3.0 WATER QUALITY IMPACTS ON RELIABILITY

Information presented in this section is based on the best available data from each Municipal Water District of Orange County (MWDOC) member agency at the time of drafting. The information is presented to provide a regional summary within the MWDOC service area. MWDOC has made every effort to coordinate information during the preparation of this section in a manner that is consistent with local agencies' Urban Water Management Plans. In the event of a discrepancy, the local retail agency plan should be consulted.

3.1 Introduction

Water supplies within MWDOC's service area are derived from a combination of sources: imported water from Metropolitan Water District of Southern California (Metropolitan), groundwater production by individual agencies, and other local supplies. Contamination of any of these sources or more stringent regulatory requirements has the potential to result in adjustments to water resource management strategies and, in a worse-case scenario, impacting supply reliability. Blending available supplies and implementing additional treatment processes are common mitigation options used by water agencies to guard against water quality impacts. Since MWDOC does not operate any facilities, MWDOC does not have any direct responsibilities in water quality sampling or compliance. However, the potential impact of reduced water quality on reliability, either from imported or local sources, is a critical piece in understanding the water system as a whole.

California Title 22 Drinking Water Standards (Title 22) incorporates the federal requirements of the Safe Drinking Water Act, and compliance with Title 22 is required by all water service providers. Therefore, Title 22 monitoring of all regulated chemicals as well as a number of unregulated chemicals is conducted by Metropolitan, Orange County Water District (OCWD), and all of the retail water agencies within the MWDOC service area. In order to be in compliance with Title 22, each agency must ensure that the regulated chemicals in the water supply meet established primary drinking water standards. In addition, secondary drinking water standards have been set for some minerals based on non-health-related aesthetics, such as taste and odor. Both primary and secondary standards are expressed as the maximum contaminated levels (MCL) allowable for a given constituent. Unregulated chemicals do not have established drinking water standards, but are chemicals of concern for which standards may be eventually adopted. These unregulated chemicals often have a "notification level," which is a health-based advisory level established by the U.S. Department of Health Services for chemicals in drinking water that lack MCLs.

As illustrated in Table 3-1, all responsible agencies within MWDOC's service area have accounted for known and foreseeable water quality impacts in their current management strategies. None of the responsible agencies for each water source anticipate water quality impacts that would either reduce the water supply available or that cannot be handled through existing management strategies. Any agencies with water sources having known contamination that cannot be remedied through

treatment, blending, or other options have already removed the impacted water source from their supply portfolio.

Table 3-1-A: Current and Projected Water Supply Change in MWDOC's Service Area Due to Water Quality

Percentage						
Water Source	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**
MWDSC	0	0	0	0	0	0
Local Supplies						
OCWD Groundwater Basin						
City of Buena Park	0	0	0	0	0	0
City of Fountain Valley	0	0	0	0	0	0
City of Garden Grove	0	0	0	0	0	0
City of Huntington Beach	0	0	0	0	0	0
City of La Palma	0	0	0	0	0	0
City of Newport Beach	0	0	0	0	0	0
City of Orange	0	0	0	0	0	0
City of Seal Beach	0	0	0	0	0	0
City of Tustin	0	0	0	0	0	0
City of Westminister	0	0	0	0	0	0
East Orange County Water District	0	0	0	0	0	0
Irvine Ranch Water District	0	0	0	0	0	0
Mesa Consolidated Water District	0	0	0	0	0	0
Santiago County Water District	0	0	0	0	0	0
Serrano Water District	0	0	0	0	0	0
Golden State Water Company	0	0	0	0	0	0
Yorba Linda Water District	0	0	0	0	0	0
Non - OCWD Groundwater Basin						
City of Brea	0	0	0	0	0	0
City of La Habra	0	0	0	0	0	0
City of San Clemente	0	0	0	0	0	0
City of San Juan Capistrano	0	0	0	0	0	0
El Toro Water District	0	0	0	0	0	0
Irvine Ranch Water District	0	0	0	0	0	0
Moulton Niguel Water District	0	0	0	0	0	0
Santiago County Water District	0	0	0	0	0	0
Santa Margarita Water District	0	0	0	0	0	0
Trabuco Canyon Water District	0	0	0	0	0	0

Sources:
1) Metropolitan Water District of Southern California, Draft 2005 Regional Urban Water Management Plan (Sept, 2005)
2) Agency interviews conduced by Camp Dresser & Mckee's for Municipal Water District of Orange County
3) Orange County Water District, *Groundwater Management Plan, 2005*

In the event of a discrepancy between the information shown above and that contained within a local retail agency's Urban Water Management Plan, the local retail agency's data control.

Each of the three main water sources for MWDOC member agencies and any water quality impacts, current or future, are discussed in detail below.

3.2 Groundwater Supply from Orange County Water District

OCWD, manages the groundwater resources in the underlying Orange County Groundwater Basin (Basin). Twenty of these agencies are within the MWDOC service area. The other three, Anaheim, Santa Ana, and Fullerton, are direct member agencies of Metropolitan. As part of its management activities, OCWD operates a network of over 800 groundwater monitoring wells that measure and record groundwater quality and levels. Monitoring occurs at both monitoring wells and at production wells. OCWD's member agencies are required by the Department of Health Services (DHS) to monitor at production wells. OCWD performs that monitoring on behalf of its member agencies. Member agencies conduct separate and additional monitoring of their distribution systems. OCWD also monitors surface water quality from the Santa Ana River and its tributaries to verify the quality of recharge water. On the western fringes of the Basin, OCWD monitors seawater intrusion as part of its seawater intrusion barrier operations. More than 100 regulated and unregulated constituents are currently monitored throughout the Basin.

3.2.1 Groundwater Quality Issues

OCWD has taken a proactive approach to protect and prevent pollution via extensive programs that address short-term and long-term water quality issues throughout the Basin. OCWD has programs to minimize the release of contaminants to groundwater including:

- Sanitary landfill program;
- Leaking underground storage tank program;
- DHS-required Drinking Water Source Assessment and Protection Program;
- Review of environmental documents associated with land use developments;
- Public outreach for pollution prevention; and
- Well-closure program for abandoned wells.

To further protect its groundwater resources, OCWD adopted a Groundwater Quality Protection Policy in 1987 that includes water quality monitoring, cleanup of contaminants, managing toxic and hazardous wastes, and sharing information with producers, regulatory agencies and the public. OCWD uses blending techniques and treatment processes to ensure groundwater quality is not degraded. Though OCWD does not currently conduct any direct treatment of groundwater, it has funded both capital, and operations and maintenance costs for the installation of a N-nitrosodimethylamine (NDMA) treatment facility in the Mesa Consolidated Water District and it is in the planning phase of a volatile organic compound (VOC) cleanup plant in the Anaheim/Fullerton area (outside of MWDOC's service area). OCWD has also assisted in the funding of two nitrate removal

plants, one in Tustin, the other in Garden Grove, as well as the Irvine Desalter project, in conjunction with Irvine Ranch Water District (IRWD).

The sections that follow identify the groundwater quality issues in the Basin for primary drinking water standards, secondary drinking water standards, and as yet unregulated drinking water standards.

3.2.1.1 Contaminant Exceeding a Primary Drinking Water Standard Maximum Contaminant Level (MCL)

3.2.1.1.1 Nitrate Management

The most prevalent form of inorganic nitrogen compounds in the Basin is nitrate. Nitrate loading of groundwater is generally associated with past agricultural land uses. However, the scale of agricultural activities is much smaller today than in years past. DHS has set the primary drinking water standard for nitrate as nitrogen in drinking water delivered to retail customers, and expresses that number as a maximum contaminant level (MCL) allowable for nitrate. The MCL established by DHS for nitrate-nitrogen concentrations is 10 mg/L. Five out of more than 500 production wells were found to have nitrate-nitrogen concentrations exceeding MCL. Water extracted from drinking water wells with nitrates exceeding the MCL is either blended with other sources or treated to reduce nitrate concentrations below the MCL. Approximately 89% of the drinking water wells have nitrate-nitrogen concentrations less than 50% of the MCL. Urban uses have replaced agricultural uses in many locations, reducing nitrate loading. However, residuals from past land uses present in underlying soils will continue to enter the Basin over time until they eventually dissipate. Nitrate remediation is occurring through multiple groundwater treatment projects currently in operation. Other projects are in the planning stage and are discussed below. In addition, as part of its Drinking Water Source Assessment and Protection Programs (DWSAPP), OCWD has identified and continuously monitors those areas susceptible to future nitrate contamination. If concentrations approach the MCL, producers evaluate various alternatives, such as additional treatment.

The Santa Ana Regional Water Quality Control Board (RWQCB) also has a water quality objective for nitrate, an average 3.4 mg/L (as nitrogen) in the Forebay and pressure regions, and 6-8 mg/L in the Irvine area. Nitrate levels have exceeded applicable RWQCB standards in individual areas, typically in shallow depths or in groundwater areas located

near former agricultural zones. However, average nitrate levels throughout the Basin meet the RWQCB standard.

3.2.1.1.2 Volatile Organic Compounds

Plumes of volatile organic compounds (VOCs) have been identified in the Basin within the vicinity of the former El Toro Marine Corps Base and Irvine, the Forebay region of the Basin within the vicinity of Fullerton, and at one IRWD well located in Santa Ana. Contamination at the former El Toro Marine Corps Base is associated with Trichloroethylene (TCE), a type of VOC with an MCL of 0.005 mg/L, which was previously utilized as aircraft cleaning solvent on the base. In Santa Ana, concentrations of TCE, PCE, and perchlorate have been detected at IRWD Well No. 3. As discussed below, projects designed to reduce the VOCs to acceptable levels are scheduled for implementation, and therefore no future water reliability impacts are anticipated.

There is also a VOC plume along the Santa Ana River, starting in the southern part of Orange County. OCWD is currently monitoring the plume. Based on available data, the plume is limited in vertical extent to the shallow aquifers. OCWD will continue to monitor the plume and respond appropriately as needed.

3.2.1.1.3 Methyl Tertiary-Butyl Ether (MTBE)

MTBE, a gasoline additive, is commonly found at leaking underground fuel tanks and in surface water (lakes and reservoirs) allowing recreational motorized boats. Hundreds of documented leaking underground fuel tanks are present within OCWD's management area. Most tank owners do not have groundwater cleanup programs in place to remove MTBE. MTBE is very soluble in water and has a low affinity for soil particles resulting in the rapid migration of contaminant plumes.

In May 2000, Department of Healthy Services established the primary MCL for MTBE at 13 µg/L based on the healthy risks. Two drinking wells that were previously removed from OCWD service due to other contaminants had been found to have MTBE exceeding that level. A secondary drinking water standard of 5 µg/L was also adopted. The use of MTBE as an oxygenate in gasoline was required by the Environmental Protection Agency to reduce air pollution. However, MTBE was completely phased out as a gasoline oxygenate after December 31, 2003.

MTBE is primarily found in the shallow portion of the aquifer. OCWD is taking proactive steps and is cooperating with local water agencies in monitoring for MTBE in groundwater to prevent MTBE from migrating down into the main aquifer where most pumping occurs.

3.2.1.2 Contaminants Exceeding a Secondary Drinking Water Standard MCL

3.2.1.2.1 Total Dissolved Solids Management

As described in Section 3.1 above, secondary drinking water standards are those standards that affect the aesthetic quality of water, such as taste. The secondary drinking water standard established by DHS for TDS in water delivered to retail customers is 500 mg/L. The Santa Ana RWQCB set a TDS objective of 580mg/L for Orange County Groundwater Basin.

In general, water recharged into the Basin has TDS concentrations greater than the water extracted. Over the past decades this has increased TDS concentrations within the Basin, creating a salt imbalance. Increased TDS concentrations can adversely impact industrial, commercial, and agricultural uses. Multiple measures have been developed or are currently being developed to reduce TDS levels in the Basin, a few of which are listed below:

- Groundwater desalter projects have been implemented to reduce TDS levels, and are further discussed in the later section;

- OCWD and MWDOC are working with Metropolitan to provide a blend of State Water Project (SWP) and Colorado River water, which will result in lower (TDS) levels for recharge water at Anaheim Lake and Kraemer Basin; Most imported water is from Metropolitan's Colorado River Aqueduct (CRA) which has higher salinity levels than State Water Project (SWP) water;

- Starting in 2007, the Groundwater Replenishment System (GWR System) will provide a source of low TDS recharge water with a concentration of approximately 100 mg/L, resulting in a reduction in the salt imbalance;

- The Santa Ana River is the primary source of recharge water for the Basin. Strategies to reduce TDS levels in the river include developing non-reclaimable waste lines in the upper watershed that segregate high TDS industrial wastewater, extension of the existing Santa Ana River Interceptor (SARI) Brine Line, and controlling TDS introduced from agricultural practices; and

- OCWD is also working with agencies to alter the composition of recharge water at the Los Alamitos Barrier Project from imported water to a blend of imported water and purified water, which will have a lower TDS concentration than the current injection supply.

3.2.1.2.2 Colored Groundwater Management

A significant quantity of colored groundwater is present in the Lower Main Aquifer of the Basin. More than one million acre-feet of water is colored primarily by contacting with redwood trees deposited in the aquifer. Sampling has indicated that the water is very high quality, but has a color and an odor that do not meet secondary drinking water standards. Colored water treatment projects are currently operated in the Basin by Mesa Consolidated Water District and IRWD. This colored water could be an additional source of supply in the region.

3.2.1.3 Contaminant Exceeding an Unregulated "Notification Level"

3.2.1.3.1 Pharmaceuticals, Personal Care Products, and Endocrine Disruptors

Potential water quality issues of concern include compounds found within pharmaceuticals and personal care products (PPCPs). PPCPs include prescription and over-the-counter medicines, fragrances, food supplements, deodorants, insect repellants, and other items. Endocrine Disrupting Compounds (EDCs) are those compounds that affect the endocrine system and include over-the-counter medicines, pesticides, and other industrial compounds. Impacts of these compounds in low doses on human health are for the most part unknown. OCWD is tracking potential regulations concerning these compounds to determine any impacts upon the level of treatment required for future water reclamation projects. The GWR System treatment process with microfiltration, followed by RO, and finally ultraviolet (UV)

light and hydrogen peroxide treatment removes these contaminants.

3.2.1.3.2 N-nitrosodimethylamine

N-nitrosodimethylamine (NDMA), which is found to be a byproduct of drinking water treatment, does not yet have an MCL. However, it has a "notification level," which is a health based advisory level established by DHS for chemicals in drinking water that lack MCLs. NDMA has an action level of 10 ng/L. The treatment process currently conducted by GWR SYSTEM, as detailed above, removes NDMA.

3.2.2 Groundwater Restoration Projects

Restoration of groundwater quality is a high priority for OCWD. As an incentive to encourage water quality improvement projects, on a case-by-case basis OCWD considers offering pumpers full or partial exemptions to the Basin Equity Assessment fees for pumping and treating water that was previously unsuitable for potable use. Benefits of the program are (1) removal and use of poor quality groundwater from the Basin, and (2) reducing or preventing of the spread of contaminated groundwater into non-degraded areas.

Garden Grove Nitrate Removal Project (Existing)

The Garden Grove Nitrate Removal Project utilizes two wells, one with a high nitrate concentration and one with a low nitrate concentration, that are blended together after the groundwater is withdrawn to achieve a nitrate concentration below the primary drinking water MCL for nitrate. Without this project, the high nitrate well would not be utilized.

Tustin Main Street Treatment Plant (Existing)

Tustin's Main Street Treatment Plant reduces nitrate levels produced by two wells through the use of RO or ion exchange (IX) treatment. During fiscal year 2001-2002, 120,000 pounds of nitrates were removed.

Irvine Desalter (Under Construction)

The Irvine Desalter is a joint project implemented by both IRWD and OCWD with financial contributions from the U.S. Navy and Metropolitan. Currently, a plume of VOCs is migrating toward the Main Basin from the former El Toro Marine Corps base. As proposed, the project will consist of two water purification plants with separate wells and pipeline systems. One plant will be designed to remove TDS and VOCs utilizing air stripping, activated carbon adsorption, and RO. The end-product will be used for irrigation in the recycled water system. The other plant, located outside the

main VOC contamination plume, will remove TDS and nitrates via RO with the end product being a new supply of drinking water.

Tustin Desalter (Existing)

Tustin's Seventeenth Street Desalter reduces nitrate and TDS concentration from groundwater produced by three wells. Two RO membrane trains are utilized to treat the water. In fiscal year 2001-2002, 354,000 pounds of nitrate were removed.

River View Golf Club VOC (Existing)

Located in the City of Santa Ana, the River View Golf Club operates a well that removes VOCs. The well is used for golf course irrigation. Prior to contamination, the well was used as a potable supply source.

Forebay VOC Cleanup Project (Future)

A Forebay VOC Cleanup is planned to remove VOC contaminants in the area north of Highway 91 and west of Highway 57 to prevent further spreading of the plume. This plume has previously resulted in the closure of two Fullerton production wells because of perchloroethylene concentrations. Four extraction wells would pump groundwater that would be conveyed to a central treatment facility. Treated groundwater would be discharged to a flood retention basin for recharge. High nitrate groundwater at one of the well sites would be blended with the three other wells to reduce nitrates below the MCL.

N-nitrosodimethylamine Removal (Existing)

N-nitrosodimethylamine (NDMA), which is found to be a byproduct of drinking water treatment, does not yet have an MCL. However, it has an "notification level", which is a health based advisory level established by DHS for chemicals in drinking water that lack MCLs. NDMA has a notification level of 10 ng/L. Mesa Consolidated Water District operates a NDMA facility to remove NDMA from groundwater in a located area and prevent down-gradient migration. Treatment consists of UV oxidation.

In addition, the treatment process currently conducted by GWR SYSTEM, which provides water to OCWD's seawater intrusion barrier and spreading grounds, does remove NDMA. The GWR SYSTEM treatment process currently includes microfiltration, followed by RO, and finally UV light and hydrogen peroxide treatment.

Mesa Consolidated Water District Colored Water Treatment (Existing)

MCWD's colored water treatment facility uses ozone oxidation to remove color extracted from two wells. Treatment of deep colored water reduces

the potential for upward migration of the colored water into areas with clear water.

IRWD Colored Water "Deep Aquifer Treatment System" or DATS (Existing)

IRWD treats colored groundwater from two wells using nanofiltration, with the end-product used as a potable water supply. The removed concentrate is discharged to the sewer for treatment with wastewater. As with the Mesa Consolidate Water District facility, this facility also reduces the potential for upward migration of colored water.

3.2.3 Groundwater Quality Impacts on Supply Reliability

Currently, there are no known water quality impacts that would reduce the reliability of the Orange County Basin as a water supply source for the next 25 years. OCWD's adopted Groundwater Quality Protection Policy serves as a framework for protecting and improving water quality in the Basin. Current water quality impacts and potential future impacts are taken into account in OCWD's management of the Basin. OCWD, in conjunction with local agencies, is proactively managing the Basin to reduce contamination. OCWD has an extensive monitoring program to identify contamination at an early stage to prevent detrimental impacts to the Basin. OCWD has implemented or will be implementing projects to address current contamination issues and to prevent future degradation of the Basin, such as reducing the TDS imbalance through construction of desalters and the GWR System. Additionally, OCWD has a toxic clean-up reserve fund to immediately begin remediation operations if a portion of the Basin were to become threatened with contamination, further enhancing the reliability of the groundwater supply.

3.3 Imported Supply From Metropolitan

MWDOC is a member agency of the Metropolitan. As a water wholesaler, MWDOC obtains 100 percent of its supply through Metropolitan. That supply accounts for approximately 50 percent of the total water supply within the MWDOC service area. Metropolitan has two primary sources of water, the State Water Project (SWP) and the Colorado River Aqueduct (CRA). For most of Orange County, imported water is served as a blend of both sources with the proportions of the blend dependent upon the year-to-year availability of CRA and SWP water. Colorado River water tends to be higher in total dissolved solids (TDS) and lower in dissolved organics. SWP water usually has a lower TDS but higher organic materials, which can lead to the formation of disinfection byproducts (DBPs). Metropolitan recognizes the regional impacts of water quality, and emphases its commitment to ensuring the highest quality water in its Integrated Resources Plan. Planning efforts have identified management strategies that allow flexibility in operations to improve water quality and source protection while maintaining reliability. Metropolitan's water quality staff conducts both required

monitoring and monitoring for constituents of concern that are currently unregulated. Over 300,000 water quality tests are performed each year.

3.3.1 Metropolitan Water Quality Issues

3.3.1.1 Total Dissolved Solids Management

High TDS levels in imported water delivered by Metropolitan to MWDOC have impacts on MWDOC's and OCWD's management of water resources. High TDS levels in potable water lead to increased recycled water treatment costs, result in increased water losses during the recycled water treatment processes, reduce recycled water use as demand decreases for recycled water with high TDS levels, recycled water does not meet RWQCB standards, brine volumes increase, and ultimately the ability to use the underlying groundwater basins for water storage could be diminished. As previously stated, TDS levels in groundwater managed by OCWD have steadily increased as lower TDS water is extracted and replaced with higher TDS water from imported water and other sources. Metropolitan has established an operational policy objective to deliver water to each of its member agencies at a TDS of 500 mg/l when feasible. This requires careful operational planning and management to achieve.

Colorado River Aqueduct

CRA water has high TDS levels, averaging 650 mg/L during normal water years. Salinity levels are dependent upon precipitation in the Colorado River Basin. During drought years, salinity levels increase. During years with above-normal precipitation, salinity levels decline as naturally occurring salt concentrations decline. In times of extreme drought salinity levels could exceed 900mg/L. A long-term salinity management strategy is in place at the state and federal level for the Colorado River Basin. Funds are appropriated annually to help fund salinity mitigation and reduction projects throughout the watershed.

State Water Project

SWP TDS levels are significantly lower than those in CRA water, averaging 250mg/L for water delivered via the East Branch of the SWP and 325 mg/L for the West Branch deliveries. West Branch deliveries have higher TDS levels as a result of salt loading in local streams, operational issues, and evaporation losses at Pyramid and Castaic Lakes. TDS levels and available supply vary based on hydrologic conditions in the Sacramento-San Joaquin watersheds, introduction of saline non-project waters by upstream parties, as well as saline intrusion in the Sacramento-San Joaquin Bay Delta.

Variations of TDS levels over short periods of time are attributed to seasonal and tidal flow patterns, presenting a unique challenge in trying to achieve Metropolitan's 500 mg/L TDS objective. During periods when TDS levels are high at the SWP intake facilities and in the Colorado River, it may not be possible to meet Metropolitan's salinity objective and maintain water supply reliability. Metropolitan's Board has adopted a policy of needs to meet Metropolitan's 500 mg/L salinity-by-blending objective in a cost-effective manner while minimizing resource losses and ensuring the viability of recycling and groundwater management programs.

Management Actions

Metropolitan has taken numerous actions to reduce TDS concentrations in its water supplies. In 1999, Metropolitan's Board adopted a Salinity Action Plan and a Salinity Management Policy with the goal of delivering water with salinity levels less than 500mg/L. A three-year joint effort between the U.S. Bureau of Reclamation and a task force of stakeholders led to the development of the Action Plan. A Salinity Summit attended by representatives from over 60 agencies was held as the Action Plan neared completion to discuss regional salinity issues and how to work together to attain salinity management goals. Components of the action plan include:

- Imported water source control and salinity reductions;
- Distribution system salinity management actions;
- Collaborative actions with other agencies; and
- Local salinity management actions to protect groundwater and recycled water supplies.

Under the Action Plan, Metropolitan is reliant upon blending of its source water to meet salinity goals. It is anticipated that the TDS goal will be met in 7 out of 10 years. Hydrologic conditions would result in Metropolitan not achieving this goal in the other three years. Member agencies, such as MWDOC, are cognizant of this and have taken this concern into development of their management strategies.

Metropolitan has obtained Proposition 13 funding to improve salinity levels for The Water Quality Exchange Partnership and The Desalination Research and Innovation Partnership (DRIP) programs. Metropolitan received $20 million to develop a water exchange partnership to access high quality water from the Sierras in exchange for SWP water. Funds are being used to develop the program and construct additional infrastructure. A total of $4 million was

received for the DRIP program to develop cost-effective advanced water treatment technologies for removing salts from the CRA, brackish groundwater, wastewater, and agricultural drainage.

Under the CALFED Bay-Delta Program actions are already reducing TDS loading in SWP water, and more actions are planned for the next 30 years. Actions in progress include improved management of salts in the San Joaquin Valley, upstream source control, desalination demonstration projects, and programs to control stormwater runoff into SWP aqueducts. In the long-term, additional projects are planned to reduce short-term variations in TDS levels and the long-term average salinity levels.

Without reductions in TDS levels in both the short-term variations and long-term average, desalination of CRA water may be needed. However, at the present time current technologies are expensive, and 5 to 10 percent of the CRA water would be lost during the treatment process. The DRIP program is designed to assist in obtaining a viable solution to reducing CRA TDS levels.

3.3.1.2 Perchlorate Management

Perchlorate has been detected at low levels in the CRA water supply, but not in the SWP water supply. Therefore, this discussion will focus on the CRA water supply. An exceedance level for perchlorate has not been adopted at this time by DHS. However, DHS has adopted a notification level of 6 µg/L, requiring agencies to inform their governing bodies. Notification of customers and the potential health risks is also recommended. DHS recommends non-utilization of sources with perchlorate levels greater than 60 µg/L. Perchlorate primarily interferes with the production of hormones for normal growth and development in the thyroid gland. Further research on the health effects of perchlorate is pending.

Metropolitan began monitoring for perchlorate in June 1997 after it was detected in the Colorado River and the Lake Mead outlet at Hoover Dam. Sampling was able to isolate the source to the Las Vegas Wash and its potential source in Henderson, Nevada. A quarterly monitoring program for Lake Mead was initiated in August 1997 followed by monthly monitoring of the CRA. The Nevada Division of Environmental Protection manages a remediation project in the Henderson area. Since inception, the amount of perchlorate entering the Colorado River has been reduced from 900 pounds per day in 1997 to less than 150 pounds per day as of December 2004.

Management Actions

In 2002, Metropolitan adopted a Perchlorate Action Plan. Plan objectives include:

- Expand monitoring and reporting programs;
- Assess the impact of perchlorate on local groundwater supplies;
- Track remediation efforts in the Las Vegas Wash;
- Initiate modeling of perchlorate levels in the Colorado River;
- Investigate the need for additional resource management strategies;
- Pursue legislative and regulatory options;
- Include information on perchlorate in outreach activities; and
- Provide periodic updates to the Metropolitan Board and member agencies.

Through its Perchlorate Action Plan, Metropolitan has taken a proactive approach towards addressing a potential water quality issue and ensuring minimal or no water supply losses associated with perchlorate.

3.3.1.3 Total Organic Carbon and Bromide Management

Treatment of SWP water supplies containing high levels of total organic carbon (TOC) and bromide with disinfectants, such as chlorine, creates disinfection byproducts (DBPs) linked to specific cancer types. CRA water does not have high levels of TOCs and bromide. TOC and bromide in the Delta region of the SWP are of a significant concern to Metropolitan as concentration levels increase as Delta water is impacted by agricultural drainage and seawater intrusion. In 1998, the United State Environmental Protection Agency adopted more stringent regulations for DBPs, which took effect in 2002. Even more stringent regulations are expected to be proposed in 2005.

Management Actions

Metropolitan's Board adopted a Statement of Needs for the CALFED Bay-Delta Program in 1999 stating that Metropolitan

requires a safe drinking water supply for compliance with existing and future regulatory requirements. CALFED's Program has developed numerous conceptual actions to improve Bay/Delta water; however, Metropolitan desires CALFED to adopt water quality improvement milestones. These milestones are necessary to assure that Metropolitan and its member agencies will be able to comply with pending water quality regulations.

Metropolitan's Board has committed to install ozone treatment processes at its two treatment plants that solely treat SWP water to avoid the production of DBPs through chlorination. In addition to the concern of DBPs, some studies have linked negative reproductive and developmental effects to chlorinated water. The other three treatment plants that receive a combination of SWP and CRA water utilize blending to reduce levels of DBPs below regulatory requirements. By 2009 Metropolitan plans on installing ozonation facilities at the remainder of its treatment faculties removing the percentage of SWP water that requires blending.

3.3.1.4 Other Contaminants of Concern

Metropolitan has identified various other contaminants of concern to its water supply sources.

Methyl Tertiary Butyl Ether (MTBE)

As previously discussed, the use of MTBE as a gasoline oxygenate has resulted in the contamination of surface waters and groundwater. Metropolitan operates boating facilities at its reservoirs. Therefore, these facilities were previously subjected to the introduction of MTBE. MTBE is discharged into surface water from the exhaust of recreational watercraft. MTBE and other oxygenates are regularly monitored in Metropolitan's water supplies. Past monitoring has detected MTBE concentrations varying from non-detected level to 3.9 µg/L in treatment plant effluent and up to 6.4 µg/L in source water effluent.

Metropolitan has taken numerous actions to reduce the contamination of its supplies with MTBE including supporting state and federal legislation to reduce the impacts of MTBE. At its Diamond Valley Lake and Lake Skinner, MTBE free-fuel and clean burning engines are required to minimize the introduction of MTBE into surface waters. Water monitoring programs for MTBE and other gasoline components were instituted at the lakes. Metropolitan has also investigated various treatment mechanisms for MTBE. Future contamination of water supplies will more than likely decrease as time elapses since the phase-out of MTBE. However,

the extent of future contamination is unknown as MTBE is still within the environment.

Arsenic

Effective 2006, a federal MCL of 10 µg/L (10 parts per billion) will go into effect for domestic water supplies. Metropolitan's water supplies contain low levels of this contaminant within the regulatory requirements. Currently, the California Office of Environmental Health Hazard Assessment has set a public health goal of 0.004 µg/L for arsenic.

Radon

The USEPA has proposed a radon MCL of 300 pCi/L for drinking water supplies in states where there are no approved Multimedia Mitigation programs for reducing indoor radon. For states with approved programs, the standard is 4,000 pCi/L. Metropolitan's supplies have radon levels well below the MCL.

Uranium

Uranium is high priority with Metropolitan as a 10.5 million ton pile of uranium mine tailings is 600 hundred feet from the Colorado River in Moab, Utah. Percolation of rainwater through the pile occurs causing contamination of local groundwater resources and flows of uranium into the river. During a large flood or other natural disaster there is the potential for large volumes of the contaminated material to flow enter the river. Interim action measures instituted by the Department of Energy (DOE) include intercepting portions of the contaminated groundwater before it enters the River. Concentrations ranging from 950 to 1,190 pCi/L have been detected at the point local groundwater enters the river. At Metropolitan's intake at the river, uranium concentrations of 1 to 5 pCi/L have been detected. California has a drinking water standard for uranium of 20 pCi/L. Metropolitan continues to monitor clean-up effort instituted by DOE.

Emerging Contaminants

NDMA is an emerging contaminant of concern believed to be widespread. NDMA is a disinfection-product of water and wastewater treatment processes. Chlorine and monochloramines can react with organic nitrogen precursors to form NDMA. California notification level is 0.010 µg/L. Concentrations found in Metropolitan supply ranging from non-detect (reporting limit of 0.002 µg/L) to 0.012 µg/L. Action measures may be required in the future to control or remove NDMA from water supplies.

Hexavalent chromium or chromium VI is a potential surface water and groundwater contaminant. It is an inorganic chemical used in cooling towers for corrosion control, electroplating, leather tanning, wood treatment, and pigment manufacturing. Contaminant pathways include discharges from industrial users, leaching from hazardous waste sites, and erosion of naturally occurring deposits. California has a current MCL for total chromium (includes chromium VI) of 0.05 mg/L. This level is currently under review by DHS. The California Legislature required DHS to set a MCL specifically for chromium VI by January 1, 2004. However, this has not been set at this time. Metropolitan participates in a Technical Work Group reviewing remediation plans for chromium VI near Topock, Arizona along the Colorado River.

3.3.2 Water Quality Protection Programs

Metropolitan participates in multiple programs to improve water quality supplies. Those programs include:

- Watershed Sanitary Survey;
- Source Water Assessment;
- Support of DWR policies and programs improving the quality of deliveries to Metropolitan;
- Support of the Sacramento River Watershed Program ;
- Water quality exchange partnerships; and
- Implementation of additional security measures.

3.3.3 Imported Water Quality Impacts on Supply Reliability

Through its management strategies and in coordination with member agencies, Metropolitan is able provide member agencies supply options that allow local agencies to meet regulatory standards. Currently known and foreseeable water quality issues are already incorporated into existing management strategies and the reliability of Metropolitan's supplies for the next 25 years. However, unforeseeable water quality issues could potentially alter Metropolitan water and potentially impact its supply reliability.

3.4 Local Projects

Multiple MWDOC member agencies supplement MWDOC's water supply with their own local potable and non-potable supplies. Local supplies are supplies not produced from the Orange County Groundwater Basin nor managed by OCWD, but rather are supplies obtained from other groundwater basins, surface waters, or recycled water. Each MWDOC member agency must manage its resources and monitor water quality to ensure all applicable regulatory requirements are met. Annual water quality reports are provided by member agencies to their customers as required. Member agencies have accounted for any anticipated water quality issues within their current management strategies and do not anticipate any future reductions in supplies related to water quality.

3.4.1 City of Brea

The city of Brea obtains local water supplies from the California Domestic Water Company to supplement imported supplies. The California Domestic Water Company extracts its groundwater from the San Gabriel Basin. Minimal groundwater pumping for non-potable uses also occurs at a local golf course for irrigation purposes only. The city of Brea has indicated it does not have any water quality issues with its local water resources nor does it anticipate any future issues that would reduce local supplies.

3.4.2 City of La Habra

The city of La Habra obtains local water supplies from both the California Domestic Water Company and local wells in the La Habra Basin. The California Domestic Water Company extracts its groundwater from the San Gabriel Basin. There are no water quality issues with water obtained from the California Domestic Water Company. Groundwater extracted from the La Habra Basin is treated to reduce iron and hydrogen sulfide to acceptable drinking water standards. Treatment consists of air stripping and the addition of sodium hexavalent. In the future, La Habra expects to double its production from groundwater wells. The city of La Habra has indicated that it does not have any water quality issues with their local water sources, beyond the two contaminants it is currently removing, nor does it anticipate any future issues that would reduce local supplies.

3.4.3 Santiago County Water District

Santiago Count Water District utilizes a small horizontal pipeline in Harding Canyon to capture groundwater under the influence of surface water as a means to supplement MWDOC supplies. This local water supply is available during the wet season only with yields ranging from 50 to 250 acre-feet per year. Previously, Santiago County Water District operated Read Well, but the well is closed as additional treatment of the water is required to meet DHS standards. Current water management strategies do not incorporate Read Well as a local supply option. Santiago County Water

District has indicated it does not have any water quality issues with its local water resource in Harding Canyon nor does it anticipate any future issues that would reduce local supplies.

3.4.4 Moulton Niguel Water District

Moulton Niguel Water District produces recycled water to offset part of its demand on MWDOC. All recycled water meets DHS water quality standards. Occasionally, end users have complained about odor or sand/debris in the recycled water distribution system. When these concerns arise, MNWD flushes the system, and the concerns are alleviated. Moulton Niguel Water District has indicated that it does not anticipate any future water quality issues that would reduce available local recycled water supplies.

3.4.5 El Toro Water District

El Toro Water District utilizes approximately 300 acre-feet per year of recycled water for golf course irrigation. El Toro Water District has indicated its does not have any water quality issues with its recycled water resource nor does it anticipate any future issues that would reduce local supplies.

3.4.6 City of San Juan Capistrano

The city of San Juan Capistrano supplements its imported Metropolitan supplies with extractions from the San Juan Basin. Extracted water is used for both potable and non-potable purposes. High manganese, iron, and TDS levels are present within the San Juan Basin. Management strategies to reduce these contaminants include installing additional wells with treatment capabilities to prevent reductions in future local supplies. Additionally, the city recently completed a groundwater desalter plant that has increased the reliability of local supplies while reducing dependability upon imported water. The desalter plant is expected to produce approximately 4,920 acre-feet per year. The city also treats non-potable groundwater from the San Juan Basin at its non-domestic treatment plant for distribution in its non-potable water system. In the future, the city plans to blend discharge from its wastewater treatment plant with the non-potable groundwater and further treat the water at its non-domestic treatment plant prior to distribution to its non-potable water system. The city does not foresee any future supply issues associated with the existing system.

3.4.7 City of San Clemente

Local groundwater is extracted by the city of San Clemente to augment imported supplies. Treatment facilities remove high iron and manganese concentrations from the extracted water. Recycled water is used to partially offset demands of potable water. The city has resolved all water quality

issues associated with its recycled water supply. The city has indicated that it does not anticipate any future water quality issues that would reduce available local water supplies.

3.4.8 Trabuco Canyon Water District

Trabuco Canyon Water District produces approximately 400 acre-feet per year from local groundwater resources that are blended with imported supplies. Trabuco Canyon Water District also utilizes recycled water to for non-potable uses. Trabuco Canyon Water District has indicated it does not have any water quality issues with its local water resources nor does it anticipate any future issues that would reduce local supplies.

3.4.9 Santa Margarita Water District

Santa Margarita Water District operates one potable groundwater well on a contract only basis, producing approximately 150 acre-feet per year. Supplies from this well are not included in Santa Margarita Water District's resource mix. Recycled water is also part of Santa Margarita Water District's local water resource mix. A portion of its recycled water is derived from stormwater captured at Oso Creek. No water quality issues are associated with this well or recycled water supplies nor are any anticipated in the future.

3.4.10 Irvine Ranch Water District

IRWD obtains the majority of its groundwater from the Orange County Groundwater Basin managed by OCWD (see discussion under that section); however, a minimal amount of local groundwater outside of OCWD's jurisdiction is extracted from a well in the Lake Forest area. Water from this well is poor quality and is used for non-potable uses only. Approximately, 300-400 acre-feet per year are extracted. In the future, IRWD may stop using this local source of groundwater. Current management strategies have taken this into account, and IRWD does not rely on this source to meet supply reliability objectives.

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