3.8

HYDROLOGY AND WATER QUALITY

3.8 Hydrology and Water Quality

This section of the Draft EIR addresses potential impacts to the hydrology and water quality of the project site and its surroundings. Impacts on groundwater supply and stormwater drainage as well as the potential for flooding and water pollution will be discussed. During the Notice of Preparation (NOP) period comments were received regarding run-off into Anderson-Cottonwood Irrigation District (ACID) canals, flooding as a result of run-off from site development, impacts to groundwater quality, loss of percolation/groundwater recharge and nearby wells, and the reliability of the package wastewater treatment plant. These comments are contained in Appendix A of this Draft EIR.

3.8.1 SETTING

Environmental Setting

WATER SUPPLY

Regional Surface Water

Shasta County is located at the headwaters of the Sacramento River Basin. This watershed, the largest in the state, is a major source of domestic and agricultural water supply for California.

Most of Shasta County's available water flows from the mountainous regions carried by rivers, streams, and creeks to lower elevations. A portion of this water is stored in lakes, reservoirs, and groundwater basins. Two major surface water storage facilities in the County are Whiskeytown Reservoir and Shasta Lake with a combined capacity of 4,734,100 acre-feet. Surface water accounts for 258,550 acre-feet of all diversions for beneficial uses in the County.

Regional Groundwater

As discussed above, a portion of the County's water supply is stored as groundwater. The County contains two major groundwater basins, the Redding and Fall River Valley basins. Other basins include the Hot Springs Valley, Cayton Valley, Lake Britton area, Goose Valley, Burney Creek Valley, Dry Burney Creek Valley, and North Fork Valley Creek basins. Additionally, water bearing soils (volcanic and alluvial soils that contain groundwater) are located throughout the County.

The combined storage capacity of the Redding and Fall River Valley basins is estimated to be approximately 6.5 million acre-feet. Although it is difficult to quantify the amount of water found in the County's water bearing soils, they provide most, if not all, of the water used by development near the project site.

Groundwater accounts for approximately 77,124 acre-feet of all diversions for beneficial uses in the county. It is important to note that there is a lack of precise, quantifiable data on the groundwater resources of the County. Therefore, safe yields (the maximum quantity of water

that can be continuously withdrawn from a groundwater basin without adverse affects on the basin) are currently unknown.

Percolation, the natural process by which groundwater is recharged or replenished, is the filtration of precipitation and stream flows through the soil to the water table where it is collected. Floodplains and streams that overlie porous materials such as gravel are the primary natural sources of groundwater recharge. In Shasta County, the flat agricultural lands of the Sacramento and Fall River Valleys are the most significant recharge areas. No man-made recharge processes have been developed in the County thus far due to the low level of development and an overall stable groundwater level.

Regional Water Demand

According to the Shasta County General Plan (1998), approximately 580,000 acre-feet of water annually are required to sustain all existing land uses within the County. It is also estimated that this requirement will increase to 671,850 acre-feet by 2030. Overall, the County's water supply is more than adequate to meet all existing and projected future needs. Although the supply is adequate, resources are not allocated throughout the County evenly. Certain areas of the County, including the City of Redding and the area under the jurisdiction of the Anderson-Cottonwood Irrigation District, the Bella Vista Water District, and the Clear Creek Community Services District, have the greatest allocations of water and are therefore prime areas for future development in regards to water supply.

Regional Water Quality

According to the *Shasta County General Plan* (1998), both surface and groundwater quality are generally considered good; however, numerous sources of pollution are the cause of some water quality degradation. These sources include sediment from improper construction activities, coliform, warm water (in cold water streams), nitrates and dissolved solids from agricultural activities and septic tank failures, pesticides from agricultural and lawn runoff, grease, oil, antifreeze and other chemicals from road runoff, dioxin from wood products mills, and heavy metals from acid mine drainage of old copper mines. The Sacramento River in particular is impacted by sediment, heavy metals, and dioxin.

Although there are many pollutants entering County waterways, pollutant levels rarely exceed federal standards for safe drinking water and overall quality remains high as indicated by healthy fish populations and recreational fishing activities.

HYDROGEOLOGY

The project, which will use an on-site well for all potable water, is located in the Redding groundwater basin. A detailed discussion of the regional hydrogeology can be found in the *Water Supply Assessment Knighton & Churn Creek Commons Retail Center, July 2009* (Appendix I) prepared for the project.

Local Hydrogeology

Lithology in the project vicinity consists of interbedded clay, silt, sand, and gravel, or mixtures thereof, interpreted to represent the Tehama Formation. At the project site, the overall stratigraphic section is coarse-grained. Cobbles and gravel were encountered for most of the depth of each test hole drilled on the project site, with only minor fine-grained beds. This is consistent with lithologies noted in Department of Water Resources drillers logs in the project vicinity, especially within about one mile of the site. The following discussion of the specific site hydrogeologic conditions is based on the investigation conducted by Lawrence & Associates in 1998-1999 for the previously proposed Flying J Travel Plaza project at the same site as the current project (see Appendix J of the Draft EIR, *Well Installation, Aquifer Testing and Groundwater Modeling for Flying J Knighton Road Travel Plaza, Shasta County, California*[1]).

There is only one significant zone of clay (almost 30 feet thick) in the section drilled, from about 209 to 240 feet below ground surface. This clay separates what are termed the "lower" and "intermediate" aquifers for this report. An additional aquifer zone, denoted as "upper," above the intermediate zone also was identified. The deposits that separate the upper from the intermediate zone, however, are not as distinctly clayey as those between the intermediate and lower zones.

Although three aquifer zones have been delineated at the project site, similar water levels in the upper two zones suggest that these zones could be considered as one. Static water levels in observation wells completed in the upper and intermediate zones were 30.3 and 30.0 feet below ground surface. Static water level from wells perforated in the deep zone (the piezometric surface) is about 52 feet. Thus, the lower aquifer is distinct from the intermediate and upper zones.

Because most of the domestic wells in the vicinity are screened in the upper aquifer or above, with a few in the intermediate zone, the site production well is to be screened in the lower aquifer to reduce the potential for interference with neighboring domestic wells.

The values of transmissivity calculated for the project site are typical of the coarser-grained water-bearing zones in the Redding basin. The values of the storage coefficients indicate that the lower aquifer is confined. Thus, if the water level does not go below the top of the aquifer during pumping, the aquifer will not "dewater" or "go dry", it will remain fully saturated. This is an important concept to remember when observing the drawdown caused by pumping a well screened in a confined aquifer (such as the project production well). Drawdown in a well-screened in a confined aquifer reflects changes in pressure in the aquifer, which is reflected in a lowering of the piezometric surface of the aquifer.

WATER SUPPLY

Discussion of project water supply is excerpted from the *Update to Preliminary Water-Supply Impacts for Knighton Road Development* (January 20, 2009) prepared by Lawrence & Associates

[1] Associated plates are available as an exhibit at Shasta County, Department of Resource Management, Planning Division.

(reference Appendix A of the *Water Supply Assessment* in Appendix I). Water for the project will be supplied by an on-site water well. There is an existing 350-foot deep, 10- inch cased production well at the site; this well, and the associated observation wells, were installed and tested for the previously proposed Flying J truck-stop project. This well is planned to serve as the supply well for the proposed project. Figure 1 in the *Update to Preliminary Water-Supply Impacts for Knighton Road Development* (Appendix A of the Water Supply Assessment) shows the existing well location.

Results from the Flying J drilling program showed at least three aquifer zones beneath the site from 108 to 125 feet ("upper"), 158 to 209 feet ("intermediate"), and 240 to 330 feet ("lower"). The upper two zones are separated from the lower zone by a clay layer from 209 to 240 feet below ground surface (bgs). The production well was completed below the clay layer; the 81-foot-long screened interval extends from 244.5 to 325.5 feet bgs.

Static water levels in the upper and intermediate aquifers are about 30 feet bgs; water level from the lower aquifer is about 52 feet bgs. The similarity in water levels in the upper and intermediate aquifers suggests that these two zones could be considered as one aquifer.

During the aquifer test, maximum drawdown in the Production Well (pumping well) was approximately 33 feet after 24 hours of pumping at 500 gpm. Data from the aquifer test was used to calculate aquifer coefficients (transmissivity and storativity). The calculated transmissivity (approximately 37,500 to 49,500 gpd/foot) was similar to that observed for similar deposits in the Redding ground-water basin. Calculated storativity (approximately 2.5 to 4.9 x lo4) was also similar to that observed for deposits in the Redding ground-water basin. The calculated storativity for the lower aquifer indicates that it is confined. Hydraulic conductivity (derived from transmissivity and taking into account aquifer thickness) in the lower aquifer ranged from approximately 60 to 80 feet/day. Vertical permeability in the clay zone between the intermediate and lower aquifers was calculated to be 0.093 gpd/square foot. This is equivalent to approximately 0.125 feet/day.

Water Demand

Project water demand is taken from the *Update to Preliminary Water-Supply Impacts for Knighton Road Development* (January 20, 2009) prepared by Lawrence & Associates (reference Appendix A of the *Water Supply Assessment* in Appendix I). Based on information provided by Pace Civil Inc. (Pace), the maximum-day demand (MDD) for non-irrigation needs will be approximately 122 gpm; and the peak demand (two-hour) will be approximately 337 gpm. For irrigation, Pace calculated a MDD of 63 gpm and a peak demand of 212 gpm. Peak demands will be met from storage, not directly from the well.

DRAINAGE

The project site is within two distinct drainage areas which are separated by the north-south main Anderson-Cottonwood Irrigation District (ACID) open channel irrigation channel serving the Churn Creek Bottom area. The easterly up gradient drainage tributary area is about 114.9 acres and the area of temporary drainage westerly of the ACID open channel is about 164.7 acres.

The project site has previously been graded for flood irrigation and slopes from north to south at a gradient of 0.002 to 0.003 excepting the area tributary to a natural drainage course in the northwest portion of the site. Water for irrigation is furnished by the ACID and is conveyed via a major open channel irrigation lateral running from north to south through the property. Approximately 76.4 acres of the project site lies easterly of the lateral. There are water take out points along the lateral allowing for flood irrigation of the adjacent lands. To the east of the lateral there are two ditches running easterly for conveyance of water to allow for irrigation from north to south across the fields. One serves the northerly 45.2 acre field and the other serves the southerly remaining 31.2 acres easterly of the lateral and terminating at Knighton Road.

There is approximately 15.6 acres of the project site to the west of the lateral. The northerly 9.8 acres drains to the existing natural swale which terminates at a 24-inch concrete pipe coursing under I-5 and thence into the Sacramento River. The southerly 5.8 acres drains to the south.

This pattern of irrigation ditches leading from the major open channel lateral to irrigate the separate fields or lands is common in the Churn Creek Bottom Area. There are no irrigation water recovery facilities in the Churn Creek Bottom. Excess irrigation water is retained on the individual fields and percolates into the soil.

There is no rainfall runoff discharge onto the easterly drainage area of the proposed project from the area up gradient of East Niles Lane. This is due to the east-west roads (East Niles Lane, Smith Road, Green Acres Drive), and east-west irrigation ditches which effectively block any storm water runoff. The irrigation ditches and roadways are built-up two to three feet above adjacent lands with no culvert crossings to allow storm water to pass. Rapid soil percolation rates in the Churn Bottom Area precludes the buildup of storm runoff and overtopping of drainage ditches or roadways.

Existing Drainage Facilities

There is an existing 24-inch concrete culvert under I-5 which provides drainage for the northwesterly corner (approximately 9.8 acres) and an up gradient tributary area (164.7 acres).

At the point where the north-south ACID open channel irrigation lateral north of Knighton Road intersects with the easterly right-of-way line of I-5, the irrigation lateral is underground in a 36-inch concrete pipe. The 36-inch pipe was installed by Caltrans at the time of construction of I-5 to both realign the channel out of the highway right-of-way and to provide drainage for lands east of the freeway. The pipe follows along the I-5 right-of-way to the southerly side of Knighton Road. The pipe then extends easterly along the south side of Knighton Road to the westerly line of Pacheco Road.

The 36-inch ACID concrete irrigation/drainage pipe provides drainage for the proposed project site easterly drainage area, Knighton Road abutting the proposed project site and a portion of the existing truck stop south of Knighton Road. Also, only runoff south of Niles Lane enters the existing truck stop south of Knighton Road. As a practical matter only runoff south of Niles Lane is served by the existing drains connecting to the 36-inch pipe in Knighton Road because of

blockage by roads and east-west irrigation ditches to the north of Niles Lane. There is one 18-inch area drain inlet into the ACID 36-inch concrete irrigation/drainage pipe about 400 feet northerly of Knighton Road, and two 18-inch area drain inlets on the northerly side of Knighton Road with 12-inch laterals to the 36-inch irrigation/drainage pipe on the southerly side of Knighton Road. There are three storm drain inlets connecting directly to the 36-inch concrete irrigation/drainage pipe on the south side of Knighton Road in front of the existing truck stop.

When Knighton Road was extended to Airport Road by the County of Shasta, drain inlets were placed on the northeast and southeast corners of the intersection of Knighton and Churn Creek Roads and storm drains were extended and connected into the underground ACID lateral at the southwest corner of Knighton and Pacheco Roads.

At the northeast corner of the truck stop the ACID irrigation/drainage concrete pipe is enlarged to 42-inches and runs southerly about 500 feet. At this point the ACID lateral becomes an open channel for about 3,000 feet; then it continues southerly along I-5 in a 36-inch concrete pipe. At the point where the open channel ends and the 36-inch concrete pipe begins there is a junction box. There are three valves within this junction box. One valve is for a 24-inch irrigation lateral to the east, one valve for the 36-inch concrete pipe to the south and one valve for an 18-inch concrete drain pipe directly to the Sacramento River. The purpose of the 18-inch concrete drain is for the discharge of storm water to the Sacramento River.

The capacities of the drains on the north side of Knighton Road and the drain within the project site side are about 5.0 cubic feet per second (cfs) each.

Rainfall and Storm Water Runoff

The Shasta County Department of Public Works and Water Agency Method of Storm Water Runoff Hydrology Analysis for Small Watersheds was used to determine rainfall storm water runoff quantities and rates for the design of storm drains facilities, to include storm drains and detention requirements.

The project site is within the design parameters for a 25-year storm event when calculating storm water runoff (watershed area over 40 acres, but less then 4 square miles).

Design criteria are 2.3 inches of rainfall over a 6-hour period and 4.9 inches over a 24-hour period during a 25-year storm event. Storm water runoff is a function of area, rainfall intensity, and coefficient of runoff (percentage of storm water that is not absorbed into the soil). Because of the soil types within the Churn Creek Bottom area there is a very low runoff coefficient. Runoff analysis is contained in EIR Appendix K, *Analysis of Churn Creek Floodplain and Detention Storage, May 2008*.

Potential Site Flooding

It has been determined by the Federal Emergency Management Agency (FEMA) that Churn Creek will overtop its banks during a 100-year storm event. FEMA identifies the site as Zone A on the FEMA Flood Insurance Rate Map. This classification indicates that the flooding will be

sheet flow from north to south and will be approximately one to two feet above existing ground level. The FEMA mapped floodzone is shown in Figure 3.8-1.

Proposed Project Site Drainage

It is proposed that the re-located ACID facilities continue to be utilized in combination with on-site detention. Runoff from the site would be limited to the existing (pre-development) flow rate (see Appendix K).

Regulatory Setting

FEDERAL

Clean Water Act (CWA)

The CWA administered through the Regulatory Program of the Corps regulates the water quality of all discharges into waters of the U.S. including wetlands and intermittent stream channels. Section 401, Title 33, Section 1341 of the CWA sets forth water-quality certification requirements for "any applicant applying for a Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable water."

Federal Emergency Management Agency (FEMA)

The National Flood Insurance Program (NFIP) is a Federal program administered by FEMA. Participants in the NFIP must satisfy certain mandated floodplain management criteria. The National Flood Insurance Act of 1968 has adopted, as a desired level of protection, an expectation that developments should be protected from floodwater damage from the Intermediate Regional Flood (IRF). The IRF is defined as a flood that has an average frequency of occurrence on the order of once in 100 years although such a flood may occur in any given year. The State Department of Water Resources occasionally audits local agencies to insure the proper implementation of FEMA floodplain management regulations.

STATE

Regional Water Quality Control Board Permitting

The National Pollution Discharge Elimination System (NPDES) program, under Section 402(p) of the Federal Clean Water Act, is administered locally by the Central Valley Regional Water Quality Control Board on behalf of the U.S. Environmental Protection Agency. The program is designed to reduce pollution from storm water discharge and may require a permit from parties discharging to lakes, streams and other water bodies. In the case of the proposed project, a construction activity permit would be required since construction activities associated with the project would result in the disturbance of more than one acre and movement of at least 2.9 million cubic yards of soil. The permit would require that the following measures be implemented during construction activities: eliminate or reduce non-storm water discharges to storm water systems and other waters of the nation, develop and implement a Storm Water

Pollution Prevention Plan (SWPPP), and perform inspections of storm water control structures and pollution prevention measures.

LOCAL

Small Public Community Water System Permit

A permit from the Shasta County Environmental Health Division is required to operate a small public community water system, transient or non-transient non-community public water system. A complete set of plans and specifications must be submitted when applying for this permit. An annual fee is charged based on the type of water system.

Shasta County Zoning Ordinance

Restrictive Flood (F-2) District. The restrictive flood (F-2) district is intended to be combined with any principal district to minimize or avoid hazards to life and property from flooding in the areas of special flood hazard established by the Federal Emergency Management Agency, pursuant to the Flood Disaster Protection Act of 1973, and in other areas of significant flood hazard. These regulations apply in all districts combined with this district, provided that in case of conflict between the regulations of the principal district and this district, the more restrictive regulations control.

Shasta County Code

Groundwater Management Ordinance. Adopted in 1998, Shasta County Ordinance 98-1 officially adopted a groundwater management plan prepared by the Shasta County Water Agency pursuant to AB 3030 the Groundwater Management Act (California Water Code Section 10750 et seq.). The California Department of Water Resources has defined groundwater management plans as a "planned use of the groundwater basin yield, storage space, transmission capability, and water in storage."

Anderson-Cottonwood Irrigation District Rules and Regulations

Rule 18 – Nuisances. No tree or vine pruning, brush, weeds, grass, rubbish, swill, garbage, manure, or refuse, or dead animal matter from any barnyard, stable, dairy, or hog pen, or other material or substance that will become offensive to the senses or injurious to health or injuriously affect the quality of water, or obstruct the flow of water or result in the scattering of seeds or noxious weeds, plants, or grasses, shall be placed or dumped in any facility of the District or be placed or left so as to roll, slide, flow, or be washed, or blown into any such facility. Any violation of this rule will subject the offender to prosecution. All employees of the District are especially urged to cooperate in its enforcement.

Installation of septic tanks, water closets, or privies, in a location which would result in pollution of the water in a facility of the District is a misdemeanor.

Unauthorized or unapproved drainage of imported water, including storm water runoff, into District facilities is prohibited.

Shasta County General Plan

Policy FL-a: New development in floodplains shall be regulated through zoning regulations addressing land use type, density, and siting of structures.

Policy FL-e: New critical or high occupancy structures (e.g., schools, hospitals) shall not be located in the 100-year floodplain unless those structures and supporting utilities are designed to prevent damage and service interruption during the 100-year flood. Major access routes to such facilities should not be subject to interruption during a 100-year flood event.

Policy FL-f: Known flood hazard information shall be reported as part of every General Plan amendment, zone change, use permit, variance, building site approval, or other land development applications subject to environmental assessment.

Policy FL-g: Flood Hazard Maps shall be maintained by the County to aid in the project review process.

Policy FL-h: The impacts of new development on the floodplain or other downstream areas due to increased runoff from that development shall be mitigated. In the case of the urban or suburban areas, and in the urban and town centers, the County may require urban or suburban development to pay fees which would be used to make improvements on downstream drainage facilities in order to mitigate the impacts of upstream development.

Policy W-a: Sedimentation and erosion from development shall be minimized through grading and hillside development ordinances and other implementation mechanisms as adopted by the County.

Policy DI-a: Dam Failure Inundation Maps shall be maintained by the County to aid in the project review process.

Policy DI-b: When development is proposed in areas adjacent to or downstream from an existing dam, the County shall determine if preparation of a dam failure inundation map is warranted.

Table 3.8-1 provides a discussion of the proposed project's consistency with applicable portions of *Shasta County General Plan* Policies related to hydrology and water quality.

Table 3.8-1
General Plan Consistency – Hydrology and Water Quality

Policy No.	Finding	Discussion
FL-a	Consistent	The proposed project will retain the Restrictive Flood Plain zoning.
FL-e	Consistent	The project is commercial and contains no high occupancy structures.
FL-h	Consistent	The project is designed to mitigate impacts on the floodplain or other downstream areas due to increased runoff.
W-a	Consistent	The project proponent will be required to file a Storm Water Pollution

Policy No.	Finding	Discussion
		Prevention Plan for project construction and obtain a Section 402 National Pollutant Discharge Elimination System (NPDES) General Construction Activity Storm Water Permit from the California Regional Water Quality Control Board (RWQCB), Central Valley Region.

3.8.2 THRESHOLDS OF SIGNIFICANCE

Based on the significance criteria contained in Appendix G of the CEQA Guidelines, the construction and operation of the project is considered to have a significant adverse impact on the environment if it will:

- Violate any water quality standards or waste discharge requirements.
- 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.
- 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.
- 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 in a manner which would result in flooding on- or off-site.
- Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.
- Otherwise substantially degrade water quality.
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.
- Place within a 100-year flood hazard area structures which would impede or redirect flood flows.
- 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.
- Have a significant risk of inundation by seiche, tsunami, or mudflow.

3.8.3 IMPACTS AND MITIGATION MEASURES

Impact #3.8-1: Violation of water quality standards or waste discharge requirements during project construction.

Discussion/Conclusion: Stormwater runoff leaving the site during construction activities can have a significant impact on water quality. As stormwater runoff leaves the site it can pick up pollutants, such as sediment, debris, or chemicals, and transport these pollutants to nearby stormwater systems, irrigation ditches or natural water conveyance systems, such as rivers, lakes or costal waters. To address this issue the project applicant will apply for coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit, 99-08-DWQ), The NPDES program requires construction site operators engaged in clearing, grading, and excavating activities that disturb 1 acre or more to obtain coverage under an NPDES permit for their stormwater discharges. In order to be granted coverage, the applicant must submit a Notice of Intent to comply with the general permit along with a site plan map and fee to the State Water Resources Control Board (SWRCB) prior to starting construction. Additionally, as part of the NPDES process, the applicant must prepare a Stormwater Pollution Prevention Plan (SWPPP) to be retained onsite. The SWPPP must include best management practices that, when implemented, prevent stormwater quality degradation to the extent practical by preventing sediments and other pollutants from leaving the project site. Compliance with the requirement of obtaining coverage under the general permit, and acquisition of a grading permit from the Shasta County Environmental Health Division, accompanied by implementation of an approved SWPPP will ensure that water quality impacts related to construction activities are ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Impact #3.8-2: Violation of water quality standards or waste discharge requirements during project operation.

Discussion/Conclusion: Development of the proposed project will result in the conversion of undeveloped land to commercial uses. The pollutants associated with the proposed project could affect the quality of storm water flowing into the proposed onsite drainage system and detention basin. These pollutants include greases and oils from driveways and parking areas and excess pesticides and fertilizers from public and private landscaping. This impact is ***potentially significant***.

Mitigation Measures

Implementation of the following mitigation measure will reduce this impact to be ***less than significant.***

Mitigation Measure #3.8-2:

Prior to approval of the proposed project site plan, the project proponent shall identify all appropriate and feasible storm water runoff Best Management Practices (BMPs) to be implemented within the project site. These BMPs shall be selected from the California Stormwater Quality Association's Stormwater Best Management Practice Handbook—New Development and Redevelopment and shall conform to the standards set forth by the

Central Valley Regional Water Quality Control Board. Typical BMPs that could be used shall include but would not be limited to catchbasin inserts, compost stormwater filters, sandfilters, vegetated filter strips, biofiltration swales, oil/water separators, biodetention basins, or other equally effective measures. Other BMPs shall include but would not be limited to administrative controls such as signage at inlets to prevent illicit discharges into storm drains, parking lot and other pavement area sweeping, public education, and hazardous waste management and disposal programs. BMPs shall identify and implement mechanisms for the routine maintenance, inspection, and repair of pollution control mechanisms. In addition, the BMPs shall be reviewed for adequacy by the Shasta County Planning and Public Works Departments.

Impact #3.8-3: 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.

Discussion/Conclusion:

REGIONAL GROUNDWATER IMPACTS

To evaluate whether there is, and would be in the future, sufficient quantities of groundwater to supply to the proposed project and other users, a supply and demand analysis for the groundwater basin was conducted as part of the Water Supply Assessment (WSA) (Appendix I). The groundwater supply for the basin in which the proposed project site is located was estimated for a normal year, single dry year, multiple dry 2 year and multiple dry 3 year scenarios. Tables 3.8-2 and 3.8-3 (Tables 7-1 and 7-2 in WSA), summarize the supply and demand calculations for the proposed project.

Table 3.8-2
1997 Existing Supply & Demand*
Normal Year, Single Dry Year, & Multiple Dry Year Scenarios (AF/yr)

	Normal Year	Single Dry Year	Multiple Dry Years	
			Year 2	Year 3
1997 Baseline Normal Year Demand from Groundwater	-37,800	-39,690	-41,670	-43,754
Project Demand	-200	-210	-221	-233
Annual inflow to Redding Basin Groundwater system	293,600	278,920	264,974	251,725
Net Balance	**255,600**	**239,020**	**223,083**	**207,738**

*Assumptions:
1) 1997 pumping rates are a sustainable groundwater withdrawal for the basin
2) There is 5% increase in demand every year added in a multiple dry year scenario
3) Recharge waters will diminish 5% every year added in a multiple dry year scenario

Table 3.8-3
2030 Supply & Demand*
Normal Year, Single Dry Year, & Multiple Dry Year Scenarios (AF/yr)

	Normal Year	Single Dry Year	Multiple Dry Years	
			Year 2	Year 3
2030 Normal Year Demand	-99,300	-104,265	-109,478	-114,951
Project Demand	-200	-210	-221	-233
Annual inflow to Redding Basin Groundwater system	293,600	278,920	264,974	251,725
Net Balance	**194,100**	**174,445**	**155,275**	**136,541**

*Assumptions:
1) 1997 pumping rates are a sustainable groundwater withdrawal for the basin
2) There is 5% increase in demand every year added in a multiple dry year scenario
3) Recharge waters will diminish 5% every year added in a multiple dry year scenario

The calculations show that there would be sufficient groundwater available for both the proposed project and other users in the long term (2030), without causing a significant impact on the availability of groundwater in the aquifer in normal, single, and multiple-dry years.

It should also be noted that of the total amount of water that the proposed project will remove from the groundwater basin (between approximately 200 acre-feet/year in a normal year and 233 acre-feet/year in a 3 year multiple dry year period), about 90 acre-feet/year will be returned to the basin from on site recharge of treated wastewater. Thus, the net withdrawal will be between approximately 110 and 143 acre-feet/year.

Thus, project induced groundwater pumping would not substantially deplete the groundwater supply relative to either the annual water budget or the total volume of groundwater stored in the aquifer and the impact to the Redding Basin aquifer from the proposed project is considered ***less than significant.***

LOCAL GROUNDWATER IMPACTS/WELL INTERFERENCE

Interference is the decrease in water level in a well caused by the pumping of a neighboring well. The level of interference caused by pumping a well depends, in part, on the pumping rate, the length of time the pumping occurs, the distance between wells, and geologic conditions. Interference increases with increasing pumping rate and increasing pumping time. Interference will be greater for wells closer to a pumping well. Interference increases with decreasing hydraulic conductivity, which is dictated by geologic conditions.

Interference decreases when pumping decreases or stops. That is, interference can be considered a more-or-less immediate (within hours or days) impact that happens when a pumping well operates.

Because the same on-site well previously analyzed in conjunction with the Flying J Knighton Road Travel Plaza and Shasta Auto Mall projects (formerly proposed to be located on the same site as the proposed project) is proposed to be used by the proposed project, Lawrence & Associates has used the same groundwater model set up for the Flying J Knighton Road Travel Plaza and Shasta Auto Mall projects (see Appendix J *Well Installation, Aquifer Testing and*

Groundwater Modeling for Flying J Knighton Road Travel Plaza, Shasta County, California and Appendix I *Water Supply Assessment Knighton & Churn Creek Commons Retail Center, July 2009*), with modification to the pumping rate and maximum-day/annual-average demand to predict localized groundwater level impacts resulting from implementation of the proposed project.

For the maximum-day demand of 215 gpm associated with the proposed project, the model shows no detectible interference in the upper and intermediate aquifers and about 5 inches of interference at 200 feet from the well, about 3 ½ inches at 400 feet, 2 ½ inches at 800 feet, and 1 inch at 1,700 feet in the deep aquifer (from which the well pumps).

For the annual-average day demand of 122 gpm, the model shows about one foot of interference at 250 feet from the well, about 6 inches at 1,000 feet, and about 4 inches at ½ mile in the deep aquifer. In the upper and intermediate aquifers the model shows less than one inch of interference at distances beyond approximately 300 feet from the well. The slightly greater degree of interference associated with the annual-average demand in comparison with the maximum-day demand is due to the longer duration water withdrawal time frame used when modeling annual-average demand effects.

In all scenarios, the model shows no detectable interference in the upper and intermediate aquifers. Although interpretation of the 1998 well-testing data suggested that there could be interference in the intermediate aquifer from pumping the deep aquifer, recharge of the treated wastewater generated by the proposed project will ameliorate this effect. Because most domestic wells in the area are screened in the upper or intermediate aquifers, most of the domestic wells would not experience interference from the proposed project well.

Since the well for the proposed project is confined to the lower aquifer and treated wastewater will recharge the upper and middle aquifer, wells in the vicinity of the proposed project will not experience groundwater depletion and this impact is considered ***less than significant.***

Mitigation Measures

No mitigation measures are required

Impact #3.8-4: 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.

Discussion/Conclusion: The proposed project would result in the creation of new impervious surfaces in the form of buildings, driveways, parking lots and other paved areas or impervious surfaces. Stormwater runoff from new impervious surfaces created by the proposed project would drain into roadside ditches, or other drainage conveyance facilities on-site, and be transported to the on-site stormwater detention/retention system. New impervious surfaces could result in an increase in the peak flow of runoff and/or the volume of stormwater runoff generated on the proposed project site compared to the existing conditions because rainfall would be

prevented from infiltrating into the soil. In addition, the proposed project would introduce new fill material and vegetation, and change the existing topography of the site. The proposed project in combination with frequency and intensity of precipitation could affect the peak flow and/or the volume of stormwater runoff. For example, reducing the steepness of slopes and removing the existing topsoil and exposing the underlying soils during construction could increase runoff; while changing the soil depth, adding vegetation, or constructing/implementing stormwater BMPs could increase the infiltration and water retention of the project site.

The project site currently contains an open channel irrigation lateral and two irrigation ditches. To address potential impacts associated with alteration of the canals, Mitigation Measure #3.2-4 shall be implemented. In order to protect these drainages and waterways from excess sedimentation and potential pollution from stormwater runoff during construction, grading and erosion/sediment control measures shall be designed in accordance with the SWPPP prepared for the proposed project as noted in the above discussion pertaining to Impact #3.8-1.

Stormwater will flow over asphalt and other surfaces characteristic of a commercial development into a County approved on-site stormwater detention/retention system and will not cause erosion or siltation. This impact is ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Impact #3.8-5: 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 in a manner which would result in flooding on- or off-site.

Discussion/Conclusion: The data and analysis contained in the Appendix K, *Analysis of Churn Creek Floodplain and Detention Storage, May 2008 - Hydmet, Inc*, indicate that the project will not cause an increase in the amount of storm water runoff so as to result in flooding on or off-site.

Hydmet, Inc. used the hydrologic model developed by the Army Corps of Engineers, HEC-1, to evaluate the hydrology on the project site. The HEC-1 models were used to develop 10/25/100 year recurrence hydrographs for the pre-project and project conditions. All of these model runs used the storm water system collection area of 83 acres. Table 2 of Appendix K lists peak flows for pre-project and project with detention. Table 2 of Appendix K shows that the proposed on-site detention facilities control runoff from the project to pre-project levels or lower for the 10/25/100 year flood events (that is, 15-17 cfs, the capacity of the 18" culvert near the intersection of Knighton Road and Churn Creek Road). The detention facilities prevent increases in peak flow at all downstream locations. With the proposed detention facilities controlling runoff from the project to pre-project levels, or below, this impact is ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Impact #3.8-6: Creation or contribution of runoff which will exceed the capacity of planned storm drainage systems or provide substantial additional sources of polluted runoff.

Discussion/Conclusion: The data and analysis cited in the discussion/conclusion section of Impact #3.8-5 substantiates that the planned stormwater drainage system will be of adequate capacity to accommodate project runoff. The data and analysis cited in the discussion/conclusion sections of Impacts #3.8-1 and 3.8-2 document that stormwater runoff pollution will be mitigated to a less than significant level. As stated in Impact #3.8-1, the applicant will be required to file a SWPPP for proposed project construction and obtain a NPDES General Construction Activity Stormwater Permit from the Central Valley Regional Water Quality Control Board (RWQCB). This impact is ***potentially significant***.

Mitigation Measures

The proposed project will not create or contribute to runoff which will exceed the capacity of planned storm drainage systems as noted in Impact #3.8-5 or provide substantial additional sources of polluted runoff during construction as noted in Impact # 3.8-1. The proposed project will not result in substantial additional sources of polluted runoff during operation with the implementation of Mitigation Measure #3.8-2 and this impact is considered ***less than significant.***

No additional mitigation measures are required.

Impact #3.8-7: Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

Discussion/Conclusion: The proposed project is a commercial project and will therefore not place housing units within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map. There is ***no impact***

Mitigation Measures

No mitigation measures are required.

Impact #3.8-8: Placement of structures within a 100-year flood hazard area that would impede or redirect flood flows.

Discussion/Conclusion: The *Analysis of Churn Creek Floodplain and Detention Storage, May 2008* prepared by Hydmet, Inc. notes that the proposed project is designed and will be constructed to allow for the passage of any flood waters through the project site without

increasing the flood water depth on the adjacent property up gradient. Flood water passage will be handled by swales between buildings and around the project site designed for passage of any flood waters through the project site. Although the analysis notes that the proposed project is designed to allow the passage of flood water through the project site, FEMA identifies the site as Zone A on the FEMA Flood Insurance Rate Map, requiring the issuance of Elevation Certificates for all structures located within the Restrictive Flood (F-2) zoned portion of the project site to ensure that the bottom floor of all occupied buildings are constructed above the base flood elevation. With the issuance of Elevation Certificates, this impact is ***less than significant.***

Mitigation Measures

No mitigation measures are required.

Impact #3.8-9: 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.

Discussion/Conclusion: The proposed project would allow new development to occur in an area subject to the risk of inundation due to dam failure. In the case of dam failure, the project site could be subject to flooding. However, the risk of dam failure is low due to the conducting of annual dam inspections by the California Department of Water Resources for the purpose of safeguarding life and preventing the destruction of property. Because the risk of dam failure is low this impact is considered ***less than significant.***

The effective FEMA floodplains are shown on Figure 3.8-1. Nearly the entire project is in Zone AO, an estimated shallow flood zone without determination of water surface elevations. The shallow flood zone was re-studied using a HEC-RAS model and detailed cross sections as seen in Appendix K. Figure 5 of Appendix K shows the revised flood zone with actual water surface elevations. The revised analysis showed that overflow flood water from Churn Creek cannot reach the northwest part of the project area, due to existing berms and high ground. In addition, overflow flood water from Churn Creek cannot cross Knighton Road east of the project and is diverted by the Knighton Road embankment to the intersection of Churn Creek Road and Knighton Road.

The purpose of the HEC-RAS analysis was to determine the influence of the project on the Churn Creek overflow 100-year floodplain. The project grading plan diverts part of the shallow overflow to the east side of the project (see Figure 6 of Appendix K). A channel will be constructed on the west side of Churn Creek Road to carry the diverted flow. The channel is adjacent to Churn Creek Road on the west. It varies from 30 ft wide and three feet deep for the north half to 50 ft wide and one foot deep for the south half. Table 4 of Appendix K shows the Churn Creek overflow 100-year floodplain elevations with and without the project. The proposed bypass ditch creates decreases in the 100-year water surfaces and more than compensates for flow displacement due to project grading and fill. Because the FEMA Flood Zone for areas of the proposed project is AO, the applicant must obtain base elevation certifications and design the proposed building foundation height accordingly to preclude sheet flow flooding of the building

during a 100 year storm. Compliance with this requirement reduces this impact to be ***less than significant***.

Mitigation Measures

No mitigation measures are required.

Impact #3.8-10: Have a significant risk of inundation by seiche, tsunami, or mudflow.

Discussion/Conclusion: Seiches, or waves generated in bodies of water similar to the back-and-forth sloshing of water in a tub, could possibly occur in natural lakes and reservoirs. Both Lake Shasta and Whiskeytown Reservoir are subject to seiches in the event of an earthquake. If the seiche overtops either of the dams, failure could result. Failure of either dam could potentially cause flooding at the proposed project site. Given the distance between the lakes, and any major faults, the risk of seiche is extremely low and this impact is considered ***less than significant.***

The proposed project site is not at risk from tsunami due to its inland location. Finally, the proposed project site is also not at risk of mudflows due to its relatively flat topography and distance from any hillsides. Risk of inundation by seiche, tsunami or mudflow is a ***less than significant*** impact.

Mitigation Measures

No mitigation measures are required.