4.8 HYDROLOGY AND DRAINAGE

This Section describes the current conditions related to hydrology and drainage in the Metropolitan Bakersfield Planning area. Additionally, this Section provides an assessment of potential impacts on existing drainage patterns and flood control facilities in the Planning area, as well as the potential effects on the groundwater quality and supply. General Plan goals and policies and mitigation measures are identified as necessary to reduce potential impacts to a less than significant level. Information in this Section is based on the Conservation, Safety and Public Services and Facilities Elements of the General Plan, the Water Quality Control Plan for the Tulare Lake Basin (1995), and the Bakersfield Water Balance Report (no date).

ENVIRONMENTAL SETTING

SURFACE WATER

The two primary sources of surface water in the Planning area are the Kern River watershed and the Caliente Creek Stream Group.

Originating in groups of glacial lakes in the vicinity of Mount Whitney, Kern River drains an approximately 2,420 square mile area in the Sierra Nevada Mountains. Water runoff from the Sierras flows from northeast to southwest and enters the San Joaquin Valley through the Kern River Canyon. The River has two principal tributaries that meet at Lake Isabella. Less significant tributaries are Erksine, Bodfish, Clear, and Cottonwood Creeks which join the River downstream from Lake Isabella. With the exception of the small valley in which Lake Isabella is located, the Kern River and its principal tributaries flow in steep, and narrow canyons from their headwaters to the mouth of Kern Canyon. Beyond the mouth of the Canyon, the river channel is deeply entrenched in an alluvial fan that extends westward to the main valley trough where the channel is controlled by levees to prevent floodflows from spreading to the adjacent land.

Kern River had an unregulated flow until 1954 when the Isabella Dam and Reservoir were constructed by the Army Corps of Engineers. The primary purpose of the dam is flood control with the ability to hold back approximately 570,000 acre-feet of water in the reservoir.

With the exception of very wet years, there is no flow in the river past Bakersfield due to upstream canal diversions. The river encounters its first diversion into a canal when it first exits the Kern River Canyon and encounters another diversion when it reaches the east side of Bakersfield, near Hart Park. The Beardsley and Rocky Point weirs are the first two of seven diversion weirs in Bakersfield. From there, canal water travels north and south to irrigate farmlands. In total, the River is diverted into seven canals that pass through the City. During very wet years, water flows in the river southwest to the Buena Vista Lake Bed and then north to Tulare Lake or into the California Aqueduct near Tupman.

The Caliente Creek Stream Group drains the west slopes of the Tehachapi Mountains. The Group consists of Caliente Creek and its tributaries, Walker Basin Creek and Tehachapi Creek, and the smaller creeks of Little Sycamore, Comanche and Tejon.

GROUNDWATER

Groundwater is defined as subsurface water that occurs beneath the ground surface in fully saturated zones within soils and other geologic formations. Where groundwater occurs in a saturated geologic unit that contains sufficient permeability and thickness to yield sufficient water to sustain a well or spring, it can be defined as an aquifer. A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers.

Metropolitan Bakersfield rests above a series of water bearing aquifers which form part of a larger groundwater basin called the Southern San Joaquin Groundwater Basin. The primary groundwater aquifer below Metropolitan Bakersfield is made up of unconsolidated sediments bordered by faults or mountain ranges to the east, west, and south. The Basin is essentially contained on three different sides by these geologic features that serve as effective barriers to groundwater movement to or from these directions.

Groundwater in the Basin occurs under unconfined, confined, and semi-confined conditions. Unconfined aquifers are generally less deep than other aquifers and are not restricted in flow by layers of confining clays. Generally, unconfined aquifers show greater evidence of water quality degradation than confined aquifers. Semi-confinement is caused in most of the basin by the presence of small, discontinuous clay lenses that slightly inhibit the movement of recharge water downward. Confined groundwater occurs in portions of the Basin overlain by identified confining clay layers.

Currently, water supplies tributary to or imported for use within the Basin are inadequate to support the present level of agricultural and other development. Therefore, groundwater resources within the Planning area are mined to provide additional water to supply demands.

The goal for water resource management is to reach a condition of “safe yield” for the groundwater basin. “Safe yield” occurs when the amount of water pumped from the basin is less than or equal to recharge into the basin. Conversely, increased groundwater extraction can eventually exceed the recharge capacity of the aquifers resulting in a condition referred to as “overdraft”.

Groundwater recharge in the Basin is currently obtained through the following sources:

- Natural recharge by precipitation runoff;
- River and canal seepage;
- Reclaimed water; and
- Spreading and banking.

Natural Recharge. Natural recharge is provided by precipitation runoff, which is defined as the amount of melted snow and rainwater measured after evaporation, evapotranspiration, and percolation. Precipitation runoff falling within the Plan area is collected as runoff in a series of drainage basins or “sumps” operated by the City. The runoff collected in these basins percolates to the groundwater thereby recharging the groundwater basin.

River and Canal Seepage. Canal seepage is defined as the amount of water that percolates into the ground from earthen canals. When added with seepage from the Kern River channel, it contributes more than half the City's water supply at an average of 54 percent, or about 106,000 acre-feet each year. Canal and river seepage also enhances unincorporated water supplies.

Reclaimed Water. Recycled wastewater, or reclaimed water, produced from the City's two wastewater treatment plants is used in land application. Reclaimed water applied to non-edible crops for irrigation then percolates into the ground recharging the groundwater basin.

Spreading and Banking. Percolation of water spread in open basins has been historically used in Kern County as a means of banking groundwater. The City owns and operates the 2,800-acre recharge facility located in and along the Kern River Channel (approximately 8 miles west of Highway 99) which is used to replenish water to the groundwater aquifers. This 6-mile long site is made up of old river channels, overflow lands, and constructed spreading basins. The groundwater is recharged in this facility by spreading water onto these spreading basins, which look like small lakes surrounded by levees, and allowing it to percolate. Additionally, the facility receives surface water supplies from the Kern River, the Central Valley Project, and the State Water Project during years when surpluses exist.

The 2,800-acre recharge area improves groundwater quality by recharging low salinity Kern River water into the aquifers. This dilutes the more saline irrigation water that percolates underground from adjacent farming operations. The underground reservoir can be pumped in dry years for agricultural and domestic use and in wet years, the reservoir can be built up. This allows water to be used without causing a groundwater overdraft problem.

In an effort to eliminate the potential for overdraft conditions in the Planning area, surface water was made available to former groundwater users via the Friant-Kern Canal and the State Water Project. These supplemental surface water supplies, as well as the development of the 2,800-acre recharge facility in 1978, have been effective in creating a condition where the inflow into the groundwater basin has exceeded the outflow. This is evidenced by the fact that there has been a steady rise in groundwater levels since 1992.[1]

As is evidenced by the discussion above, recharge of groundwater supplies is very dependent on surface water. The sources of surface water available to the City are the Kern River, the State Water Project and the Central Valley Project. Also, the wet year/dry year cycle can have a significant impact on recharge, with groundwater banking being the most noticeably impacted source of recharge.

WATER QUALITY

The principal law governing pollution of the nation's surface waters is the Federal Water Pollution Control Act, or Clean Water Act. Originally enacted in 1948, it was totally revised by amendments in 1972 that gave the Act its current shape. The Clean Water Act consists of two major parts: the provisions that authorize federal financial assistance for municipal sewage treatment plant construction and the

[1] Bakersfield Water Balance Report, Pages 7 and 13, no date.

regulatory requirements that apply to industrial and municipal dischargers. The law gave the authority to set effluent standards on an industry basis (technology-based). Also, the Act requires states to adopt water quality standards that "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses."

To achieve its objectives, the Act is based on the concept that all discharges into the nation's waters are unlawful, unless specifically authorized by a permit. Thus, industrial and municipal dischargers must obtain permits from the appropriate Regional Water Quality Control Board (i.e., the Central Valley Regional Water Quality Control Board). Point source dischargers of pollutants into surface waters are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit. Other dischargers, such as those affecting groundwater or from nonpoint sources are required to file a Report of Waste Discharge. For specified situations, some permits may be waived and some discharge activities may be handled through enrollment in an existing general permit. The existing NPDES (Phase I) storm water program requires municipalities serving greater than 100,000 persons to obtain a NPDES storm water permit for construction projects greater than five acres in size. ~~Proposed~~ NPDES storm water regulations (Phase II) expand this existing national program to smaller municipalities with populations of 10,000 persons or more and construction sites that disturb greater than one acre.

The Porter-Cologne Water Quality Control Act requires that water quality control plans (basin plans) contain policies and procedures for protecting state waters. Consistent with these requirements, the Water Quality Control Plan for the Tulare Lake Basin was formulated and adopted in August 1995.[2] The Plan consists of an identification of designated beneficial uses to be protected, water quality objectives to protect those uses, and a program of implementation needed for achieving the objectives.

The issue of pollution of storm water and urban runoff has been recognized by both Federal and State agencies since there is a growing concern regarding activities that discharge water affecting California's surface, coastal, or groundwaters. Discharges of water are classified as either point source or non-point source discharges. A point source discharge usually refers to waste emanating from a single, identifiable point. Regulated point sources include municipal wastewater, oil field wastewater, winery discharges, solid waste sites and other industrial discharges. Point source discharge must be actively managed to protect the state's waters. A nonpoint source discharge usually refers to waste emanating from diffused locations. As a result, specific sources of nonpoint source pollution may be difficult to identify, treat, or regulate. The goal is to reduce the adverse impact of nonpoint source discharges on the Basin's water resources through better management of these activities. Nonpoint sources include drainage and percolation from a variety of activities such as agriculture, forestry, recreation, and storm runoff.

[2] The Central Valley Region is divided into three basins: the Sacramento River Basin, the San Joaquin River Basin, and the Tulare Lake Basin. The Tulare Lake Basin comprises the drainage area of the San Joaquin Valley south of the San Joaquin River. Kern River is one of three rivers which provide the bulk of the surface water supply native to the Tulare Lake Basin. The Planning area is located in the Kern River sub-basin of the Tulare Lake Basin.

Protection and enhancement of beneficial uses of water against quality degradation is a basic requirement of water quality planning under the existing legislation. In setting water quality objectives, past, present, and probable future beneficial uses of water are considered. Further, the protection and enhancement of beneficial uses requires that certain quality and quantity objectives be met for surface and groundwaters. The beneficial uses that apply to surface and groundwaters in the basin include, but are not limited to the following:

- Municipal and domestic supply;
- Agricultural supply;
- Industrial service and process supplies;
- Hydropower generation;
- Water contact recreation; and
- Wildlife habitat.

Water quality policies have been identified in the Plan to protect the beneficial uses. These provisions consider the characteristics of various units, including the following:

Surface Waters

- Ammonia;
- Bacteria;
- Biostimulatory Substances;
- Chemical Constituents;
- Color;
- Dissolved Oxygen;
- Floating Material;
- Oil and Grease;
- pH;
- Pesticides;
- Radioactivity;
- Salinity;
- Sediment;
- Settleable Material;
- Suspended Material;
- Tastes and Odors;
- Temperature;
- Toxicity; and
- Turbidity.

Groundwaters

- Bacteria;
- Chemical Constituents;
- Pesticides;
- Radioactivity;
- Salinity;
- Tastes and Odors; and
- Toxicity.

Surface water quality in the Basin is generally good, with excellent quality exhibited by most eastside streams.[3] However, the greatest long-term problem facing the entire Tulare Lake Basin is the increase of salinity in groundwater.[4] Because of the closed nature of the Basin, there is little subsurface outflow. Thus, salts accumulate within the Basin due to importation and evaporative use of the water. This problem is compounded by the overdraft of groundwater for municipal, agricultural, and industrial purposes, and the use of water from deeper formations which further concentrates salts within remaining groundwater (also refer to Section 4.9, S*oils and Agricultural Resources*, for further discussion regarding salinity.)

STORM DRAINAGE

Storm drainage policies for the City and County urbanizing areas have reflected recognition of the limited annual rainfall and the relatively flat topography on which most of the study area's development has occurred. Both the City and the County adopted several "planned drainage areas" for which master storm drain system plans have been developed and in which area-specific, benefit-related development fees are charged to fund construction of major drainage facilities.

Kern County typically requires developing sites to provide for their own on-site retention or show that existing facilities have sufficient capacity to carry the additional runoff. This policy also extends to individual, newly created single-family residential lots. If it can be clearly demonstrated that adequate downstream facilities exist, the County will on occasion lessen their full retention requirement to detention facilities so that the peak off-site runoff is not increased. One significant impact of this County policy is the proliferation of isolated drainage basins. In contrast, the planned drainage district concept, encouraging larger, area-wide drainage facilities, would be effective in mitigating the maintenance problems associated with the proliferation of smaller drainage basins.

City and County policies and design standards regarding storm drainage for newly developing areas are not greatly at variance with one another. The primary difference between the City and County philosophies relates to provisions for on-site retention (sumps) of storm water generated by developing properties.

The City tends to accept on-site runoff into its system as long as adequate downstream facilities are in place. On large planned developments where off-site drainage facilities are not available and on-site retention will be required, the city attempts to strategically locate sumps so that they can be incorporated into future development. Proliferation of multiple isolated basins is discouraged in the City.

There is currently no quantitative data regarding dry-weather nuisance water flows in the storm drainage systems serving various sections of the Metropolitan Bakersfield area. Such flows are significant in some areas, which may restrict the joint usage of drainage basins as recreational areas. Additionally, there is no known data on the subject of dry weather nuisance flows.

FLOODING

[3] Water Quality Control Plan for the Tulare Lake Basin Second Edition – 1995, Page III-2.

[4] Ibid., Page I-2.

Flooding within the Planning area originates from the Kern River watershed which lies in Kern and Tulare Counties at the southern end of the Sierras, and from the Caliente Creek stream group which drains the west slopes of the Tehachapi mountains. Also, some smaller areas are subject to flooding from localized watersheds.

The most severe flooding problems on the Kern River near Bakersfield have resulted from high-intensity winter rainstorms over a large portion of the basin, which generally occur from November through April. Floods caused by snow melt, which usually occur in the late spring and early summer, generally have a longer period of runoff and also a lower peak than rain floods. As a result, spring storms have rarely caused significant damage although periodic flooding of Lamont has created problems for community residents.

The most severe rainstorm on record occurred in the southern San Joaquin Valley between December 2 and 7, 1966. The United States Army Corps of Engineers (USACOE) estimated that if Isabella Reservoir had not been built, flow on the Kern River six miles upstream of Bakersfield would have been approximately 80,000 cubic feet per second (cfs). Actual flow was only 9,300 cfs at Bakersfield and consisted primarily of inflow from tributary streams entering the river between Lake Isabella Dam and the City of Bakersfield.

In the past 40 years, seven major floods have occurred along Caliente Creek, including the 1998 flood caused by “El Nino”. These floods have been investigated by the Kern County Water Agency and the United States Army Corps of Engineers (USACOE). The frequency and the magnitude of these floods, coupled with the existing development in the floodplain have caused extensive flood damage to the Lamont/Arvin area. A series of localized flood control projects are currently under consideration by the County.

PLANNING TOOLS FOR FLOOD HAZARD MITIGATION

The City of Bakersfield entered the Regular Phase of the National Flood Insurance Program (NFIP) as administered by the Federal Emergency Management Agency (FEMA) on May 1, 1985. The County of Kern followed on September 29, 1986. By adopting flood damage prevention ordinances to regulate development in special flood hazard areas, private property owners in participating communities are allowed to purchase affordable flood insurance through the NFIP, while the community retains its eligibility to receive certain federally backed monies, and disaster relief funds.

Both the City of Bakersfield and the County of Kern participate in the state-mandated Kern River Designated Floodway Program, which is administered by the California Department of Water Resources Reclamation Board. The Kern River Designated Floodway Program provides development criteria and issues permits for development within the limits of the Kern River Designated Floodway.

Floodplain mapping has been performed under the NFIP to delineate the special flood hazard areas. The City of Bakersfield Public Works Department and the Kern County Department of Engineering and Survey Services have the official Flood Insurance Rate Maps (FIRMS) and Flood Boundary Floodway Maps (FBFM) which show the extent of the floodplains. In addition, the communities are empowered to

develop and use improved floodplain information. FEMA has accepted the California Department of Water Resources (DWR) Reclamation Board's Kern River designated floodway from Interstate 5 to the mouth of the Kern River canyon. This floodway has been designated because the DWR Study is based upon the 100-year peak discharge of 15,000 cfs, which exceeds the Kern River Food Insurance Study flow of 10,200 cfs.

FEMA identifies areas of floodway, floodway fringe, and non-regulatory floodplain as follows:

Floodway. The channel of a river and adjacent land areas required to pass the 100-year discharge without cumulatively increasing the water surface elevation at any point more than one-foot above the prefloodway condition.

Floodway Fringe. The area of the 100-year floodplain outside of the Floodway.

Non-Regulatory Floodplain. All other areas outside of the 100-year floodplain. Protection provisions of the NFIP do not apply.

Both the City and County have adopted general plan designations which identify allowable uses in the floodplain. Local zoning ordinances more closely define known areas to have potential for flooding.

In July 1985, both the City and County adopted the Kern River Plan Element (KRPE) as a part of their general plans. The KRPE establishes provisions for development along the Kern River, and specific policies for floodplain management.

The Flood Damage Prevention Ordinance provides criteria for development within all floodplains, including prohibiting encroachments into a floodway, and requiring protection and/or elevation of construction within a floodway fringe.

The City of Bakersfield has merged the Kern River Levee into its Water Resources Department operation. The established levee system is maintained to USACOE standards. The USACOE provides an annual inspection and maintenance report in the evaluation of the Kern River Levee.

STANDARDS OF SIGNIFICANCE

SIGNIFICANCE CRITERIA

In accordance with CEQA, the effects of a Plan are evaluated to determine if they will result in a significant adverse impact on the environment. An EIR is required to focus on these effects and offer mitigation measures to reduce or avoid any significant impacts that are identified. The criteria, or standards, used to determine the significance of impacts may vary depending on the nature of the project. Hydrology and Water Quality impacts resulting from the implementation of the General Plan Update could be considered significant if they cause any of the following results:

- 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 (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);

- 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 stormwater 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; and/or

- Inundation by seiche, tsunami, or mudflow.

Based on these standards, the effects of the proposed project have been categorized as either a “less than significant impact” or a “potentially significant impact.” If a potentially significant impact cannot be reduced to a less than significant level through the application of goals, policies, standards or mitigation, it is categorized as a significant and unavoidable impact.

IMPACTS AND MITIGATION MEASURES

WATER QUALITY STANDARDS AND WASTE DISCHARGE REQUIREMENTS

- **BUILDOUT OF METROPOLITAN BAKERSFIELD IN ACCORDANCE WITH THE GENERAL PLAN UPDATE MAY RESULT IN VIOLATION OF WATER QUALITY STANDARDS OR WASTE DISCHARGE REQUIREMENTS.**

Level of Significance Before Policies/Mitigation: Potentially Significant Impact.

Impact Analysis: The degree of water quality impacts from discharges associated with the General Plan’s forecasted growth is relative not only to the intensity and location of the discharge source (i.e., future development) but also to the volume, quality, and uses of the receiving waters.

Urbanization has the potential to result in a net increase in pollutant export over naturally occurring conditions. The impact of the higher export can be on the adjacent streams and also on the downstream receiving waters. However, it should be noted that an important consideration in evaluating stormwater quality from any future development is to assess whether or not it impairs the beneficial use of the receiving waters. Receiving waters can assimilate a limited quantity of various constituent elements, however, there are thresholds beyond which the measured amount becomes a pollutant and results in an undesirable impact. A summary of the typical impacts to water quality from urbanization is discussed below.

Storm Water Runoff. Impacts of storm water contaminants on surface and groundwaters are an important concern. Storm water runoff from residential and industrial areas can contribute to water quality degradation since it contains organics, pesticides, oil, grease, and heavy metals. Because these pollutants accumulate during the dry summer months, the first major storm after summer can flush a highly concentrated load to receiving waters and catch basins. Combined storm and sanitary systems may result in some runoff to wastewater treatment plants. In other cases, storm water collection wells can produce direct discharges to groundwater.

Erosion. Erosion is one of the greatest problems in the watershed area. Erosion is a natural occurrence, however, most activities of man accelerate the process. Erosion causes discoloration of streams, and the suspended matter settles to form a smothering blanket on the streambed. Erosion is accelerated by poor drainage and soil stabilization associated with the following activities: road building, clearing land, leveling land, construction, brush clearing, off-road vehicle use, agriculture, overgrazing, and fires.

It should be noted that there are various activities that presently occur throughout the Planning area which are anticipated to continue, although to a lesser extent, with buildout of the proposed General Plan Update. Section 4.7 of this EIR, *Soils and Agricultural Resources*, and Section 4.14 of this EIR, *Mineral and Energy Resources*, discuss the effects that forecasted growth could potentially have on agriculture and mineral resources. The following is a summary of the anticipated water quality impacts associated with continuation of the existing activities:

Agriculture. Agricultural drainage which is the excess water not used by crops runs off or percolates. This drainage, depending on management and location, carries varying amounts of salts, nutrients, pesticides, trace elements, sediments, and other by-products to surface and groundwaters. Most critical, is the problem of the salts brought in with irrigation water and leached out of soils. Evaporation and crop transpiration remove water from soils, which can result in an accumulation of salts in the root zone of the soils at levels that retard or inhibit plant growth. Additional amounts of water often are applied to leach the salts below the root zone. The leached salts eventually enter ground or surface water. Evaporation basins are sometimes used to concentrate drainage water and contain salts. However, evaporation basins have varying potentials to impact wildlife due to salinity.

Confined Animal Operations. Where not controlled, surface runoff from confined animal (dairy and poultry) operations can impair both surface and groundwater beneficial uses. Uncontrolled runoff can also cause nuisance conditions. Animal wastes may produce significant bacteria, organic, nitrate, and other contamination.

The greatest potential for water quality problems has historically stemmed from the overloading of the facilities' waste containment and treatment ponds during the rainy season and inappropriate application of wastewater and manure. Overloading sometimes results in discharge of manure waste to canals and drainageways. Most animal confinement facilities have designated some land for wastewater and spreading manure. However, the lands assimilative capacity is dependant upon area, crop, crop yield, soil, and season of the year. When land and capacity is exceeded, the excessive salts and nutrients are leached to the underlying groundwater.

Unconfined Animals. Grazing animals can contribute bacteria and pathogens to surface waters. However, the greatest potential problem is erosion resulting from overgrazing (refer to *Erosion* discussion above). Grazing impacts are generally considered nonpoint source of pollution.

Overdraft. The elimination of overdraft is an important step in managing the rate of salinity increase in the groundwater. Continued overdraft would deplete good quality water supplies and introduce salts from poorer quality aquifers.

Salinity. Some of the salt load to groundwater resources is primarily the result of natural processes within the Basin. This includes salt loads leached from the soils by precipitation, valley floor runoff, and native surface waters. Salts that are not indigenous to the Basin water resources are a product of man's activities. Salts come from imported water, soil leached by irrigation, animal wastes, fertilizers and other soil amendments, municipal use, industrial wastewaters, and oil field wastewaters. These salt sources, all contributors to salinity increases, should be managed to the extent practicable to reduce the rate of groundwater degradation.

Degradation of groundwater in the Basin by salts is unavoidable without a plan for removing salts from the Basin. A valleywide drain to carry salts out of the valley is considered the best technical solution to the water quality problems of the Tulare Lake Basin.[5] The drain would carry wastewater generated by municipal, industrial, and agricultural activities, high in salt and unfit for reuse.

Mineral Exploration and Extraction. Drainage and runoff from mines and various operations associated with mining can result in serious impacts to ground and surface water beneficial uses, if not properly managed. Sedimentation caused by mining is addressed by discharge requirements for existing mines, however, the Regional Water Board does not have a specific program for controlling erosion from abandoned mines.

As discussed above, surface runoff and erosion associated with the General Plan's forecasted growth has the potential to contribute to water quality degradation. Further, the continuation of certain activities also has the potential to degrade the quality of water. Overall, Plan implementation has the potential to result in the addition of a variety of pollutants which would be considered a significant impact unless mitigated. However, future development's compliance with the legal/regulatory requirements, including but not limited to the NPDES Permit Program, would reduce this impact to a less than significant level. Further, the Conservation Element in the General Plan Update has identified the goal of

[5] Ibid., Page I-2.

"continuing to identify cooperative planning and implementation of programs and projects, which will resolve water resource deficiencies and water quality problems." In addition, the Conservation Element (Water Resources) includes implementation programs which require the maintenance of industrial waste discharge regulation and monitoring programs which protect the planning area groundwater from contaminants. The implementation program also includes support for water conservation measures and programs of benefit. The goals and policies included in the Conservation/Water Resources Element, and specified implementation programs would help to maintain water quality in the Planning area as it approaches buildout. Therefore, less than significant water quality impacts are anticipated to occur with implementation of the General Plan Update.

Goals and Policies in the General Plan Update: The Conservation Element contains the following goals and policies:

CONS/WR-G-4 Continue cooperative planning for and implementation of programs and projects which will resolve water resource deficiencies and water quality problems.

CON/WR-P-6 Protect Planning area groundwater resources from further quality degradation.

CON/WR-P-7 Provide substitute or supplemental water resources to areas already impacted by groundwater quality degradation by supporting facilities construction for surface water diversions.

CON/SA-P-7 Land use patterns, grading, and landscaping practices shall be designed to prevent soil erosion while retaining natural water-courses when possible.

CON/SA-P-13 Minimize the alteration of natural drainage and require development plans to include necessary construction to stabilize runoff and silt deposition through enforcement of grading and flood protection ordinances.

Mitigation Measures: No mitigation measures beyond the goals, policies and implementation identified in the General Plan Update are proposed.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

GROUNDWATER DEPLETION

- **BUILDOUT OF THE CITY OF BAKERSFIELD AND UNINCORPORATED AREAS IN ACCORDANCE WITH THE GENERAL PLAN UPDATE MAY CONTRIBUTE TO THE DEPLETION OF GROUNDWATER SUPPLIES OR MAY INTERFERE WITH GROUNDWATER RECHARGE.**

Level of Significance Before Policies/Mitigation: Potentially Significant Impact.
Impact Analysis: Water demands are generally projected as a function of population increases. As described in Section 3.0, *Project Description*, the Planning area's population is projected to increase to 458,000 persons by the year 2010, an approximately 14 percent increase over the area's year 2001 population of 402,100

persons. Thus, it is assumed that the projected water demand would increase proportionate to the projected population growth. Based on average annual water supply, it is anticipated that the future water supply would be able to meet the Planning area's future water demand without resulting in a substantial depletion of groundwater supplies or substantial interference with groundwater recharge.

As stated in Section 4.11, *Services and Utilities*, the physical supply of water to residents and businesses within Metropolitan Bakersfield is provided by a series of water districts and private water supply companies. The Kern County Water Agency Improvement District No. 4 (I.D.-4) sells water at wholesale prices to various water purveyors within greater Metropolitan Bakersfield. The primary water purveyors consist of the City of Bakersfield domestic water system known as Ashe, Fairhaven, and Riverlakes Domestic Water Systems, the California Water Service Company (CWSC), Vaughn Water Company (VWC), Oildale Mutual Water Company (OMWC), North of the River Municipal Water District (NORMWD) and the East Niles Community Service District (ENCSD).

The City of Bakersfield purchased both the Kern River water rights and the physical water distribution systems for the Ashe Service Area from Tenneco West in 1977. The City also subsequently added service areas in the Fairhaven and Riverlakes areas. These are the only portions of the City that receives water service from the City of Bakersfield. Water supply to the system is pumped from 47 groundwater wells. Additional wells are continually in development. The California Water Service Company operates the City's water system under contract from the City of Bakersfield. Also, the CWSC supplies groundwater through 187 wells in combination with surface water.

According to the 2000 Bakersfield Water Balance Report, the year 2020 projected water demand for the City of Bakersfield would be less than the average annual water supply that has been available over the past 20 years. However, based on dry year conditions, the projected water demand would be greater than the imported water supply.[6] This dry year condition has the potential to result in an increase in groundwater mining to meet the additional water supply demands of the projected population growth. As previously noted, increased groundwater extraction can eventually exceed the recharge capacity of the aquifers resulting in "overdraft". In their planning, the City has identified certain measures which may be implemented to address possible prolonged drought conditions which may occur in the future. These may include water usage restrictions, distribution of water conservation devices and stringent price controls. However, the primary element of the City's "drought management" plan is it's "banked" groundwater. Because the undergroundwater supply has been "banked", the underground reservoir can be pumped during future dry years without causing a groundwater overdraft problem. Further, data indicates that the current banked groundwater is over three times greater than the collective shortfall which occurred between 1990 and 1992.[7] Also, the undergroundwater supply can continue to be built up during future wet years.
In addition to continued groundwater banking through the City's 2,800-acre recharge facility, other measures implemented by the City for increasing future groundwater supplies include the following:

[6] Bakersfield 2000 Water Balance Report, Page 14.

[7] Ibid., Page 15.

- Implementation of a Water Management Plan to increase flow in the Kern River channel through the Kern River Parkway to complement Parkway activities and increase groundwater aquifer recharge;

- Enhancement of the Reclaimed Water Program with the acquisition of additional farmland for the use of recycled water for irrigation of crops, thereby decreasing the reliance of those lands on the shared groundwater basin.

The Vaughn Water Company obtains all of its water from wells. The VWC owns and operates 11 wells. Approximately 11,000 acre-feet of groundwater are extracted per year by VWC. VWC overlies the Kern River Fan and has excellent water supplies due to ground water recharge programs operated by several entities, including the City of Bakersfield and I.D.-4. Wells and other water facilities are created on an as-needed basis. The VWC has indicated that it would have adequate groundwater supplies available to serve the Planning area at buildout of the General Plan.[8]

The Oildale Mutual Water Company, over the past 25 years, has pumped an average of 250 acre-feet of groundwater per year. As a result of receiving treated water, groundwater has been minimized and used for a backup supply and peaking supply. Hydrogeologic analysis of the Oildale groundwater sub-basin indicates that subsurface outflows currently exist even and would continue to exist even with increased groundwater pumping to over 8,500 acre-feet per year.[9] This would support the reliance of groundwater as a supplemental water supply source for backup, as well as future demands. Thus, groundwater quantities would be available and sufficient to meet future demands associated with buildout of the General Plan.

The North of the River Municipal Water District obtains the majority of its water from the Henry Garnett Water Treatment Plant operated by the Kern County Water Agency. The remainder of the District's water supplies comes from a well. Depending on climatic conditions, the amount of water obtained by the NORMWD over the past several years has ranged from 8500 to 9700 acre-feet per year. The NORMWD has indicated that new or expanded facilities would likely need to be constructed to meet future needs associated with buildout of the General Plan.[10]

The East Niles Community Service District currently utilizes six well to obtain water, in addition to water purchased from I.D.-4 and water obtained from the Diatomaceous Earth Treatment Plant. In 2000, ENCSD extracted 1,202 million gallons of water via the six wells. In order to meet future demand associated with buildout of the General Plan, the ENCSD would need to increase water supplies, possibly by constructing new wells.[11]

With continuation of on-going recharge efforts, as well as continued compliance with the Drought Management Plans and the goals and policies outlined below, it is not

[8] Written correspondence from Michael L. Huhn, General Manager, of the Vaughn Water Company. October 9, 2001.

[9] Written correspondence from Douglas R. Nennely, General Manager, of the Oildale Mutual Water Company. November 15, 2001.

[10] Written correspondence from the North of the River Municipal Water District. November 12, 2001.

[11] Written correspondence from Kelly K. Ulrich, General Manager, of the East Niles Community Service District. October 4, 2001.

anticipated that buildout of the General Plan Update would result in a significant impact with respect to groundwater supplies or groundwater recharge.

Additionally, it should be noted that the net increase in future water demand caused by population growth is expected to be decreased as a result of the conversion of agricultural lands to urban uses. More specifically, future municipal water consumption associated with the expansion of urban development pursuant to the proposed Land Use Element would be offset by reduction of water consumption associated with the conversion of farmland. Section 4.7, *Soils and Agricultural Resources*, discusses the Project's affects on farmlands. Further, it should be noted that overall water use tends to decrease over time as increased emphasis is placed on both conservation and recycling.[12]

Goals and Policies in the General Plan Update: The Conservation Element contains the following goals and policies:

CONS/WR-G-1 Conserve and augment the available water resources of the planning area.

CONS/WR-G-2 Assure that adequate groundwater resources remain available to the planning area.

CONS/WR-G-4 Continue cooperative planning for and implementation of programs and projects which will resolve water resource deficiencies and water quality problems.

CONS/WR-G-5 Achieve a continuing balance between competing demands for water resource usage.

CONS/WR-G-6 Maintain effective cooperative planning programs for water resource conservation and utilization in the planning area by involving all responsible water agencies in the planning process.

CON/WR-P-1 Develop and maintain facilities for groundwater recharge in the Planning area.

CON/WR-P-2 Minimize the loss of water which could otherwise be utilized for groundwater recharge purposes and benefit Planning area groundwater aquifers from diversion to locations outside the area.

CON/WR-P-3 Support programs to convey water from other than San Joaquin Valley basin sources to the Planning area.

CON/WR-P-4 Support programs and policies which assure continuance or augmentation of Kern River surface water supplies.

CON/WR-P-5 Work towards resolving the problem of groundwater resource deficiencies in the upland portions of the Planning area.

[12] Ibid., Page 14.

CON/WR-P-6 Protect Planning area groundwater resources from further quality degradation.

CON/WR-P-7 Provide substitute or supplemental water resources to areas already impacted by groundwater quality degradation by supporting facilities construction for surface water diversions.

CON/WR-P-8 Consider each proposal for water resource usage within the context of total Planning area needs and priorities--major incremental water transport, groundwater recharge, flood control, recreational needs, riparian habitat preservation and conservation.

CON/WR-P-9 Encourage and implement water conservation measures and programs.

Mitigation Measures: No mitigation measures beyond the goals, policies and implementation identified in the General Plan Update are proposed.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

DRAINAGE AND RUNOFF

- **BUILDOUT OF THE METROPOLITAN BAKERSFIELD AREA IN ACCORDANCE WITH THE GENERAL PLAN UPDATE MAY RESULT IN IMPACTS TO DRAINAGE PATTERNS WHICH WOULD RESULT IN EROSION, SILTATION, OR FLOODING.**

Level of Significance Before Policies/Mitigation: Potentially Significant Impact.

Impact Analysis: Implementation of the General Plan Update would modify the hydrologic characteristics of the watershed by increasing the amount of impervious area, modifying drainage patterns, increasing the hydraulic efficiency of the drainage conveyance system and natural drainage courses to improved underground storm drain systems, reducing the time to peak flow and increasing the peak discharge.

The provision of adequate storm drainage facilities for the Planning area is essential to the safety and welfare of area residents, and necessary for the development of the area in accord with the General Plan Update. However, the provision of adequate storm drainage facilities for both currently developed portions of the Planning area and for Planning area development in accord with the General Plan Update is both increasingly costly and difficult because of the generally flat topography of much of the area and the limited number of available storm drainage disposal points.[13]

The General Plan Update has two goals regarding storm drainage; ensure the provision of adequate storm drainage facilities to protect Planning area residents from flooding resulting from storm water excess, and maintain a comprehensive storm drainage system which serves all urban development within the Planning area. The proposed policies are to undertake drainage programs which would serve all currently developed portions of the Planning area that are not now served by

[13] General Plan Update, Public Services and Facilities Element, Storm Drainage, December 2001.

adequate storm drainage systems; and to pursue individual drainage plans where they are most needed.

Pursuant to Kern County requirements, new development would be required to provide for their own on-site retention or show that existing facilities have sufficient capacity to carry the additional runoff. Also, the City would accept on-site runoff from future development into its system as long as adequate downstream facilities are in place. In the absence of adequate downstream facilities, the City would require new development to provide for their own on-site retention and would strategically locate sumps so that they can be incorporated into future development.

Overall, buildout pursuant to the General Plan Update would have a significant impact on storm drainage unless mitigated. Impacts on storm drainage would occur as a result of grading and development of future projects, the addition of impervious surfaces (i.e., roadways, parking lots, and hardscape), and the introduction of landscaping irrigation associated with future development. However, after compliance with legal/regulatory requirements and the following goals/policies, drainage impacts would be reduced to a less than significant level.

Goals and Policies in the General Plan Update: The Public Services and Facilities Element contains the following goals and policies:

PSF/SD-G-1 Ensure the provision of adequate storm drainage facilities to protect Planning area residents from flooding resulting from storm water excess.

PSF/SD-G-2 Maintain a comprehensive storm drainage system which serves all urban development within the Planning area.

PSF/SD-P-1 Develop drainage programs which will serve all currently developed portions of the Planning area that are not now served by adequate storm drainage systems.

PSF/SD-P-2 The city and county should pursue individual drainage plans where they are most needed.

PSF/SD-P-3 Investigate the preparation of a Master Drainage Plan based on the proposed growth in the Planning area.

CON/SA-P-6 Continue implementing land grading ordinances that reduce soil erosion/siltation commonly associated with land development.

CON/SA-P-7 Land use patterns, grading, and landscaping practices shall be designed to prevent soil erosion while retaining natural watercourses when possible.

CON/SA-P-8 Encourage agricultural uses to employ soil conservation measures to prevent erosion.

CON/SA-P-12 Prohibit premature removal of ground cover in advance of development and require measures to prevent soil erosion during and immediately after construction.

CON/SA-P-13 Minimize the alteration of natural drainage and require development plans to include necessary construction to stabilize runoff and silt deposition through enforcement of grading and flood protection ordinances.

Mitigation Measures: No mitigation measures beyond the goals, policies and implementation identified in the General Plan Update are proposed.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

FLOODING

- **BUILDOUT OF THE PLANNING AREA IN ACCORDANCE WITH THE GENERAL PLAN UPDATE MAY RESULT IN POTENTIAL FLOODING IMPACTS.**

Level of Significance Before Policies/Mitigation: Potentially Significant Impact.

Impact Analysis: Some future development areas proposed for development may be situated within the 100-year floodplain, thus, possibly exposing people or structures to a significant risk involving flooding. Flood hazards are discussed in both the Safety and Land Use Elements of the proposed General Plan Update. The City of Bakersfield and County of Kern have identified flooding as a Key Safety Issue in the proposed Safety Element.

There are three basic areas of concern regarding flood control in the Planning area including the following: the development of evacuation procedures to reduce impacts in the event of a flood, maintenance of the Isabella Dam and Kern River levees, and development of flood control/retention basin facilities.

An important issue regarding flood control is the development of evacuation procedures in the event of a flood. Although there is a one percent chance that the 100-year floodplain will be exceeded in any given year, thus requiring evacuation procedures, these procedures are necessary to reduce impacts of flooding in the Planning area. Refer to Section 4.6, *Geologic and Seismic Hazards*, for a discussion of evacuation procedures.

The Kern River extends through the primary areas of development in the Planning area. As a result, the maintenance of adequate flood control facilities is a high priority. With the exception of the Lamont area (see discussion below), the Land Use Element does not propose development within the Kern River's 100-year floodplain. However, development is proposed directly adjacent to the floodplains boundary. Therefore, the maintenance of the channel's capacity through the Planning area is imperative to protect the safety of the residents. Overall, with the construction of Isabella Dam, hazards from a 100-year flood have been substantially reduced for the Oildale/Bakersfield Metropolitan area.[14] Nevertheless, new development within the 100-year floodplain would be required to be flood protected. The Plan's policies

[14] General Plan Update, Safety Element, Flooding, December 2001.

regarding the maintenance of the Kern River adequately protect the areas adjacent to the channel from the risk of flooding.

The greatest risk of flooding in the Planning area occurs south of Bakersfield in the Lamont/Arvin area. Factors attributed to this risk include the lack of flood control facilities along the Caliente Creek Channel such as dams and levees, and development within the existing floodplain. Whereas the Plan's Land Use Element does not allow for development along the Kern River floodplain, it does allow for development within the Caliente Creek floodplain including industrial, estate residential, single-family residential, and multi-family residential uses. The Caliente Creek floodplain is anticipated to continue to experience flooding until localized programs and facilities can be implemented.[15] The Plan recognizes this potential risk and recommends that measures be implemented to minimize flooding effects on Caliente Creek. In an effort to mitigate these potential flood hazards in the Lamont area, goals and policies have been identified in the Safety Element to regulate flood flow on Caliente Creek. More specifically, policies address the need for funding, planning, construction, and design of flood control measures on Caliente Creek. This policy adequately addresses the problem in the long-term, however, not in the short-term. As a result, mitigation has been specified below which addresses flood control/retention basin mitigation.

Specific goals and policies have been included in the General Plan Update to decrease potential flood hazards. Therefore, with implementation of the following policies and mitigation measures, impacts would be reduced to a less than significant level.

Refer to Section 4.6 of this EIR, *Geologic and Seismic Hazards*, for a discussion pertaining to seismically-induced flooding caused by a break in Isabella Dam.

Goals and Policies in the General Plan Update: The Safety Element contains the following goals and policies:

SAF/FL-G-1 Minimize hazards to planning area residents resulting from flooding.

SAF/FL-G-2 Reduce the risk of flooding to land uses.

SAF/FL-G-3 Maintain adequate flood flow capacity in the Kern River channel to prevent flooding from anticipated 100 year design flood flows.

SAF/FL-G-4 Regulate flood flow on Caliente Creek to mitigate flood hazard in the Lamont area.

PSF/GU-G-1 Maintain a coordinated planning and implementation program for the provision of public utilities to the Planning area.

SAF/FL-P-1 Develop specific standards which apply to development located in flood hazard areas, as defined by Federal Flood Insurance maps and most recent information as adopted by the responsible agency.

[15] Ibid.

SAF/FL-P-2 Maintain adequate levees along the Kern River channel throughout the Planning area.

SAF/FL-P-3 Prevent urban development encroachment which would impede flood flows in the Kern River designated floodway.

SAF/FL-P-4 Remove sand and excessive plant growth from the Kern River channel as required to maintain channel capacity through the planning area.

SAF/FL-P-5 Develop a program or series of programs to control and reduce flooding in the Lamont area resulting from Caliente Creek.

CON/BR-P-2 Preserve areas of riparian vegetation and wildlife habitat within floodways along rivers and streams, in accordance with the Kern River Plan Element and channel maintenance programs designed to maintain flood flow discharge capacity.

CON/WR-P-8 Consider each proposal for water resource usage within the context of total Planning area needs and priorities--major incremental water transport, groundwater recharge, flood control, recreational needs, riparian habitat preservation and conservation.

Mitigation Measures:

4.8-1 Construct flood control retention basins to minimize flooding along Caliente Creek.

4.8-2 The County's Flood Prevention Program shall be implemented for new development in areas of flooding potential.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

DAM FAILURE

- **IMPLEMENTATION OF THE GENERAL PLAN UPDATE MAY EXPOSE PEOPLE OR STRUCTURES TO A SIGNIFICANT RISK RESULTING FROM FAILURE OF ISABELLA DAM.**

Level of Significance Before Policies/Mitigation: Potentially Significant Impact.

Impact Analysis: Seismically-induced failure of Isabella Dam is addressed in Section 4.6, *Geologic and Seismic Hazards*. However, it should be noted that the Dam could fail as a result of some other unforeseen event. As illustrated in Figure VIII-2 of the 1990 General Plan, failure of Isabella Dam would result in flooding 60 square miles of the Metropolitan Bakersfield area. According to the Land Use Map, a growth in population and additional development resulting from Project implementation would occur throughout this area. Therefore, an increased number of people and structures would be exposed to this potential risk. This would in turn require the evacuation of a substantial portion of the Planning area. If communications are intact, the City may have from two to six hours to complete the evacuation.

With implementation of the goals, policies and mitigation measures outlined in Section 4.6, *Geologic and Seismic Hazards*, and incorporation of the respective evacuation plans for the sequential and orderly evacuation of the potential dam inundation area, impacts regarding dam inundation hazards due to unforeseen events would be reduced to a less than significant level.

Goals and Policies in the General Plan Update: The Safety Element contains the following goal and policies:

SAF/SEI-G-7 Protect land uses from the risk of dam failure inundation including the assurances that: the functional capabilities of essential facilities are available in the event of a flood; hazardous materials[16] are not released; effective measures for mitigation of dam failure inundation are incorporated into the design of critical facilities; and the rapid and orderly evacuation of populations in the inundation area will occur.

SAF/SEI-P-1 Ensure that earthquake survival and efficient post-disaster functions are a primary objective in the siting, design and construction standards for discretionary essential facilities or for expansion of such existing facilities.

SAF/SEI-P-2 Require that the siting and development of critical facilities under discretionary approval by the City Council and Board of Supervisors be supported by documentation of thorough hazard investigations relating to site selection, pre-construction site investigations and application of the most current professional standards for seismic design.

SAF/SEI-P-3 Encourage existing critical facilities with significant seismic vulnerabilities to be upgraded or relocated as appropriate.

SAF/SEI-P-4 Encourage critical facilities in dam inundation areas to develop and maintain plans for safe shut-down and efficient evacuation from their facilities, as appropriate to the degree of flood hazard for each facility.

SAF/SEI-P-5 Incorporate planning for incidents affecting critical facilities into contingency plans for disaster response and recovery.

SAF/SEI-P-18 Design discretionary critical facilities located within the potential inundation area for dam failure in order to: mitigate the effects of inundation on the facility; promote orderly shut-down and evacuation (as appropriate); and, prevent on-site hazards from affecting building occupants and the surrounding communities in the event of dam failure.

[16] Hazardous materials are defined as injurious substances, including pesticides, herbicides, toxic metals and chemicals, liquefied natural gas, explosives, volatile chemicals, and nuclear fuels.

SAF/SEI-P-19 Design discretionary facilities in the potential dam inundation area used for the manufacture, storage or use of hazardous materials to prevent on-site hazards from affecting surrounding communities in the event of inundation.

SAF/SEI-P-20 Require emergency response plans for the Planning area to include specific procedures for the sequential and orderly evacuation of the potential dam inundation area.

SAF/SEI-P-21 Encourage critical and high-occupancy facilities as well as facilities for elderly, handicapped and other special care occupants located in the potential inundation area below the dam to develop and maintain plans for the orderly evacuation of their occupants.

Mitigation Measures: No mitigation measures beyond the goals, policies and implementation identified in the General Plan Update are proposed.

Level of Significance After Policies/Mitigation: Less Than Significant Impact.

UNAVOIDABLE SIGNIFICANT IMPACTS

All hydrology and drainage impacts associated with implementation of the General Plan Update would be less than significant with adherence to/compliance with policies in the General Plan Update, legal/regulatory requirements, and with the implementation of the specified mitigation. No unavoidable significant hydrology and drainage impacts would occur as a result of buildout of the proposed General Plan Update.