast food court, and restroom facilities. Most of the remainder will be used for parking. The Preliminary Grading and Drainage Plan indicates no more than 1 to 2 feet of filling to create a nearly level pad with slight slopes to storm drains.

Conditions analyzed in this section include site and area drainage patterns, flooding conditions, and water quality impacts. The proposed development will alter existing land use and result in increased impervious surface area, and the installation of new drainage infrastructure that will cause a shift in the amount and quality of runoff leaving the site.

Primary information in this section was obtained from the *City of Dixon Northeast Quadrant Specific Plan* (1995), *Preliminary Drainage Report, Flying J Travel Plaza* (Morton & Pitalo, Inc., December 19, 2005), *Dixon California Engineering Design Standards & Construction Specifications* (City of Dixon Engineering Department, 2004), *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region Fourth Edition and the Sacramento River Basin and The San Joaquin River Basin* (1998), *Dixon Municipal Code* (June 22, 2004), *Preliminary Grading and Drainage Plan, prepared by Morton and Pitalo, Inc. (July 15, 2004);* and documents for the neighboring Dixon Downs Environmental Impact Report found online through www.thecityofdixon.com Additional information was obtained through communication with the City of Dixon and Dixon Resources Conservation District..

## A ENVIRONMENTAL SETTING

### Climate

The project site is located approximately 15 miles north of the Sacramento River Delta, halfway between Fairfield and Sacramento. The proposed development is strategically located along the heavily traveled I-80 transportation corridor that connects Sacramento with the San Francisco Bay Area.

Area climate is characterized by hot dry summers and cool wet winters. During the summer months coastal fog and low clouds only infrequently penetrate inland as far as Dixon. However, in response to intrusion of the marine layer into the Bay and Delta a west wind known as the "delta breeze" forms that is a major influence in reducing high temperatures during the summer. In contrast, during the winter months an advective fog known as the "Thule fog" often blankets the valley and insulates the area from radiational heating by the sun, thereby keeping temperatures cool.

The summer climate in California is very stable due to the presence of a dominating high-pressure system over the Eastern Pacific. The East Pacific high blocks nearly all rain producing northerly and westerly storms from penetrating the area during the summer dry season, although occasional monsoonal moisture and convective storms may penetrate from the south and east. Consequently, the region's rainy season typically extends from November through April, when at least 80 percent of precipitation falls. A majority of rainfall in California falls along the Coastal Mountains and through orographically enhanced precipitation in the Sierra Nevada, while the Central Valley is considerably drier. The nearest station with long-term meteorological data in Davis, approximately 9 miles from the site, averages 17 inches of precipitation per year. Average maximum temperatures range from a low of 54 degrees Fahrenheit in December and January to the highest average maximum temperature of 94 degrees in July (Western Regional Climate Center, 2005). Each year there are approximately 82 days when the temperature exceeds 90 degrees (including several days above 100) and about 28 days when the temperature at night drops below freezing. Snowfall is extremely rare.

### Geology and Site Soils

The project site is considered part of the "Great Valley Geomorphic Province" of California. This includes most of the Sacramento and San Joaquin valleys, also known as the central valley since it is located between the Coastal Mountain Ranges and Sierra Nevada. The central valley of California is a trough in which sediments have been deposited since the Jurassic (160 million years ago).

A recent geologic map of the area published by the United States Geological Survey (USGS, 2002) indicates the site is underlain by alluvial fan deposits of Holocene age (less than 11,000 years old), except for a linear segment of artificial fill upon which Interstate 80 was constructed along the northwest corner of the property. Deposits as thick as 100 feet likely formed from ancestral Putah Creek and tributaries washing sediment off nearby Rocky Ridge. Underlying these alluvial fan deposits are likely to be rocks of the Great Valley

Sequence, such as nearby Pliocene Age rocks from the Vacaville Assemblage of the Tehama Formation. No rocks outcrop on the project site.

Soils mapped across the property are derived from the alluvial fan deposits. Over time these deposits have chemically and physically weathered to create the soil assemblages and horizons seen today. According to the Soil Conservation Service Soil Survey for Solano County, there are two soil types mapped on the project site. Eighty percent of the site is mapped as Capay Silty Clay Loam (Ca), while about 20 percent of the site adjacent to the southeast corner is mapped as Yolo Silty Clay Loam.

The permeability and texture of these on-site soils is important since it directly influences drainage patterns. Soil permeability is the rate at which water is absorbed under saturated conditions and is related to the hydraulic conductivity (constant determining flow rate through soil or rock) of the soil. A list of on-site soil types and their relevant hydrologic characteristics are shown in **Table 1**. The two soil types are alike since they are both fine-grained soils with slow to very slow runoff and slight erosion hazard. Yet the Capay silty clay loam contains more expansive clay minerals and is more likely to swell and shrink when wetted and dried, an important geotechnical consideration for any proposed foundations. Since both soils have only slow to moderate permeability increased runoff following paving with an impervious surface would be less than the anticipated volume of increased runoff should more permeable soils, such as a sandy loam or loamy sand, be paved.

**Table 1:** Site Soils - Hydrologic Characteristics

| Name | Symbol | Permeability | Runoff | Shrink-Swell Potential |
|---|---|---|---|---|
| Capay silty clay loam | Ca | Slow | Very Slow | High |
| Yolo silty clay loam | Ys | Moderately Slow | Slow | Moderate |

SOURCE: USDA, 1977. *Soil Survey of Solano County.*

**Regional Hydrology and Topography**

The Project site is within the Putah Creek watershed known as the City of Dixon Watershed D, Lower Putah Creek. This watershed is cataloged by the USGS as watershed number 511.20, USGS Hydrologic Unit Code (HUC) 18020109. Historical drainage from the area likely flowed into Putah Creek, while existing drainage is channeled through a series of drainage ditches that eventually enter into the Sacramento River through Hass and then Cache Slough. **Figure 1** shows the site location relative to the Sacramento River and Delta to which the region drains. The historic drainage pattern has been altered through agricultural and highway engineering, which has diverted runoff through a series of culverts, ditches and canals. Regional drainage in the area is controlled by the gradual southeasterly slope of alluvial fans and alluvium built from sedimentary deposits eroded from the Mayacmas and Vaca Mountains. Creeks from these mountains flow in a southeasterly

direction toward the Sacramento River. The Sacramento river drains most of the California interior north of the Sacramento River delta and flows through Suisun and San Pablo Bays before emptying into San Francisco Bay and eventually the Pacific Ocean.

The Project area is contained within the City of Dixon Watershed D, which drains into the Dixon Resource Conservation District's Tremont 3 Drain. The Tremont 3 Drain discharges into the Reclamation District (RD) 2068 Main Canal and then V-Drain. The V-Drain discharges into Hass Slough and Cache Slough, which outfalls into the Sacramento River near Mile 19 of the Sacramento River.

According to the Dixon Resource Conservation District (DRCD), management of drainage ways has been an ongoing problem, especially since many culverts, including those on private lands, have not been maintained and have become plugged with mud and debris. The Tremont 3 drainage was originally designed to accommodate agricultural drainage and development within the watershed has increased runoff, soil erosion, and siltation in often unpredictable ways that were not foreseen. As a result of urbanization the DRCD and City of Dixon are working together with landowners to establish a long-term plan for handling future drainage.

**Site Hydrology**

The preliminary drainage report indicates the site is within Basin G of the Dixon Northeast Quadrant Specific Plan (NQSP). The site is relatively flat with a 0.1 percent slope toward the east-southeast and site elevations range between 60.5 and 63.5 feet NAVD. The steepest slopes in the vicinity are up to 15 percent along the embankment for the Pedrick Road bridge over I-80.

In the Dixon area a series of privately maintained culverts drains approximately 2,700 acres of agricultural land north of I-80 and since I-80 was constructed above the surrounding ground by a few feet, the flow of floodwater to the southeast is often impeded causing frequent flooding to the northwest of I-80. The project site lies at the downstream end of a 360-acre watershed that is bisected by I-80. Most of the drainage area contains fields northwest of the freeway that drain through four 24-inch x 36-inch diameter culverts under I-80 and onto the subject parcel. The culvert discharges runoff near the Pedrick Road off ramp, approximately 600 feet east of the Pedrick Road intersection. A majority of existing flow in the drainage ditch on the property is due to offsite flow from an estimated 300 acres of agricultural land northwest of I-80, equivalent to 86 percent of the total drainage area. The watershed is very gentle and hence significant ponding and slow runoff are normal.

Site drainage was observed on the subject property during a site visit on December 28, 2005. A majority of site drainage is channeled through a shallow 18-inch deep roadside drainage ditch along the west side of Pedrick Road. This drainage ditch was followed from the four 24-inch x 36-inch diameter culverts under I-80 for approximately 2900 feet to a 36-inch x 24-inch diameter culvert that crosses under Pedrick Road south of the Campbell Soup Property. Runoff flows under Pedrick Road and into a drainage canal along the south edge of the Campbell Soup Property. This canal joins another canal alongside the railroad tracks that flows northeasterly toward the Tremont 3 drainage canal. According to the Preliminary

Drainage report there is another 24-inch diameter culvert underneath Pedrick Road that is immediately south of the offramp. This could not be observed due to standing water or clogging by silt or mud, but the sump and borrow pit to which this culvert would flow was observed.

The preliminary drainage report indicates Pedrick Road is overtopped by floods that head easterly toward the Tremont 3 drain approximately once every two to three years. No flooding was observed on December 28, 2005, but standing water was observed along the offramp, within the onramp circle, and locally within the ditch alongside Pedrick Road. Flow in the drainage ditch was negligible. FEMA maps indicate no part of the Project area is within the 100-year flood zone.

Existing flooding is due to a combination of factors, including nearly flat terrain below a large watershed, clayey soils with only low to moderate permeability, and a poorly undersized drainage system. Flooding occurs in areas where water is unable to percolate through the saturated or impervious ground and the water depth increases to accommodate upstream drainage and rainfall.

**Groundwater**

The project site is located within the Solano Groundwater Basin, a sub-basin of the larger Sacramento Groundwater Basin that supplies about 2.5 million acre-feet of water annually to municipal, industrial, and agricultural users. The Solano Basin is bounded by Putah Creek on the north, the Sacramento River to the East, the North Mokelumne River to the Southeast, the San Joaquin River to the south, and the English and Montezuma Hills to the west.

Groundwater levels in the area have fluctuated in response to rainfall and groundwater pumping. Until about 1959 pumping of groundwater resulted in significant localized drawdown and a depressed water table. This trend started to reverse during the 1960s when groundwater levels started to rise in response to the Solano Project, which reduced pumping due to the creation of alternative water sources from dam impoundments and drainage improvements. The groundwater table has remained fairly stable since the 1990s, with seasonal and annual fluctuations reflecting typical patterns associated with summer and winter water use.

Groundwater data for nearby monitoring wells was checked through the State Water Resource Control Board "Geotracker" Database. Two nearby monitoring wells within one-mile of the site reported groundwater at depths of between 14 and 34 feet below the ground surface.

A well at 8665 Pedrick Road, immediately north of I-80, reported a minimum depth to groundwater of 14.48 feet and maximum depth to groundwater of 28.09 feet. Another well located at 1900 1st Street, approximately 1 mile southwest of the site, reported a maximum depth to water of 34.29 feet. Both wells are at approximately the same elevation as the project site and indicate the depth to shallow groundwater is similar on the proposed project

site. While the depth to static groundwater on the site is likely to exceed 10 feet, there may be small areas of locally perched groundwater near the surface.

**Flooding**

Flood insurance rate maps (FIRMs) produced by the Federal Emergency Management Agency (FEMA) show the project site is in Zone C, an area of minimal flooding. Zone C refers to an area outside of both the 100-year and 500-year flood hazard zones (FEMA, 1982). However, the drainage report for the site indicates that the accumulation of both onsite drainage from the Flying J parcel and contributing flow from Basin G north of I-80 frequently overtops Pedrick Road due to inadequate culvert volume and conveyance underneath the road. The model developed for the site also predicts major ponding upstream of these culverts. While, the model did not predict that I-80 would be flooded by a 100-year storm, it does predict that the minimal flooding depicted by FEMA maps, while local, may be frequent. **Figure 1** shows predicted flooding according to FEMA.

**Water Quality**

The regional watershed drains to the Sacramento River and Delta, which is listed impaired by the State Water Resources Control Board (SWRCB) for mercury and the pesticide diazinon. Water quality for the site has not been assessed. However, regular monitoring of runoff and groundwater is completed in the area. This includes sampling and testing of runoff for the Central Valley Regional Water Quality Control Board agricultural water quality program. Sampling of Willow Slough at Road 99 is reported to have trace concentrations of the following pesticides, DDE, dieldrin, simazine, chlorpyrifos, and dimethoate.

The composition of groundwater is often considerably different than surface water, especially since percolation of groundwater through soil and rock may concentrate certain dissolved minerals, and would tend to absorb any soil contamination. According to the Department of Water Resources (DWR), groundwater quality in Solano County is generally suitable for most urban and agricultural uses.

For drinking water contaminants of particular concern are total dissolved solids (TDS), nitrate, boron, chloride and organic compounds. Testing has found that from 123 public water supply wells sampled in the Solano Groundwater Basin, approximately 6 percent or 7 wells were found to have contaminant levels exceeding the State maximum allowable contaminant levels (MCLs) for drinking water. The most common contaminants were nitrates and pesticides, while less common were volatile and semi-volatile organics and inorganic contaminants such as metals. Probably the most significant inorganic contaminant is arsenic. While values are typically below the MCL of 0.050 mg/L, the new MCL of 0.01 mg/L may be exceeded in many wells.

The nearest collection of monitoring wells to the site across I-80 at 8665 Pedrick Road were placed in response to a leaking underground fuel tank in 2000 or 2001. MTBE and nitrates were reported to be the major impact from the leak. Sampling of water from the well

continued throughout 2005, and the latest report obtained online, indicated that MTBE, gasoline and other tested contaminants were not detected. According to the state underground storage tank database other nearby monitoring wells about 1 mile southwest of the site near I-80 at Grant Road and along Milk Farm Road were reported for MTBE leaks into groundwater associated with former gas stations. Reports available online at http://geotracker.swrcb.ca.gov/ indicate little or no remaining contamination from the most commonly tested petroleum hydrocarbons.

Sampling and testing of both groundwater and surface water indicate the most common causes of contamination are leaking underground storage or fuel tanks, runoff including high levels of pesticide and nitrates, and general runoff from roadways that may contribute minor quantities of oil, grease, and other contaminants.

## *B. REGULATORY SETTING*

Development and construction of the project will be in accordance with regulatory programs, laws, and regulations that aim to protect water resources, establish adequate drainage, and reduce the risk of flooding. Certain Federal laws are administered and enforced by state and local government. In other cases, state and local regulations in California are stricter than those imposed by Federal law. This section summarizes relevant regulatory programs, laws, and regulations with respect to hydrology and water quality and how they relate to the proposed project.

### Federal Laws and Regulations

#### *Clean Water Act (CWA)*

The Clean Water Act (CWA) was enacted by Congress in 1972 and amended several times since inception. It is the primary federal law regulating water quality in the United States, and forms the basis for several state and local laws throughout the country. Its objective is to reduce or eliminate water pollution in the nation's rivers, streams, lakes, and coastal waters. The CWA prescribed the basic federal laws for regulating discharges of pollutants as well as set minimum water quality standards for all waters of the United States. Several mechanisms are employed to control domestic, industrial, and agricultural pollution under the CWA. At the Federal level, the CWA is administered by the U.S. Environmental Protection Agency (EPA). At the state and regional level, the CWA is administered and enforced by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs). The State of California has developed a number of water quality laws, rules, and regulations, in part to assist in the implementation of the CWA and related Federally mandated water quality requirements. In many cases, the Federal requirements set minimum standards and policies and the laws, rules, and regulations adopted by the State and Regional Boards exceed them.

#### *Floodplain Development*

The Federal Emergency Management Agency (FEMA) is responsible for determining flood elevations and floodplain boundaries based on US Army Corps of Engineers and other studies. These studies are used to create Flood Insurance Rate Maps (FIRMS) that identify areas within different flood hazard designations, such as the 100-year floodplain predicted to flood once every 100 years.

While FEMA allows non-residential development within certain floodplains, other areas are considered too hazardous or expensive to develop. Federal regulations governing floodplain development are set forth in Title 44, Part 60 of the code of federal regulations (CFR).

**State Laws and Regulations**

### *Porter-Cologne Water Quality Control Act*

The Porter-Cologne Water Quality Control Act establishes the SWRCB and the RWQCB as the principal state agencies having primary responsibility in coordinating and controlling water quality in California. The Porter-Cologne Act establishes the responsibility of the RWQCBs for adopting, implementing, and enforcing water quality control plans (Basin Plans), which set forth the state's water quality standards (i.e. beneficial uses of surface waters and groundwater) and the objectives or criteria necessary to protect those beneficial uses.

### *NPDES Permit Requirements*

The CWA has nationally regulated the discharge of pollutants to the waters of the U.S. from any point source since 1972. In 1987, amendments to the CWA added section 402(p), which established a framework for regulating non-point source (NPS) storm water discharges under the National Pollutant Discharge Elimination System (NPDES). The Phase I NPDES storm water program regulates storm water discharges from industrial facilities, large and medium-sized municipal separate storm sewer systems (those serving more than 100,000 persons), and construction sites that disturb five or more acres of land. Under the program, the project applicant will be required to comply with two NPDES permit requirements. The NPDES permits must be consistent with the Basin Plans.

The NPDES General Construction Permit Requirements apply to clearing, grading, and disturbances to the ground such as excavation. The project applicant is required to submit a Notice of Intent (NOI) with the State Water Resource Control Board's (SWRCB) Division of Water Quality. The NOI includes general information on the types of construction activities that will occur on the site. The applicant will also be required to submit a site-specific plan called the Stormwater Pollution Prevention Plan (SWPPP) for construction activities. The SWPPP will include a description of Best Management Practices (BMPs) to minimize the discharge of pollutants from the site during construction. It is the responsibility of the property owner to obtain coverage under the permit prior to site construction.

The NPDES General Industrial Permit Requirements apply to the discharge of storm water associated with industrial sites. The permit requires the implementation of management measures that will achieve the performance standard of best available technology (BAT) economically achievable and best conventional pollutant control technology (BCT). Under the statute, operators of new facilities must implement industrial BMPs in the project SWPPP and perform monitoring of storm water discharges and unauthorized non-storm water discharges. An annual report must be submitted to the RWQCB each July 1. Operators of new facilities must file an NOI at least 14 days prior to the beginning of operations.

**Local Programs and Regulations**

## *Northeast Quadrant Specific Plan (NQSP)*

The NQSP was developed by the City of Dixon to set guidelines for detention of storm water runoff and to mitigate for increased runoff, risk of flash flooding, and potentially rapid spreading of surface pollutants through incorporation of appropriately designed storm water detention facilities around new and existing developments.

According to the NQSP, new development projects within the City are required to submit a detailed drainage improvement plan that shall either provide for pre-project flow detention on-site or provide a master drainage plan. The City of Dixon reserves the right to evaluate the environmental effects of the drainage improvements at the time of submittal as a condition of approval. Pertinent NQSP policies regarding hydrology and water quality are summarized below, including those designed to protect water quality and prevent soil erosion:

POLICY 5.9.4 Soil Protection and Grading

- All development plans shall provide an erosion and sediment control plan, including seeding of graded areas and watering during grading to reduce wind erosion.
- Prior to development, a master conceptual grading plan should be submitted which identifies the overall grading concept for the plan area.
- Drainage problems resulting from poor soil permeability should be reduced through development of gravel sub-drains and the creation of swales and channels to convey runoff.

POLICY 5.9.5 Water quality

- Paved parking areas should be designed to minimize paving, while still meeting parking requirements. Permeable paving materials should be considered where feasible.
- Best Management Practices (BMP) such as sediment traps, evaporation basins, flow reduction devices, and other methods to treat pollutants draining from parking areas and streets shall be installed in the storm drain system for individual projects within the plan area in accordance with City standards.
- Detention ponds shall incorporate similar BMP devices and methods in accordance with City standards.
- Design of storm detention facilities should be consistent with City design standards. Standards include a maximum depth of ten feet, with freeboard of at least one-foot

and highest water elevation set by the lowest catch basin elevation. If a maximum four-foot depth can be maintained at the perimeter, no enclosure fencing will be required.

Other policies have been developed to plan the future storm drainage infrastructure. According to the City of Dixon Drainage Report, existing storm drainage infrastructure in the NQSP area is inadequate to handle current peak flow conditions resulting in downstream flooding. Due to existing flooding problems and with runoff likely to increase due to future development the City of Dixon is in the process of implementing a citywide drainage system. All new projects, including the Flying J Travel Plaza, will be incorporated into this system.

This system will be implemented through the Dixon Resource Conservation District (DRCD) drainage master plan. Currently, the plan proposes construction of three retention basins along the eastern perimeter of Dixon's 50-year development boundary and also proposes a new channel paralleling Pedrick Road to empty to Haas Slough. In accordance with this plan each application for development pursuant to the NQSP will be required to demonstrate the capacity to retain all storm water in a 100-year event unless a comprehensive storm drainage system is available to serve the Proposed Project. Design of these onsite detention ponds will be subject to approval in accordance with the City of Dixon. Pertinent NQSP policies regarding master drainage for the City include:

POLICY 6.11.4 Drainage

- Urban runoff shall be directed to the proposed city-wide drainage conveyances and shall meet standards for peak flows. Each planned unit development (PUD) pursuant to this Specific Plan will be required to demonstrate the capacity to retain all on-site storm water in a 100-year event unless a comprehensive storm drainage system is available to serve the Proposed Project.

- The Dixon Public Works Department shall review all drainage facilities prior to improvement and approval of individual project plans

- Required retention/detention basins should be developed in coordination with facilities requiring additional on-site storm water storage.

- Overall storm water volumes generated from the plan area will be mitigated through plan area participation in a regional drainage project, funded, in part through the Dixon North First Street Assessment District and supplemented by other methods as determined by the City.

### *Dixon Engineering Design and Construction Standards*

The City of Dixon Engineering Design Standards and Construction Specifications provide minimum storm drainage design standards for all new development, including the Flying J

Travel Plaza. Storm drainage calculations for culvert sizing and other parameters, as well as structural elevations are based on 10-year and 100-year design storms. Standards for new development minimize the use of open drainage channels, and utilize detention basins. Key standards include the following:

1) Storm Drains must be large enough (sized) to carry flow from the 10-year storm with the hydraulic grade line at least one foot below the gutter flow line.

2) The 100-year hydraulic grade line may exceed the gutter flow line and flood streets, parking lots and other areas where structures would not be permanently damaged, but remain one-foot below building pad elevations and lie below the level that would cause damage to or flood businesses or residences.

3) Open channels shall only be allowed upon written approval of the City Engineer. Where allowed they shall be designed to convey the 100-year storm, have a minimum freeboard of at least one foot if the design water level is below the surrounding ground and three feet if the design water level is above the surrounding ground surface. The maximum velocity is three feet per second unless additional erosion protection is provided. The side slopes shall be no steeper than four horizontal to one vertical. Additional requirements, per City Standards, include maintenance roads, erosion control, and perimeter fencing.

4) Detention ponds must be sized for the critical 100-year four-day storm. The minimum freeboard shall be one foot if the design water level is below the surrounding ground surface and shall be three feet if the water design level is above the surrounding ground surface. The side slopes shall be no steeper than four horizontal to one vertical, and side slopes within public access areas (e.g. parks or green belts) shall be no steeper than six horizontal to one vertical. The detention basin discharge shall be determined on a case-by-case basis and is subject to review and approval by the City Engineer.

### *Dixon Stormwater Management Plan*

The City of Dixon Stormwater Management Plan includes six required programs: (1) Public Education and Outreach Program. (2) Public Involvement and Participation Program. (3) Illicit Discharge Detection and Elimination Program. (4) Construction Site Stormwater Runoff Control. (5) Post Construction Stormwater Management Program. (6) Pollution Prevention and Good Housekeeping for Municipal Operations.

Program goals include establishing Best Management Practices (BMPs) to prevent polluted site runoff during and after construction, development of structural and non-structural strategies for pollutant removal, and education to reduce water pollution. Goals are in accordance with those regulated by the statewide National Pollutant Discharge Elimination System (NPDES) Stormwater Program and Construction General Permit..

### *Dixon Ordinances*

Two important City of Dixon ordinances related to management of storm water runoff pollution and drainage hydrology are the Grading Control Ordinance (Chapter 16.04, Title 16 of the Dixon Municipal Code) and the Storm Water Control Ordinance (Chapter 16.06, Title 16 of the Dixon Municipal Code). These ordinances establish grading controls and stormwater controls that meet the intent of the programs described above and that are enforceable by law and through required permit conditions. Requirements for overall storm drainage are not included in specific ordinance, but are part of the NQSP. Enforcement is through the Dixon Resources Conservation District (DRCD), which owns, maintains, and operates the Tremont 3 Drain. This is the main drainage canal for runoff from the Dixon area. An encroachment permit is required from the DRCD to add or modify culverts or pipes contributing drainage to the Tremont 3 Drain. The primary requirements for obtaining the encroachment permit are to ensure that any new or modified drainage does not result in an increase of flows into the Tremont 3 Drain and that the new or modified drain pipe serves areas that are within the Tremont 3 service area.

### *Dixon Regional Watershed Joint Powers Authority*

The City of Dixon, DRCD, RD 2068, and the Maine Prairie Water District (MPWD) recently formed a Joint Powers Authority (JPA) to cooperatively manage storm water issues and related flooding from the Dixon Regional Watersheds, including the Northeast Quadrant Proposed Project area. A summary of JPA mandates include the following:

1) Within the City of Dixon Northeast Quadrant specific plan area the City is entitled to drain into the DRCD drainage system the present natural runoff from the Northeast Quadrant, without concentration or acceleration.

2) Baseline present storm flows from the Northeast Quadrant shall be set at 23.1 cfs for a 5-year storm, 27.2 cfs for a 10-year storm, and 37.2 cfs for a 100-year storm

measured at the 30-inch corrugated metal pipe (CMP) in the railroad embankment as set forth in a letter from West Yost & Associates to the City dated June 16, 2004.

3) The City will mitigate for development projects in the Northeast Quadrant that will generate flows exceeding the baseline and may be required to pay for downstream improvements needed to convey the baseline storm flows from the Northeast Quadrant to Haas Slough without damage.

## C IMPACTS AND MITIGATION MEASURES

### Significance Criteria

According to CEQA Guidelines, the proposed project would have a significant environmental impact if it would:

*a)* Violate any water quality standard or waste discharge requirements;

*b)* Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);

*c)* Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site (i.e. within a watershed);

*d)* Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff (e.g. due to increased impervious surfaces) in a manner which would result in flooding on- or off-site;

*e)* Create or contribute runoff water which would exceed the capacity of the existing or planned storm water drainage systems due to changes in runoff flow rates or volumes;

*f)* Otherwise degrade water quality;

*g)* Place within a 100-year flood hazard area structures which would impede or redirect flood flows;

*h)* Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or

*i)* Inundation by seiche, tsunami, or mudflow.

**Proposed Project Hydrology and Hydraulics**

The proposed project is to develop 27 acres into a service station with major structures covering 17,648 square feet, while parking lots would cover most of the remaining 27 acres. As a result, the project would convert open agricultural land into impervious surface and increase storm water runoff significantly. In addition to increased site runoff, the development parcel would continue to convey drainage from 360 acres of agricultural lands northwest of Interstate 80 that is conveyed through the four existing culverts underneath Interstate 80.

In order to handle increased runoff the project applicant has proposed to eliminate the existing ditch along the west side of Pedrick Road and convey flow through a subterranean drainage system shown on **Figure 2**. This system would intercept runoff from drain inlets constructed across the site. Due to the increased volume of runoff the applicant has proposed detention of this runoff in the field bordering the development to the east of Pedrick Road. Detention would allow for gradual release into the downstream drainage system managed by the Dixon Resources Conservation District. Prior to release drainage would flow through a combination of mechanical and non-mechanical water quality treatment systems, a CDS or Vortex interceptor and vegetative swales.

The preliminary storm water management plan shows a water quality swale located at the northeast corner of the site to intercept drainage from the culvert underneath I-80 and parking areas along the northern portion of the development, while a water quality swale south of the development area would intercept runoff from the remaining impervious surface area. Site runoff will be collected is shown in a subterranean drainage system that extends along the west side of Pedrick Road and then eastward underneath the road through a 40-inch diameter culvert. Drainage would collect within the detention basin constructed in the field neighboring to the east. The proposed shallow detention basin would then gravity drain to the east through a proposed 12-inch pipe into the existing agricultural drainage ditch that flows to the Tremont 3 drainage canal.

According to the preliminary drainage report, the piped storm drain system was modeled to fit into the NQSP drainage system for pipe profiles and inverts. The proposed detention basin (pond) is proposed as mitigation to allow for increased runoff to be detained and gradually released into the downstream drainage in accordance with the long-term drainage plan that is being determined by the Joint Powers Authority. However, the drainage report did not determine future peak flows or the adequacy of drainage infrastructure in accordance with long-term drainage design goals.

## POTENTIALLY SIGNIFICANT IMPACTS

## DRAINAGE IMPACTS

### IMPACT 1: Increased Runoff

As a result of the development a wide area of impervious surface would be created that would increase runoff to neighboring drainages. Yolo Silty Clay Loam or Capay Silty Clay Loam soils that currently allow for rainwater to infiltrate into the ground, pond and evaporate, or runoff gradually into drainage ditches would be replaced with impervious asphalt concrete and roofs. This could cause as much as 95 percent of rainfall within the developed area to runoff. Both the volume and rate of runoff would increase for the developed area and without mitigation represent a potentially significant impact to local drainage infrastructure. The potential increase in peak discharge as a result of project development is shown in **Table 2**. This includes an analysis of the development area, onsite drainage, and total drainage including offsite drainage from the 360 acre Basin G located north of I-80.

**Table 2**
**Potential Increases in Peak Discharge Without Detention**

| Location | Conditions | Area (Acres) | Peak Flow (cfs) | |
|---|---|---|---|---|
| | | | 10-yr | 100-yr |
| Onsite | Pre-Development | 27 | 13 | 21 |
| Onsite | Post-Development | 27 | 31 | 46 |
| Total | Pre-Development | 387 | 95 | 160 |
| Total | Post-Development | 387 | 113 | 185 |

SOURCE: City of Dixon Engineering Design Standards, Section 4-Drainage Design (2004) cfs-cubic feet per second. **Not design calculations, approximate only**.

This estimate projects that proposed site development would increase peak flows by 19 percent for the 10-year storm and 16 percent for the 100-year storm, assuming no change within Basin G. Morton and Pitalo also modeled piped drainage from the 10-year and 100-year storms and estimated peak flows analytically for two links from the site that would total 54 cfs for the 10-year storm and 93 cfs for the 100-year storm. While drainage improvements have been proposed to accommodate increased runoff in terms of a linked model an evaluation of detention basin adequacy and feasibility to handle peak runoff has not been made. Therefore, changes in peak runoff remain a ***potentially significant impact*** to downstream drainages.

**MITIGATION MEASURE 1:**

**Implementation of onsite detention for increased peak runoff in accordance with the NQSP, City of Dixon, and Joint Power Authority Requirements.**

Preliminary drainage improvements show use of water quality swales along the north and south sides of the proposed development, and use of a shallow detention pond east of the site. These facilities may hold peak runoff and allow for gradual release into the storm drain network, thereby reducing downstream flooding, but the adequacy of these detention and retention facilities has not been specifically analyzed for projected peak flows. Neither has maintenance or conveyance of drainage infrastructure been adequately addressed. To address these concerns the following measures are proposed:

1) The project applicant shall complete a design level analysis of increased peak runoff from the project site per City of Dixon Standards. All proposed infrastructure improvements shall comply with City of Dixon, NQSP, and Joint Power Authority requirements. Proposed infrastructure should include not only proposed detention and water quality treatment features, but establish adequate culvert conveyance underneath Pedrick Road, including handling runoff from Basin G.

2) Inspection and maintenance program for drainage infrastructure. The program shall include a schedule to remove sediment that is clogging the system, while water quality elements shall be tested for water quality at discharge points in accordance with NPDES.

**Implementation of mitigation measure 1 would reduce the impact from peak runoff to a less than significant level.**

**WATER QUALITY IMPACTS**

Non-point source pollutants (NPS) are washed or discharged from various sources and concentrated into runoff. This includes petrochemicals, pesticides, fertilizer, paint, tar, litter, sediment and debris washed by rainwater from roofs, landscape areas, streets and parking areas into the drainage network. Development of the proposed project is likely to contribute to higher levels of urban NPS pollutants, such as oil and grease, heavy metals, petroleum hydrocarbons, and litter entering downstream waters. The Tremont 3 Drainage Canal, Hass Slough and the Sacramento River would be the ultimate recipient of these pollutants.

An increase in NPS pollutants could have adverse effects on wildlife, vegetation, and human health. NPS pollutants could also infiltrate into groundwater and degrade the quality of potential groundwater drinking sources. While NPS pollutants from the site already exist due to road and agricultural runoff, including sediment, trace amounts of pesticides and herbicides, any concentrated development is likely to increase potential pollutants simply due to an increased population with vehicles. There would also be at least a slight risk to shallow groundwater and site runoff from a spill or leak from underground sewer infrastructure. A

future service station and any buried tanks would also create a hazard from a spill or leak of petroleum hydrocarbons.

Under the NPDES storm water permit, the proposed project is required to provide permanent treatment for site runoff. To meet this requirement, the project applicant has proposed to install a combination of mechanical and non-mechanical treatment systems, such as CDS/vortex interceptor and vegetated swales, to treat runoff. In order to meet the storm water detention requirements of the NQSP the applicant has also proposed to construct a shallow detention facility in the agricultural buffer area east of the area to be developed. However, the adequacy of storm water treatment and detention has not yet been evaluated in terms of final design and compliance with the regulatory standards discussed above. A preliminary drainage report for the project site dated December 19, 2005 summarizes existing infrastructure and projected post development drainage, but did not evaluate the suitability or adequacy of any proposed drainage improvements or water treatment details.

**IMPACT 2: Alterations in drainage patterns and grading during the construction period could result in construction-related erosion problems and turbid runoff.** Construction for the proposed project would require mass grading to create individual building pads, parking areas, and to construct on-site roadways. The site is proposed to receive an average of one to two feet of fill. There will also be major excavation and backfilling for the installation of utilities, foundation keyways and other facilities. This will involve stripping, clearing and grubbing, with removal of vegetation and large-scale movement of earth that could result in increased erosion, rutting, and tracking of dirt onto pavement next to the site that could result in sediment laden or turbid runoff. Muddy or silty waters would have reduced water quality for aquatic organisms with high levels of nitrogen, phosphorus, and trace metals. These turbid waters would likely deposit sediment downstream and could clog culverts, reducing drainage capacity. There is also a risk from a spill of construction materials or from a spill of equipment fuel that could pollute runoff. Increased risk of polluted runoff during construction represents a ***potentially significant impact.***

**MITIGATION MEASURE 2: Preparation, implementation and approval of a Project SWPPP in accordance with terms of the Construction General Permit**

Pursuant to NPDES requirements and the City of Dixon Stormwater Management Program, the applicant shall develop a SWPPP to protect water quality during and after construction. The project SWPPP shall include, but is not limited, to the following mitigation measures for the construction period:

(1) Grading and earthwork shall be prohibited during the wet season (October 15 through April 15) and such work shall be stopped before pending storm events.

(2) Erosion control/soil stabilization techniques such as straw mulching, erosion control blankets, erosion control matting, and hydro-seeding, shall be

utilized, in accordance with the regulations outlined in the California Storm Water Best Management Practices Handbooks; Caltrans Storm Water Quality Handbook or other approved manuals. Silt fences shall be installed down slope of all graded slopes, while drain inlet protection, such as hay bales or straw wattles should be installed along the flow paths of graded areas receiving concentrated flows.
(3) Erosion control and sediment filtration measures for dewatering operations.
(4) Verification that any imported fill is "clean" and meets minimum RWQCB standards for shallow soils within commercial and residential developments such as the environmental screening levels (ESLs).
(5) Apply non-storm water BMPs for preventing the discharge of other construction-related NPDES pollutants beside sediment (i.e. paint, concrete, asphalt coatings, etc) to downstream waters.
(6) After construction is completed, all drainage facilities shall be inspected for accumulated sediment, and these drainage structures shall be cleared of debris and sediment.

Long-term mitigation measures to be included in the project SWPPP shall include, but are not limited to, the following:

(7) Description of potential sources of erosion and sediment at the project site. Industrial activities and significant materials and chemicals that could be used at the proposed project site should be described. This will include a thorough assessment of existing and potential pollutant sources.
(8) Identification of BMPs to be implemented at the project site based on identified industrial activities and potential pollutant sources. Emphasis shall be placed on source control BMPs, with treatment controls used as needed.
(9) Development of a monitoring and implementation plan. Maintenance requirements and frequency shall be carefully described including vector control, clearing of clogged or obstructed inlet or outlet structures, vegetation/landscape maintenance, replacement of media filters, regular sweeping of parking lots and other paced areas, etc. Wastes removed from BMPs may be hazardous, therefore, maintenance costs should be budgeted to include disposal at a proper site.
(10) The monitoring and maintenance program shall be conducted at the frequency agreed upon by the RWQCB and/or City of Dixon. Monitoring and maintenance shall be recorded and submitted annually to the SWRCB. The SWPPP shall be adjusted, as necessary, to address any inadequacies of the BMPs.
(11) The applicant shall prepare informational literature and guidance on industrial and commercial BMPs to minimize pollutant contributions from the proposed development. This information shall be distributed to all employees at the project site. At a minimum the information shall cover: a) proper disposal of commercial cleaning chemicals; b) proper use of landscaping chemicals; c) clean-up and appropriate disposal of hazardous materials and chemicals; and d) prohibition of any washing and dumping of materials and chemicals into stormdrains.

**IMPACT 3: Increased runoff following development that would concentrate non-point source pollutants.** There will be increased runoff from impervious surfaces, such as roofs and parking areas that is likely to entrain and concentrate litter, oil and grease, paint, and any other pollutants that are likely to occur. Runoff would discharge into area drainages and eventually into the Sacramento River. This could decrease water quality of area waterways adversely impacting the health of aquatic organisms and may ultimately harm the quality of life for residents and visitors to creeks and waterways. This represents a ***potentially significant impact.***

**MITIGATION MEASURE 3:**

**Review and approval of onsite storm water treatment measures for conformance with the *Northeast Quadrant Specific Plan (NQSP)* and *Dixon Stormwater Management Program.***

Details of the proposed water quality swales 1 and 2 shall be provided to the City of Dixon for approval in accordance the NQSP and all applicable stormwater regulations.

Each proposed water quality system shall have water quality analysis that includes calculations of residence times for all non-structural (vegetative) water quality systems and long term management/maintenance plan that provides the details on performance criteria and maintenance thresholds. The plan shall be approved by the City of Dixon and Regional Water Quality Control Board (RWQCB).

**IMPACT 4: Potential Contamination of Local Groundwater**. The project site is located within a groundwater basin as defined by the DWR. The potential for groundwater contamination from infiltration BMPs must be carefully considered, especially in areas where the distance between groundwater and unlined detention basins, treatment swales, and unpaved ground is relatively shallow. Potential contamination due to a spill or leak of sewage from the proposed sanitary sewer would also adversely impact groundwater quality. The infiltration of industrial and parking lot pollutants into shallow groundwater and the risk from a spill from sewer infrastructure could potentially impair the quality of local groundwater sources. Another impact is from a leak from any future underground storage tanks. Mitigation for these hazards shall also be in accordance with the mitigations presented in the Hazardous Materials Section of this EIR. Potential contamination of local groundwater is a ***potentially significant impact.***

**MITIGATION MEASURE 4A:**

**Utility design and approval in accordance with The City of Dixon Engineering Design Standards and Construction Specifications.**

All utilities, including the sanitary sewer and underground tanks shall be designed, constructed, and backfilled in accordance with City of Dixon Standards and Standards. Conditions to be met include the following:

1) Tracer wire or other approved method shall be used to permanently locate lines. All road crossings shall be marked at the surface, as well as areas where pipes are buried on top of each other with minimum separation between wastewater and domestic and storm water lines followed.

2) Adequate backflow prevention and use of only approved corrosion resistant and durable materials.

3) Sufficient cleanout and maintenance schedule.

4) Final pressure testing of all utility lines in accordance with applicable standards. Leaking pipe or junctions will not be permitted.

**MITIGATION MEASURE 4B:**

**Storage tank design and approval in accordance with Fire Department, Solano County Environmental Health, and City of Dixon Requirements. This shall included registration and permitting through the hazardous materials business and waste plan programs, where applicable.**

**IMPACT 5 Increased Erosion or Siltation to Receiving Waters**

The project would create drainage pathways in an area where water is currently allowed to pond or flow alongside roadway ditches and eventually through culverts underneath Pedrick Road. Proposed drains would not significantly alter the direction or pattern of runoff, but would concentrate runoff more efficiently due to increased impervious surface area and rely upon a system of drain inlets. Concentrated runoff may increase soil erosion in and around the outlets of these facilities and effectively increase sedimentation downstream that represents a ***potentially significant impact.***

**See Mitigation Measure 3.**

*Significance After Mitigation*. **Implementation of mitigation measures 1, 2, 3, 4A and 4B would reduce the impact from the project violating water quality or contributing to soil erosion or sedimentation to a less than significant level**.

## FLOODING IMPACTS

### IMPACT 6: Potentially Hazardous Flooding

While the area is shown to have minimal flooding, the drainage report for the site indicates that certain areas, such as Pedrick Road, are occasionally flooded. While the depth of these floodwaters has not been specifically calculated it is well known that even local and minor flooding can soon cause vehicles to lose traction causing accidents, and even localized flooding may cause damage to structures. Since drainage improvements would not preclude the risk from at least minor flooding, the impact from such flooding would be a **potentially significant impact**.

### MITIGATION MEASURE 6A:

**Review of Preliminary Drainage Design to Ensure Compliance with the NQSP and City of Dixon Engineering Design and Construction Standards, including the following standards:**

1) Storm Drains must be large enough (sized) to carry flow from the 10-year storm with the hydraulic grade line at least one foot below the gutter flow line.
2) The 100-year hydraulic grade line may exceed the gutter flow line and flood streets, parking lots and other areas where structures would not be permanently damaged, but must be at least one foot below the building pad elevations and be demonstrated to not cause damage to or flood businesses or residences.
3) Open channels shall only be allowed upon written approval of the City Engineer. Where allowed they shall be designed to convey the 100-year storm, have a minimum freeboard of at least one foot if the design water level is below the surrounding ground and three feet if the design water level is above the surrounding ground surface. The maximum velocity is three feet per second unless additional erosion protection is provided. The side slopes shall be no steeper than four horizontal to one vertical. Additional requirements, per City Standards, include maintenance roads, erosion control, and perimeter fencing.
4) Detention ponds must be sized for the critical 100-year four-day storm. The minimum freeboard shall be one foot if the design water level is below the surrounding ground surface and shall be three feet if the water design level is above the surrounding ground surface. The side slopes shall be no steeper than four horizontal to one vertical, and side slopes within public access areas (e.g. parks or green belts) shall be no steeper than six horizontal to one vertical. The detention

basin discharge shall be determined on a case-by-case basis and is subject to review and approval by the City Engineer.

**Development and approval of final drainage design.**

**MITIGATION MEASURE 6B:**

**Applicant shall develop emergency plans, including evacuation or shelter plans in the event of an emergency. The plan shall include conditions for site closure when roadways are flooded and shall be approved by the City of Dixon.**

*Significance after Mitigation*. **Implementation of mitigation measures 6A and 6B would reduce the risk of flooding causing injury, death or property damage to a less than significant level.**

**LESS THAN SIGNIFICANT OR NO IMPACT.**

**Decrease in Groundwater Recharge**

Development of the project site would result in a net increased impervious surface area of 27 acres, corresponding to approximately 45 percent of the 60-acre parcel. A net increase in impervious surface area would result in a decrease in groundwater recharge. However, the 425,000-acre surface area of the Solano Groundwater Basin is more than 10,000 times the area to be developed with impervious surface. Should increased runoff be allowed to infiltrate into underlying aquifers through onsite detention then the proportional loss of recharge would be further reduced. Furthermore, since soils are clayey existing recharge is not good and may be exceeded by evaporation. Water will be supplied by the Dixon-Solano Municipal Water Service (DSMWS) or the California Water Service Company through an existing 12-inch water main line located south of the project site at Vaughn Road and would not require pumping from an onsite well. For these reasons the project impact on groundwater recharge is considered **less than significant.** No mitigation is required.

**Place structures within the 100-year flood hazard zone that would impede or redirect flood flows**

The FEMA map for the project area does not show the site to be within a 100-year flood hazard zone, therefore there is considered to be **no impact.** No mitigation is required.

**Inundation by seiche, tsunami, or mudflow**

The proposed project is not next to a lake or the ocean, and is in a flat area that is not susceptible to slope instability. Therefore, there is considered to be **no impact.** No mitigation is required.

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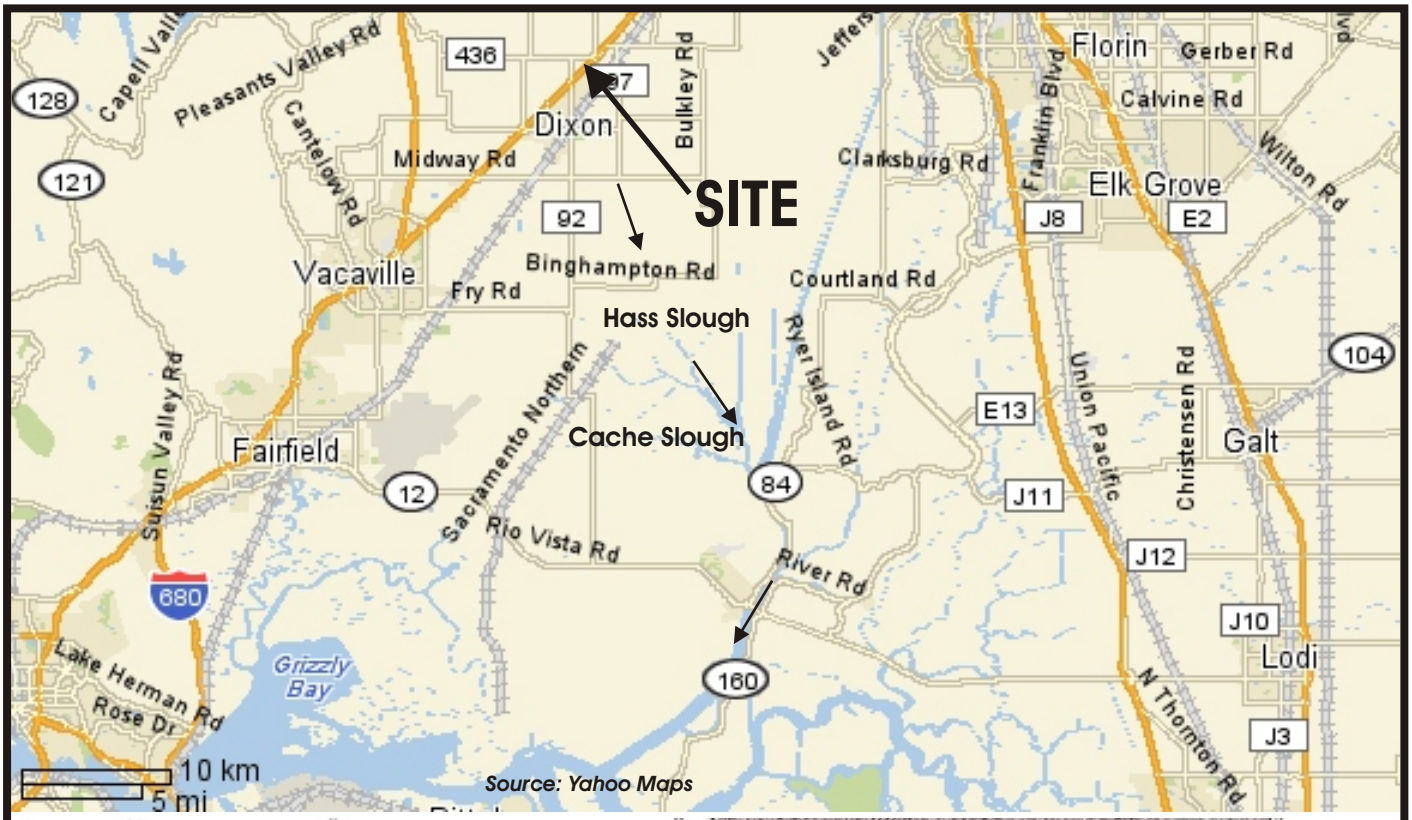


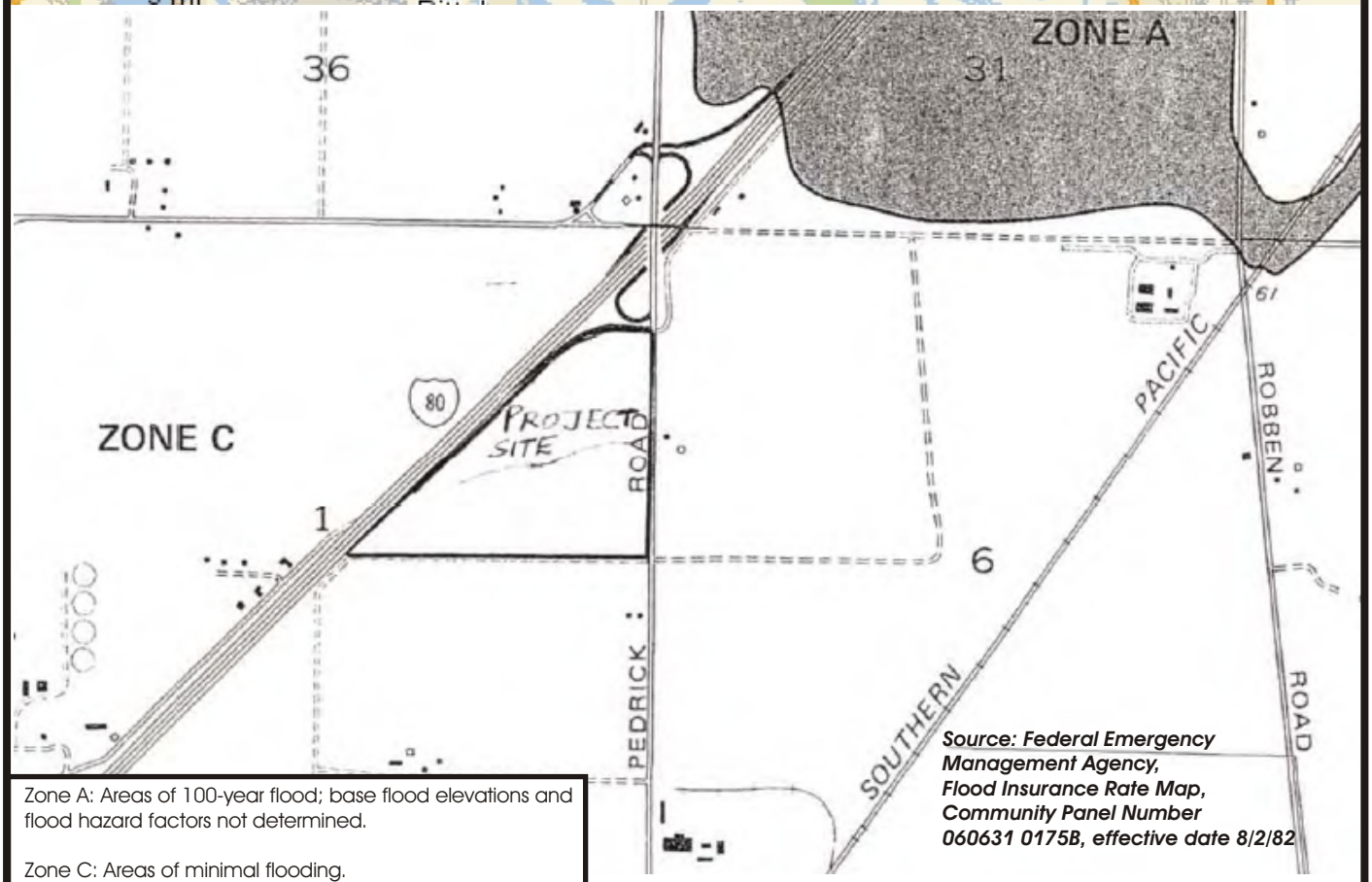


Zone A: Areas of 100-year flood; base flood elevations and flood hazard factors not determined.

Zone C: Areas of minimal flooding.

*Source: Federal Emergency Management Agency, Flood Insurance Rate Map, Community Panel Number 060631 0175B, effective date 8/2/82*

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| Date: | 02/15/06 |
| Drawn: | JF |
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| Dwg. No. | 240262 |

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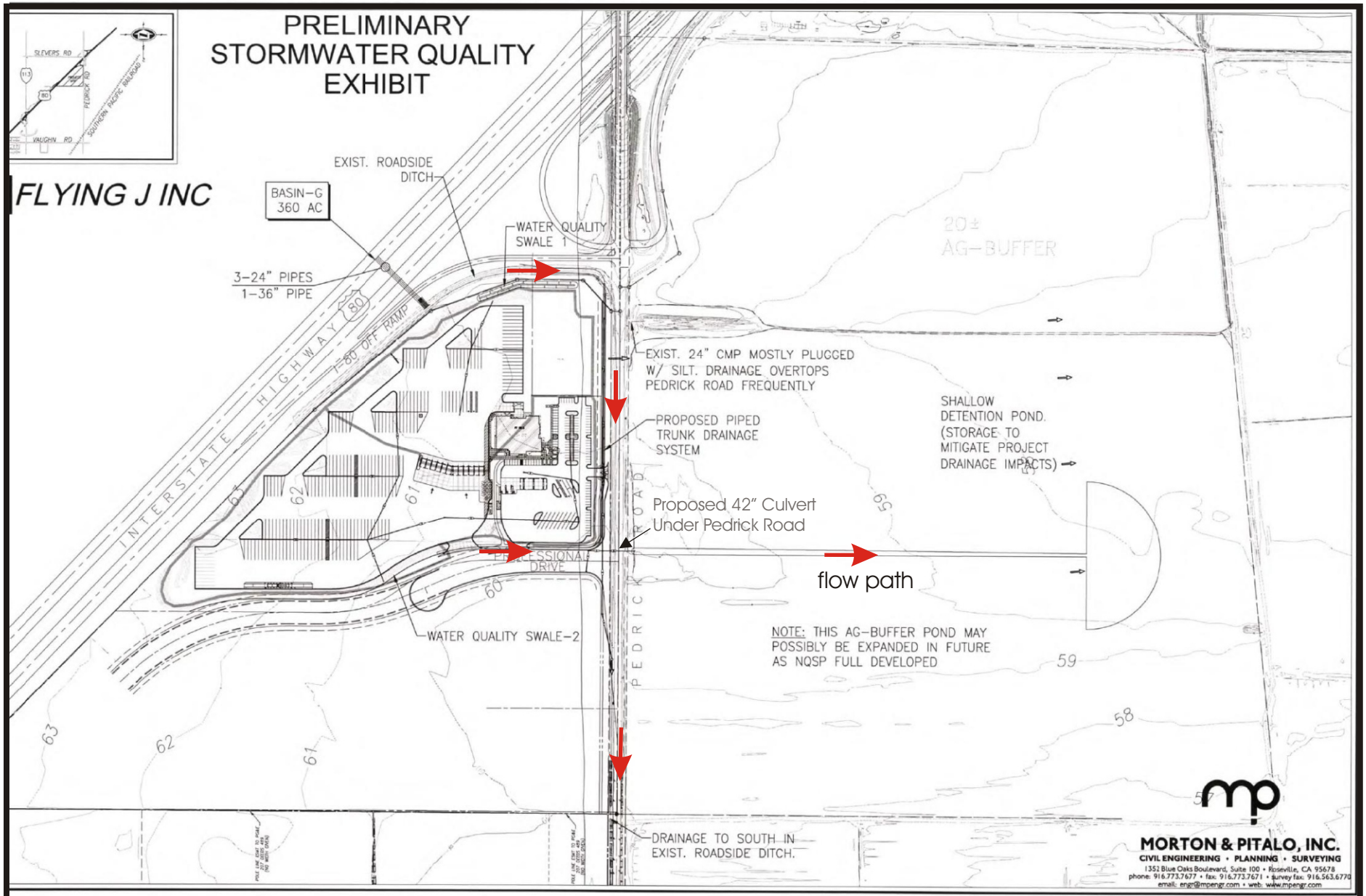
Site Location and Flooding
Flying J Travel Plaza
Dixon, CA

FIGURE
1

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Proposed Drainage Map
Flying J Travel Plaza
Dixon, CA

FIGURE
2