

CLARK COUNTY

2008

**WATER QUALITY
MANAGEMENT PLAN**

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CLARK COUNTY 208 WATER QUALITY MANAGEMENT PLAN

CLARK COUNTY, NEVADA

(CLARK COUNTY BOARD OF COMMISSIONERS)

208 PLAN

May 9, 1978

Prepared by

208 PROJECT STAFF
Clark County Sanitation District

Based on Studies Previously Conducted by

SEDWAY/COOKE
URS COMPANY
EARTH METRICS
McDONALD & GREFE, INC.
CLARK COUNTY CONSERVATION DISTRICT

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CLARK COUNTY 208 WATER QUALITY MANAGEMENT PROGRAM

The Federal Water Pollution Control Act Amendments of 1972 require the control of all sources of water pollution in meeting the goals of the Act. Section 208 of the Act encourages that all activities associated with water pollution problems be planned and managed through an integrated areawide water quality management program.

In May, 1975, the 58th Session of the Nevada State Legislature passed Senate Bill 468 which vests areawide water quality management planning duties and powers with certain counties within their jurisdictional boundaries. Subsequent gubernatorial action consistent with this legislative direction resulted in the official designation of the Clark County Board of Commissioners as the Areawide Water Quality Management Planning organization within the County of Clark.

The initial two-year 208 Plan is required by EPA to be adopted by the County Commissioners and certified by the Governor before June 13, 1978.

The Clark County Board of Commissioners have designated the Clark County Sanitation District No. 1 as the agency to manage 208 planning.

CLARK COUNTY BOARD OF COMMISSIONERS

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RESOLUTION

(of Clark County Board of Commissioners)

APPROVING THE CLARK COUNTY 208 WATER QUALITY MANAGEMENT PLAN

WHEREAS, the Clark County Board of Commissioners, as the 208 planning agency, has prepared a 208 Water Quality Management Plan (hereinafter referred to as "the Plan"); and

WHEREAS, the process in developing the Plan has been extensively reviewed by the Citizens' Advisory Committee, Areawide Policy Advisory Committee, Technical Advisory Committee, City Commissions/Councils, Town Boards, and other public groups; and

WHEREAS, the Plan is to be submitted to the State of Nevada for approval; and

WHEREAS, the Plan is required by the Clean Water Act of 1972 as amended in 1977 to be submitted to the U.S. Environmental Protection Agency by June 13, 1978.

NOW, THEREFORE, BE IT RESOLVED that the Clark County Board of Commissioners does hereby adopt the Clark County 208 Water Quality Management Plan.

PASSED, ADOPTED and APPROVED this 9th day of May, 1978.

CLARK COUNTY, NEVADA

by Thalia M. Dondos
Chairman,
Board of County Commissioners

ATTEST:

Jo Ann Soule
LORETTA BOWMAN, County Clerk
By: Jo Ann Soule, Deputy
/kh
042478

CERTIFIED COPY

The document to which this certificate is attached is a full, true and correct copy of the original as filed and of record in my office.

DATE: May 9, 1978
I, Jo Ann Soule, County Clerk and Clerk of the District Judicial District Court, do and for the County of Clark, State of Nevada.

By Jo Ann Soule Deputy.

Abstract

TITLE: Draft Clark County 208 Water Quality Management Plan

AUTHORS: Sedway/Cooke
McDonald and Grefe, Inc.
Earth Metrics, Inc.
URS Company
Clark County 208 Project Staff

SUBJECT: Water Quality Policies and Programs

DATE: May 9, 1978

LOCAL PLANNING AGENCY: Clark County, Nevada

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ABSTRACT: The Draft Clark County 208 Water Quality Management Plan presents the objectives, policies, and programs for managing water quality in the County. The Plan addresses itself to municipal wastewater treatment, groundwater management, storm-water programs, Las Vegas Wash, agriculture diffuse sources, water quality standards revisions, management reorganization and financing necessary to carry out the Plan, and an implementation schedule.

An environmental assessment of the proposed plan is included as Section II of the report. A description of the planning process of the 208 Program is included as Section III.

Section II

ENVIRONMENT ASSESSMENT

CHAPTER X

BACKGROUND AND SUMMARY

Background

This section is the last of the Environmental Report Series developed for the Clark County 208 Water Quality Management Plan. Environmental Report No. 1 is an annotated bibliography of 208 related documents used in the planning process. Report No. 2, Land Development Suitability Analysis, provides information on the existing environmental setting and constraints to future growth in Las Vegas Valley. Report No. 3, Unconstrained Growth Forecasts and Report No. 4, Growth Impacts identify base case growth patterns and resultant environmental conditions in Las Vegas Valley. These reports and interim reports of the Water Quality Series provided a basis for formulating 208 objectives and criteria (Management Report No. 3) and forming 208 alternative water quality management and land development strategies. Alternatives are presented in Management Report No. 4, Draft Plan of Alternative Water Quality Management Strategies and evaluated for primary and secondary impacts in Management Report No. 5, Evaluation of Alternatives. On the basis of the alternatives analysis, a preferred draft plan was selected and is presented in Management Report No. 6, Draft 208 Plan which has been modified to reflect public review in Section I.

The following chapters in Section II summarize the findings of preceding studies to assess overall environmental impacts of the recommended 208 plan. It does not constitute an Environmental Impact Statement (EIS) as required by Federal law, because the recommended 208 plan has not been accepted by Clark County entities. However, information herein will be used to develop the draft EIS, and is organized in an identical manner.

Summary

The elements of the proposed 208 Plan are briefly described in Chapter I. Chapter XI summarizes existing features and constraints of the Clark County setting. A description of projected significant impacts which would result from Plan implementation is contained in Chapter XII, with suggested mitigating measures.

Unavoidable adverse primary and secondary impacts are given in Chapter XIII. These are as follow:

Primary Impacts

- **WATER QUALITY:** Receiving water quality standards for Las Vegas Wash/Bay at Northshore Road may be exceeded by urban runoff pollutants following storm events.
- **LAS VEGAS WASH:** Reduction of wastewater effluent flow in Las Vegas Wash will cause reduction of existing hydric areas and corresponding decrease in biota dependent upon marsh habitat.

Secondary Impacts

- **TRAFFIC AND TRANSPORTATION:** With increasing population and transportation needs, roadways within Las Vegas Valley will suffer increased congestion, reduced vehicle speeds, longer travel times, and associated adverse air quality impacts. However, the ongoing Clark County Transportation Study is examining measures to mitigate these impacts.
- **AIR QUALITY:** With increasing population and transportation needs, vehicle emissions within Las Vegas Valley may cause exceedance of State and Federal air quality standards for carbon monoxide, photochemical oxidant and total suspended particulate, although, the ongoing Clark County air quality planning will be required to mitigate these impacts.
- **BIOLOGY:** Increasing use of outlying habitat areas for fishing, hunting, ORVs and other forms of outdoor recreation will impact fish and game populations and cause additional stress upon resident wildlife and vegetation species.
- **ENERGY:** Increasing energy needs for transportation and electric power generation in Las Vegas Valley will cause demand to exceed available domestic supply for petroleum and natural gas, with shortages of fossil fuel experienced as soon as 1990.

Growth aspects of the 208 Plan as related to water and wastewater facilities are discussed in Chapter XIV. Irreversible effects and commitment of irretrievable resources are discussed in Chapter XV. Primary irreversible effects include: use of materials and energy for construction of wastewater facilities; partial reduction of marsh in Las Vegas Wash as wildlife habitat area, water use for urban irrigation, marsh maintenance, and power plant cooling purposes. Secondary irreversible effects include consumption of energy and materials for land development and other needs of the expanding Clark County population. In Chapter XVI the short-term benefits of growth in the Las Vegas Valley are discussed in relation to long-term productivity and enhancement of the Valley environment.

CHAPTER XI

ENVIRONMENTAL SETTING AND CONSTRAINTS

A comprehensive description of the Clark County setting is contained within Environmental Report No. 2, Land Development Suitability Analysis and interim reports of the Water Quality Series on surface water, sub-surface water, and Las Vegas Wash. The following summarily describes major features of the Clark County environment as these relate to water quality and urban growth. For additional detail the reader is referred to the above reports.

Topography/Geology/Soils

Setting. The topography of Clark County is characterized by north-south trending mountain ranges eroding laterally to vast desert valleys. The ranges rise to elevations as high as 11,918 feet (Mt. Charleston, Spring Mountain Range) and are major determinants of areal meteorology, hydrology, and air quality. From the base of the mountains extend wide alluvial fans or aprons formed by severe erosions of steep mountain areas. The alluvial fans gently level out to the basin lowlands, where eroded sediments are received and deposited from gullies and washes draining the aprons. The basin lowlands have been continually filling with sediment since the mountains were originally formed, with sediment deposition attributable to reduced runoff velocities and associated low scouring in the valley bottom areas. Storm drainage channels in the low lands are poorly defined, and most storm runoff occurs as sheet flow, concentrating ultimately in major wash areas with very high speed and intensity.

Clark County lies within the Basin and Range Province near its juncture with the Colorado Plateau Province to the east. The Las Vegas Valley along with the Spring Valley and Three Lake Valley comprise a southeast trending structured basin about 50 miles in length. Las Vegas Valley drains to the Colorado River via Las Vegas Wash. Other valleys drain internally as closed basins. Basin fill occupying the Valleys consists of lake and playa sediments, alluvial fan deposits, mudflow debris, and evaporites. Typical of Basin and Range topography, the basins are modified by encroaching alluvial fans.

The soils data base for Clark County is currently being expanded and updated with cooperation of the Clark County Conservation District to contain more detailed geotechnical and hydrologic information on areal soils for purposes of development and flood control evaluation. Generally, soils in Las Vegas Valley are marginal for agricultural use and show high runoff and low permeability characteristics. Mountain ranges in the Valley area are covered with little soil material, and are generally classified within the stony steep land, basalt-stony steep land, limestone association. The alluvial cobbly, and stony sand deposits, grade to finer materials as slopes decrease toward the valley floor. The basin lowlands are depositional areas

of lake laid silts and clays and younger alluvial deposits which are still being laid today. Numerous sand dunes exist in the Valley as products of recent wind activity.

Constraints. Areas with geotechnical constraints to growth in Las Vegas Valley include the following:

- Areas of steep slope posing potential slope stability hazards and runoff problems;
- Areas underlain by nearly impervious cemented gravel or hard pan with low infiltration characteristics. (Septic tank drainage and lawn irrigation waters cannot penetrate underlying hard pan, and raise shallow groundwater levels to within several feet of the land surface);and
- Areas exhibiting land subsidence phenomena attributable primarily to localized groundwater overdraft.

Hydrology/Water Quality

Setting. Las Vegas Valley is drained principally by the Las Vegas Wash and its related tributary washes and creeks. Approximately two thirds of the Las Vegas Wash Drainage Basin is mountainous and one third is valley. Winter storm runoff is primarily important to the higher mountain elevations above 6,000 feet (EPA 1975), which serve as the primary recharge areas for the Valley aquifers. During the intense summer storms, however, rapid runoff within the basin often causes rapid rising of flows in the Las Vegas Wash, with flash flooding on numerous occasions.

Dry weather flow in Las Vegas Wash consists almost entirely of effluent from wastewater treatment plants operated by Clark County Sanitation District No. 1 and City of Las Vegas. The question of how to dispose of future effluent flows from the Advanced Wastewater Treatment (AWT) plant to the Wash drainage system has been a principal focus of the 208 planning program. Surface water quality in the Wash is directly related to the level of treatment to effluent discharges from municipal treatment plants. The Wash itself acts as a natural treatment mechanism for reducing constituent levels of discharged effluent and urban storm runoff prior to outflow in Las Vegas Bay of Lake Mead.

Groundwater occurs in Las Vegas Valley in two major zones: (1) the near surface reservoir, ranging in depth from zero to 200 feet and frequently perched on impermeable layers of caliche or hardpan, and (2) the principal aquifers below 200 feet depth which are commonly pumped for water supply. Quality of the near surface reservoir is generally inferior to that of the principal aquifers, showing higher salinity concentrations and some degradation of nutrient and bacteriological quality in localized areas where sewage effluent irrigation or septic tank disposal occurs or where organic material has been deposited.

Constraints. Major issues of concern as related to hydrology and water quality include:

- water quality standards;
- flood hazard in urbanized areas located in the 100 year flood plain;
- effects on shallow groundwater, primarily due to over-irrigation of urban lawns, which may cause septic tank failure and construction problems; and
- groundwater quality in areas of reclamation activities, septic tank disposal and gradient reversals between near surface and principal aquifers.

Traffic and Transportation

Setting. The transportation system of Las Vegas Valley is primarily oriented toward private auto usage, although limited transit service exists for the Strip and downtown areas. Planned improvements to the urban roadway system are expected to improve north-south circulation, although east-west travel corridors are becoming problematic due to traffic increases in the Valley. McCarran International is the major commercial airport and handles nearly all tourist trade. North Las Vegas Air Terminal is used for private and cargo operations and should remain largely in this capacity in coming years.

Constraints. Major problems relating to traffic and transportation in Las Vegas Valley include:

- increasing peak hour congestion and roadway undercapacity on nearly all major streets, with associated air quality problems;
- low transit feasibility due to high costs associated with low residential densities and urban sprawl; and
- continuing reliance upon the automobile as a primary means of travel, despite indications that world petroleum reserves will become critical in the early 1990's.

Air Quality

Setting. Climate and topography in Las Vegas Valley create unfavorable air quality conditions which cause buildup of auto-related air pollutants, principally carbon monoxide and hydrocarbons. The Valley has been designated an Air Quality Nonattainment Area for three pollutants: carbon monoxide (CO), photochemical oxidant and total suspended particulate (TSP) and the County is currently preparing an Air Quality Implementation Plan (AQIP) to determine best control strategies for attainment of State and Federal ambient air quality standards in the Valley.

In cooperation with the AQIP, 1975 carbon monoxide contours were prepared for 21 major Valley roadways and intersections as part of the 208 planning process. Data compiled by Clark County Health District documents present-day violations of the one-hour oxidant standard, the eight-hour CO

The continuing planning process should seek and encourage citizen participation. Citizen involvement is initiated through, but should not be limited to, the following organizations:

- Environmental Quality Policy Review Board;
- Citizens' Environmental Resources Advisory Board;
- Wash Development Committee;
- Water Conservation/Waste Flow Reduction Committee;
- Sewage and Wastewater Advisory Committee;
- County and city planning commissions; and
- Clark County Board of Commissioners.

Financing

Funds for the programs and studies initiated by the Clark County 208 Plan have been described throughout the Plan.

In addition, Clark County should apply for continuing planning funds (on a 75 percent cost sharing basis) as provided by Section 208. These monies, granted by the Environmental Protection Agency, are designed to assist, in part, the County Department of Comprehensive Planning in its continuing planning studies and programs.

208 Plan Update

As stressed earlier, the 208 Plan cannot be static. Consequently, the County Department of Comprehensive Planning, Environmental Planning Division, will conduct an annual review and initiate action as necessary to update the program. The review will include progress reports on the various studies initiated and on the effectiveness of enacted ordinances and programs. The content of these reports in conjunction with comments from local governments, special districts, citizens, and other interested groups; revised federal standards and guidelines; new water quality control technologies; and revised population projections will be reflected in the update of the Clark County 208 Plan.

The County Department of Comprehensive Planning, Environmental Planning Division staff, given their responsibilities for continuing 208 planning and air quality implementation plan development will need to coordinate with the Transportation Study, Regional Planning Council, and local planning departments to ensure close coordination on land use and transportation planning with the environmental planning programs.

standard, the 24-hour and annual average TSP standards, and the 3-hour non-methane hydrocarbon standard.

Constraints. Air quality limitations within the Valley include:

- periodic exceedances of State and Federal ambient CO concentrations at major intersections and much of the downtown area due to vehicle emissions;
- exceedances of State and County ambient TSP standards due to blow-off from construction sites, paved and unpaved roadways and Off Road Vehicle (ORV) use; and
- exceedances of State and Federal ambient oxidant standards due to regional vehicle emissions.

Noise

Setting. The prominent sources of noise in Clark County are roadway noise, aircraft noise, and railroad noise, all of which are commonly associated with an urban area. Generally, the highest noise levels occur in the vicinity of Las Vegas, along the major roadways, near McCarran International Airport and Nellis Air Force Base, and near the Union Pacific Railroad lines. Very low noise levels are the rule in the sparsely populated areas of Clark County, except in localized areas where a similar array of noise sources are present, notably, near Interstate 15 southwest of Las Vegas and at the Nellis Air Force Range when training flights or other military operations are in progress.

Constraints. Noise contours identifying areas of high noise exposure have been used in the 208 study to assess land use compatibility with nearby noise sources. The major noise sensitive areas within Las Vegas Valley include:

- areas within the 30 NEF contours of McCarran International Airport and Nellis Air Force Base; and
- areas within the 60 L_{dn} contours of major roadway and railway alignments.

Visual

Setting. The location of the city within the center of the valley tends to focus the field of vision, so that the free-standing towers of the high-rise buildings are emphasized. Clarity of outline and detail and highly reflective surfaces are typical of city forms on clear days. The mountain ranges appear to emerge and recede, assuming various colorations depending on time of day and sun angle. The desert foreground with its low lying scrub vegetation, broken by occasional clumps of wash vegetation, provides a neutral contrast to the city and mountains.

Within the city, urban form is more difficult to discern. The urbanization pattern results in vacant parcels of desert land scattered

randomly throughout the city, creating a visual disintegration rather than the concentration of form apparent from a distance. This abundance of open space is not a visual asset; the desert loses its visual integrity when fragmented, and the unmaintained empty spaces detract from city appearance. The relatively uniform elevation of the ground plane and the unvarying one and two-story development throughout most of the city (with the exception of the Strip and downtown) make it difficult to see much of the city at any one moment. Daytime orientation, however, is provided by frequent views of the mountains, and the highrise towers.

Significant Visual Elements. Visual elements which are important for their aesthetic contributions to urban areas within the Valley include:

- travel corridors, which function as important visual breaks in the urban pattern;
- activity centers, including the Strip, the Las Vegas downtown area, McCarran Airport, University of Nevada, North Las Vegas Civic Center and the Henderson downtown area;
- landscaped areas; and
- Las Vegas Wash, which functions as an important recreational, aesthetic and wildlife habitat resource.

Parks and Recreation

Setting. Land supply and need for park and recreation open space in Clark County is comprehensively discussed in Environmental Report No. 2, Land Development Suitability Analysis. Regional existing and proposed park provisions include the following major areas:

- Red Rock Canyon Recreation Area;
- Desert National Wildlife Range (proposed for expansion);
- Toiyabe National Forest (proposed for expansion);
- Lake Mead National Recreation Area (proposed for expansion);
- Valley of Fire State Park;
- Overton Wildlife Management Area;
- Floyd Lamb Park;
- Bureau of Land Management identified recreation sites; and
- Las Vegas Wash (proposed).

Although regional recreational lands are in plentiful supply, regional recreational facilities are in many instances overcrowded. Areas of projected unmet regional needs are identified in Table 31 of Environmental

Report No. 2.

Clark County, City of Las Vegas, North Las Vegas and Henderson all have deficiencies in urban park land supply, using Clark County Regional Planning Council standards. Boulder City park land supply is considered adequate by these criteria. Unmet needs for local park space is discussed and quantified for each city in Environmental Report No. 2.

Constraints. Although urban growth will not be inhibited by insufficient park and recreational provisions to meet user needs, the quality of neighborhood and urban life would be diminished by such inadequacies. Principal factors affecting future park land supply are:

- whether county lands will be annexed to the City of Las Vegas, shifting the burden of local park provision to the City and allowing the County to concentrate on regional park needs;
- availability of funds to match Federal monies for park acquisition and development, and local funding shortages for maintenance; and
- availability of reclaimed water for park irrigation.

Biology

Setting. Although a number of biotic communities are represented within Clark County (see Environmental Report No. 2, Land Development Suitability Analysis), the urbanizing areas within the Valley are predominantly of the creosote bush community, with valuable riparian and hydric (marsh) communities within the Las Vegas Wash. Numerous threatened wild-life and vegetation species exist in the County. Minor populations of the Vegas Valley leopard frog (Rana pipiens fisheri), a federally recognized threatened species, exists in the lower Las Vegas Wash and at Bluepoint Springs. Several endemic fish occur due to habitat isolation. These species include the endangered: Colorado squawfish (Ptychocheilus lucius) in Lake Mead and the Colorado River; the woundfin (Plagopterus argentissimus) in the Virgin River; the moapa dace (Moapa coriacea) in the Muddy River; and the Pahrump killifish (Empetrichthys latos) in two Corn Creek Ponds. All of these species may be threatened with extinction by future growth. The only other endangered species is the Peregrine falcon (Falco peregrinus peregrinus) which has a much wider range. Numerous other species have been identified as rare or protected on a state level.

Areas containing several threatened plant species have been identified by the Nevada Division of Forestry. The Spring Mountain Range is the most sensitive area. It includes three potential refuges; Cold Creek-Indian Ridge Refuge, Mount Charleston Refuge, and Mount Potosi-Bird Spring Refuge. Additionally, Rainbow Garden-Gypsum Cave Refuge is located immediately east of Las Vegas near Lake Mead and Black Mountain Refuge is adjacent to the southern boundary of Henderson. To present, no steps have been taken to establish the refuge areas and many of the threatened plants have not received an official designation as threatened or endangered.

Hunting and fishing demand is currently increasing in the County. Big

game species include mule deer, pronghorn antelope, bighorn sheep, elk, and mountain lion. Small game species are mourning dove, desert cottontail, gambel's quail, ring necked pheasant, white winged dove, chukar partridge and band tailed pigeon. Game fish are rainbow trout, silver salmon, green sunfish, striped bass, largemouth black bass, black crappie, bluegill, black bullhead, and channel catfish. Anticipated increase in game demand will call for more intensive management and restrictions on hunting, fishing, and other recreational uses.

Additionally, many nongame species exist. For a complete listing refer to a report prepared by Bradley and Deacon in 1967 called The Biotic Communities of Southern Nevada.

Constraints. Areas where fish, wildlife, and/or vegetation may suffer from increased human encroachment into their habitats include:

- all water related habitats; primarily the Las Vegas Wash, the Virgin River, the Muddy River, Colorado River, Lake Mead, and Lake Mojave
- all critical habitats of threatened and endangered wildlife;
- the proposed refuge areas which contain many threatened plant species; and
- big game habitats.

Agriculture

Setting. Approximately .7 percent of Clark County (10,848 acres) is presently in agricultural production, with some 10,185 acres of this irrigated. Most farming is located in the Virgin and Moapa Valleys and supports beef and dairy cattle industries. The Virgin and Muddy Rivers provide approximately 75 percent of irrigation water used (about 85,000 acre-feet/year); the remaining 25 percent is pumped from groundwater wells in the primary aquifer (208 Agriculturally Related Sources, 1977). Primary crops are alfalfa, sorghums and wheat. Truck crops are produced on a small scale and include corn, melons, and vegetables.

Agriculture in Las Vegas Valley is minimal (2012 acres), primarily due to water quantity and quality limitations. Groundwater and wastewater are used for irrigation of alfalfa, barley, sorghum, and corn.

Constraints. Limitations to agricultural growth in Clark County include:

- scarcity of suitable agricultural soils;
- water supply and return water quality problems in reclaiming marginal farmland; and
- inability of many farmers to finance improved agricultural water supply and drainage facilities.

History and Archaeology

Setting. Historical and archaeological resources cover a broad range of prehistoric and historic time periods. Historic and prehistoric sites are often found together near springs, in areas which provided hospitable campsites. Prehistoric sites date back to 10,000 B.C. They are usually identified as a campsite, midden, or lithic scatter. Evidence of the earliest inhabitants (10,000 to 12,000 years ago) was found near Tule Springs, the Whitney Mesa, and margins of the Las Vegas Wash. Succeeding cultures included the Pinto hunting culture (9,000 to 4,000 years ago), the Gypsum Culture (4,000 to 1,500 years ago, Pueblo people (1,500 to 800 years ago), and Paiutes (800 years ago to the arrival of Europeans). Evidence of these cultures can be found in the general areas designated in Environmental Report No. 2, Land Development Suitability Analysis.

The earliest Spanish exploration of Clark County was in the 16th century. Wider attention was brought to the area when Captain John Fremont, an American, enthusiastically described its springs and vegetation to Congress. The United States acquired the area in 1848 as a result of the Treaty of Guadalupe Hidalgo. The first white settlers were composed of 30 Mormon missionaries. They successfully established a fort and initiated farming, but later abandoned the area. Trails through this region and the steamboat navigation of the Colorado River brought more settlers to the region. Farming and mining became established in the late 1850's. In 1905, the City of Las Vegas was founded along the newly completed San Pedro, Los Angeles, and Salt Lake Railroad Company line which ran between Southern California and Salt Lake City. The City subsequently prospered. In 1931, gambling was legalized and ten years later military and defense facilities arrived. After World War II casinos and hotels flourished in the City.

Constraints. Areas of historical and/or archaeological sensitivity include:

- all recognized National Register sites in Clark County;
- potential archaeological sites, such as the edges of dry lake beds, like Jean, Hidden, Eldorado, and Dry Lakes;
- areas where archaeological sites have already been identified, especially the Duck Creek area; and
- all historic resources recognized at state or local levels.

Energy

Setting. The primary sources of energy in Clark County are petroleum products, natural gas, and fossil fuel generated electricity. The Las Vegas Valley is responsible for nearly all of the energy use since it contains 95% of Clark County's population. Per capita consumption of energy resources

is extremely high in this area compared to national figures.

Petroleum products are delivered to the Las Vegas area from Southern California via the Calnev Pipeline. Transportation consumes 75% of the total petroleum budget, with electric power generation and industrial fuel comprising the remainder. Petroleum use is expected to increase due to future transportation demands.

Natural gas is delivered to Clark County via a pipeline from El Paso, Texas. It is distributed by the Southwest Gas Corporation according to the following order of priority: 1) residential, 2) commercial, 3) industrial, 4) steam generation in electric power plants.

The Nevada Power Company provides most of Clark County with electricity although some electric power is imported from Southern California. Coal provides up to 68% of the total County power needs for electrical generation. Residential use consumes the largest percentage (44.3) of electrical energy. The projected increase in County population can be expected to result in rapid increases in electricity consumption.

Constraints. Energy limitations within the Valley include:

- shortage of domestic petroleum and natural gas supply; and
- need for suitable coal supplies for electrical power generation.

Solid Waste

Setting. Present solid waste collection and disposal practices are directed through the County Six Year Implementation Plan, in which the existing system is being upgraded and unauthorized disposal sites are being closed or upgraded to sanitary landfill criteria. The primary future disposal site for Las Vegas and North Las Vegas is Sunrise Mountain Sanitary Landfill, which receives 1100 tons of solid waste daily. Although the present operation at Sunrise Mountain is limited to 320 acres, an additional 1440 acres are available adjacent to the site.

Presently, sewage sludge from Henderson and City of Las Vegas treatment plants is deposited on city parks as soil conditioner. Sludge from the County Sanitation District plant is incinerated. In the future, municipal sludge will be disposed of in the Sunrise site. With the proposed land annexation, this site is projected to have adequate landfill capacity to accommodate Valley solid waste production beyond the year 2000.

Constraints. The present and planned solid waste collection and disposal systems are adequate to meet County needs, although the need for a resource recovery system may become greater as energy and resources become more scarce. This is discussed exhaustively in the proposed Clark County Comprehensive Solid Waste Management Plan (URS, 1974).

CHAPTER XII
SIGNIFICANT IMPACTS OF THE PROPOSED PLAN
AND SUGGESTED MITIGATING MEASURES

Introduction

The following identifies significant primary and secondary impacts projected to occur if the proposed 208 Plan is implemented. This does not imply that the proposed 208 Plan would be responsible for all identified secondary impacts. Examples are transportation and air quality, where severe congestion and air pollution problems are predicted to occur in Las Vegas Valley as a result of increasing urban growth and auto usage. The 208 Plan, while it may serve to accommodate urban growth, has only a limited capacity by which it may address the attendant transportation and air quality impacts. These impacts must be addressed through coordination of the 208 with other areawide plans, including the Clark County Transportation Plan, the County Air Quality Implementation Plan, the proposed Clark County Solid Waste Management Plan, McCarran Airport Master Plan, and land use plans developed by various entities within the Valley.

Where significant impacts are identified in the following analysis, mitigating measures are suggested at the end of each chapter to either (1) provide for measures which may directly mitigate identified impacts, or (2) identify other ongoing areawide plans which must be coordinated with the 208 Plan when these are in the completion phase. Coordination may entail either expanding ongoing plans (e.g., the proposed areawide Solid Waste Management Plan may also plan for elimination of litter as part of the 208 goal to reduce urban runoff pollution), or recommending areas of flexibility in the 208 Plan itself (the prime example here is the recommended land development strategy, which may not be of sufficiently high density to support expanded mass transit per the possible requirements of the Air Quality Implementation Plan).

Geology/Hydrology/Water Quality

In Las Vegas Valley, the impacts of the 208 Plan upon local geologic, hydrologic and water quality characteristics are intimately related. Primary hydrogeologic and water quality concerns in the Valley are subsidence hazard, flood hazard, high near surface groundwater levels, inferior sub-surface water quality, and surface water quality. The degree to which the proposed 208 Plan will be able to both mitigate and prevent future escalation of these existing problems is addressed below.

Subsidence Hazard

Ground subsidence is common to many areas of Las Vegas Valley, creating structural hazards as well as the potential for sewer line gradient reversals and dangerous fuel line damage. Areas of 1963 to 1972 land subsidence are shown in Figure 8. Subsidence is also known to be a problem at Nellis AFB.

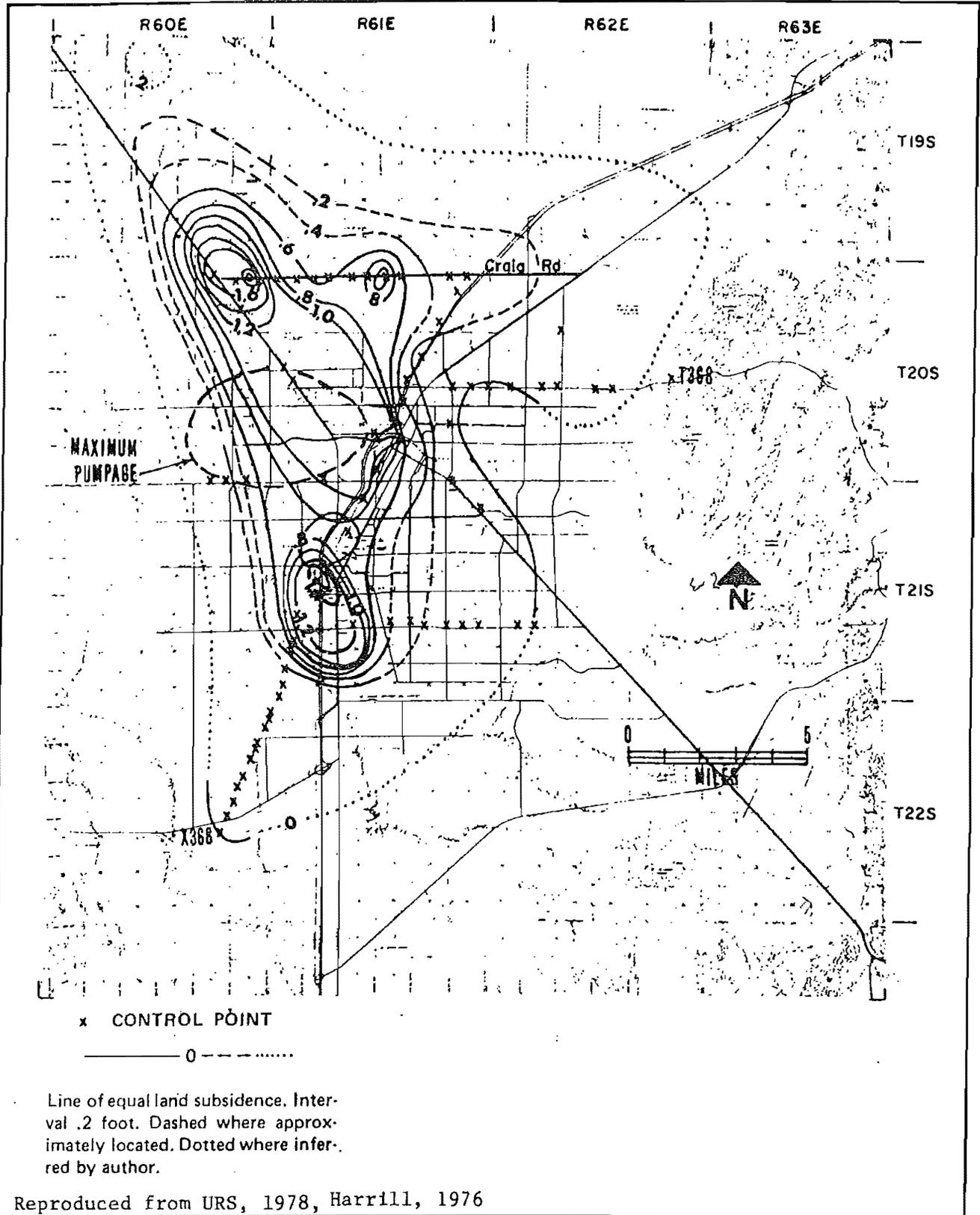
The main contribution to total subsidence in Las Vegas Valley has been principal aquifer overdrafting by pre-1980 development. Groundwater withdrawal has led to artesian head declines and subsequent compaction of sediments in water bearing beds near areas of heavy pumpage. Consequent differential sinking of the ground has resulted in structural damages, including the destruction of at least one house. Pre-1980 development of fissured land has locally obscured the surficial evidence of subsidence prone areas.

Post-1980 development of subsidence prone areas will continue under the localized management strategy. The recommended 208 Subsurface Water Management Program will monitor and model groundwater movement and may be used ultimately to coordinate pumping strategies with identified subsidence-prone areas and sensitive land uses. Consequently, overdraft and resultant subsidence may be expected to continue until a more complete evaluation of the subsidence problem has been made. Full mitigation of subsidence will likely not be possible without drastic cutbacks in groundwater withdrawal.

Flood Hazard

Loss of life and costly damage to property, roads, and utility lines have been the past consequence of locating large numbers of homes and businesses in the Las Vegas Valley 100-year flood plain. Specific problem areas of intense floodplain development include downtown Las Vegas, sections of the Strip, and isolated areas of North Las Vegas.

Pre-1980 floodplain development will be protected under the recommended Surface Water Management Program through construction of flood control improvements designed to pass floods of ten-year return frequency. Periodic damage will be incurred by less frequent floods of greater magnitude. Present-day capital expenses necessary to provide ten-year flood protection to pre-1980 flood plain development has been estimated at 29 million dollars (Surface Water Management Interim Report No. 3). Because past projections of peak flow resulting from different frequency storms have been abnormally high, no city is using the 100-year design storm. The present work being done by the Soil Conservation Service identifies 100-year flows which closely correspond with the current 10-year design criteria being used by local entities. The surface water management plan will more fully develop stormwater flow projections which can then be the basis for design criteria.



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FIGURE 8. APPROXIMATE LAND SUBSIDENCE IN LAS VEGAS VALLEY 1963-1972

Adoption of development restrictions within floodplain areas as recommended in the proposed land development strategy will minimize future flood hazard and related expenses by prohibiting or requiring flood-proofing of future floodplain development. Flood related costs incurred by post 1980 development will be limited to economic losses suffered by owners of currently undeveloped floodplain property.

Development in many outlying regions of Clark County will continue to experience occasional flash flood damage. The surface water management program does not include outlying regions due to the generally sparse residential populations and small watershed areas.

High Near Surface Groundwater Levels

The water table is currently within fifty feet of the ground surface over a large part of southeastern Las Vegas Valley and is rising in areas of increased development, primarily due to over-irrigation of lawns. The extent to which future waterlogging hazards in the "urban core" region, shown in Figure 9, are prevented will depend upon the ability of the proposed 208 Plan to increase discharge and reduce recharge of the near surface reservoir.

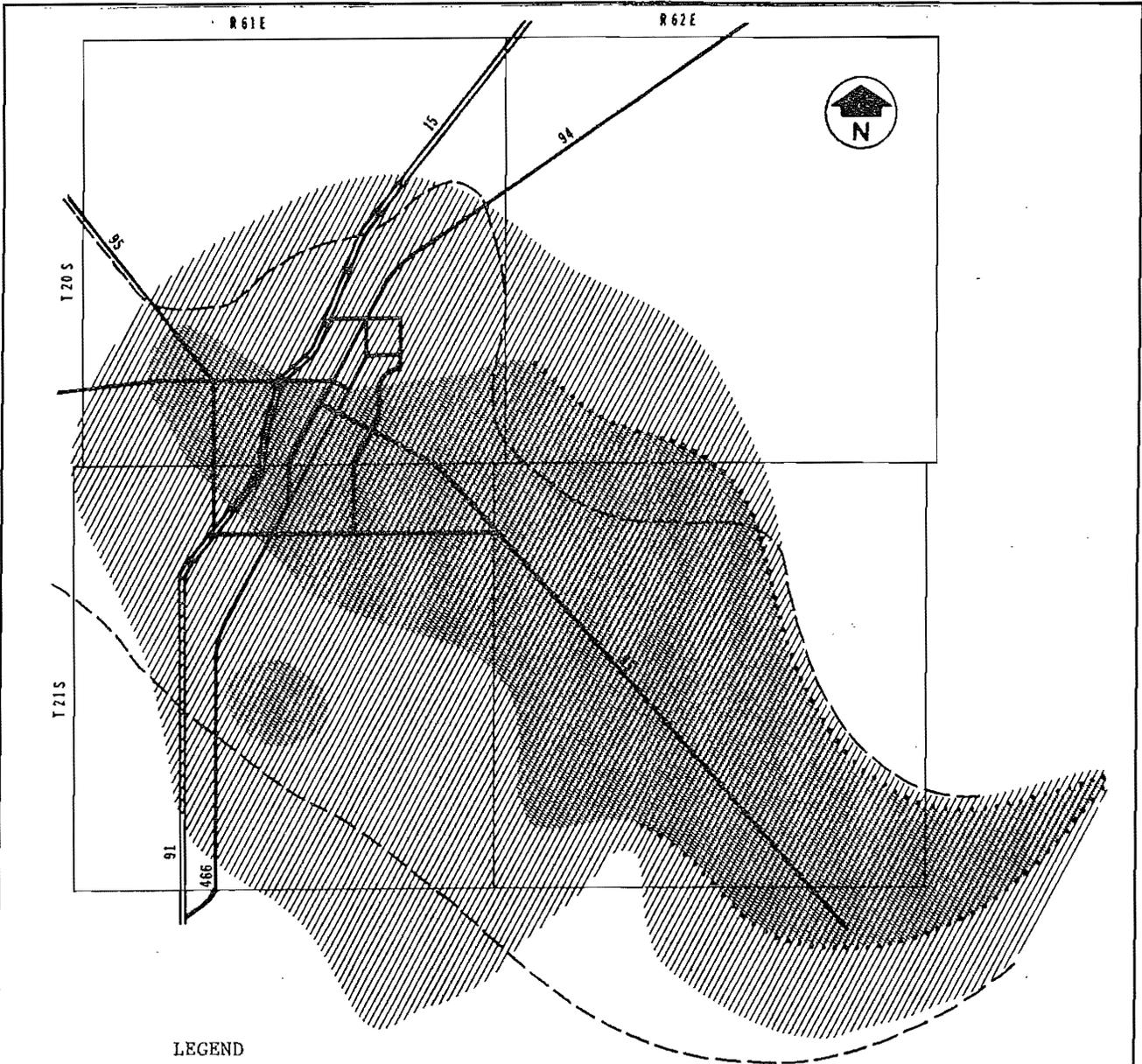
To make room for pre-1980 development, large numbers of phreatophytes have been removed from Las Vegas Valley, reducing an important source of near surface reservoir discharge. A simultaneous increase in recharge has been caused by excessive lawn irrigation, which accounts for nearly 70 percent of the total annual recharge to the near surface reservoir in the "urban core" region. The net impact of pre-1980 development on the near surface reservoir has been an increase in the amount of water stored and a concomitant rise of the water table in parts of the "urban core" region.

The subsurface water management plan of the proposed 208 Plan attempts to prevent continued hazardous rising of the water table if the recommended educational programs are successful in bringing about improved lawn watering practices. The reduction in per capita lawn irrigation called for by the plan will reduce recharge while proposed conservation of phreatophyte areas and encouragement of near surface groundwater use will increase discharge, causing a potential net reduction in near surface groundwater storage.

Subsurface Water Quality Impacts

The proposed subsurface water management program would establish a coordinated network of test wells throughout the Valley with periodic data gathering of water quantity, water quality, and land subsidence related information. Proper location of test wells should identify areas where subsurface water quality is degraded by (1) effluent reclamation activities, (2) septic tank leach field drainage or (3) leakage of contaminated or saline shallow groundwater into deeper aquifers.

Present wastewater reclamation activities have locally degraded underlying groundwaters, although this has not interfered with beneficial uses of these waters. Future prospective reclamation areas would be identified through a proposed '201' facilities plan for wastewater reuse, which would serve to determine groundwater transport phenomena and potential contamination problems prior to initiation of groundwater activities. Septic tank performance in Las Vegas Valley and selected outlying areas would be improved



LEGEND

-  Limits of area with water table within 50 ft. of surface (from Kaufman, 1976)
-  Limits of area with water table within 10 ft. of surface (from Converse-Davis data)
-  Limits of area with water table within 10 ft. of surface, Inferred.
-  Boundary of area with net rise in near surface water level

Redrawn from URS, 1978, Subsurface Water Interim Report No. 3



earth metrics
1000 elwell court
palo alto, ca. 94303

FIGURE 9. NEAR SURFACE WATER DEPTHS.
LAS VEGAS VALLEY

through recommended septic tank maintenance checks performed at times of pumping and/or change in property ownership. Additionally, maintenance checks would be performed routinely in areas where septic tank operation may interfere with beneficial use of the underlying (near surface) groundwater.

Generally, areas of shallow groundwater leakage into principal aquifers do not occur where the shallow groundwater is of poor quality: leakage zones occur in the western area of the Valley, while areas of poor quality shallow groundwater occur in the southeast (Subsurface Water Management, Interim Report No. 3). In the few instances where degraded shallow groundwater may interfere with principal aquifer usage, the monitoring program should be adequate to identify potential problems and to recommend measures (e.g., different pumping strategies, closing of abandoned wells, etc.) to minimize contamination hazard.

Surface Water Quality Impacts

Surface water quality will be affected by the proposed 208 plan in three major areas in the Clark County sphere of influence: (1) Las Vegas Wash, which will receive (a) secondary effluent for marsh maintenance and (b) storm flows from the urban area; (2) Las Vegas Bay and Lake Mead, which will receive (a) the remainder of wastewater effluent (treated by AWT) not used for marsh maintenance or in-Valley reuse and (b) urban storm flows (3) Virgin and Muddy Rivers, which receive agricultural return flows from agricultural areas in the Virgin and Moapa Valleys and which flow into the Overton Arm of Lake Mead.

Las Vegas Wash. The proposed plan recommends release of secondary wastewater to the upper marsh. Approximately 9,900 acre-feet/year would be required to maintain the marsh vegetation without impacting the Bureau of Reclamation Salinity Control Unit. This release of wastewater is recommended to be discharged via a flow distribution system (to be designed as a part of the Wetlands Park Study) and would be totally consumed by marsh evapotranspiration at a point just downstream of Pabco Road. Principal water quality effects upon the Las Vegas Wash are projected to be:

- lowered oxygen demand and solids levels attributable to improved secondary treatment;
- possible increase over present dissolved oxygen levels (the Wash is anaerobic in many stillwater locations) attributable to lowered oxygen demand and increased surface area for reaeration;
- increased salinity levels due to wider distribution, increased evaporation, and decreased dilution. Salt levels will increase downstream, with highest concentrations below Pabco Road. Soil salinity in the downstream fringe areas will increase beyond the estimated 18,000 mg/l maximum tolerance for cattails, resulting in replacement of cattails with more salt tolerant species; and
- minimal or no impact upon operation of the proposed Bureau of Reclamation Salinity Control Unit.

Las Vegas Bay and Lake Mead. Wastewater effluent flows at the Northshore Road monitoring station would consist entirely of AWT effluent during dry periods. State receiving water quality standards for this station should be met by AWT effluent, although the suspended solids standard will certainly be violated if the Northshore headcut facility is not constructed.

Stormwater quality is more problematic. Limited water quality data taken at the Northshore Road monitoring station indicates that after storm events State receiving water quality standards are probably violated at present for the following constituents: suspended solids, BOD₅, COD and fecal coliform. Additionally, the State phosphorus loading standard of 400 pounds/day during April-October may be exceeded for year 2000 stormflows (Surface Water Quality, Interim Report No. 2). Stormwater quality data taken after the 16-17 August, 1977 storm are compared with receiving water quality standards for Northshore Road in Table 8.

Implementation of the proposed control measures for stormwater management and the recommended water quality monitoring program for Las Vegas Wash will provide information on the effectiveness of the Wash and control techniques for reducing stormwater oxygen demand, nutrients, and pathogenic bacteria. However, there is presently no assurance that standards will be maintained at Northshore Road. In the event of non-compliance, further detention and treatment measures would be investigated, although present indications are that costs for such facilities would be very high (Alternative Water Quality Management Strategies, Management Report No. 4). This may be further complicated by partial reduction of marsh environment available for natural treatment of urban runoff through implementation of the proposed Las Vegas Wash Alternative III-A. Marsh treatment of stormwater was identified in Surface Water Management, Interim Report No. 2 as a major mechanism in reducing existing pollutant loads to Las Vegas Bay.

Virgin and Muddy Rivers. The Agriculturally Related Diffuse Sources Study was undertaken by the County Conservation District to determine possible reductions in agricultural salts and other pollutant contributions to the Colorado River. No federal salt loading standards are set for the Virgin and Muddy Rivers, which are tributary to the Colorado River. However, the Muddy River does have a salinity (TDS) concentration standard of 500 mg/l. Present standards for these waterways are enforced by the State Division of Environmental Protection and include pesticides, dissolved oxygen, phosphorus, nitrogen, total dissolved solids (Muddy River only), fecal coliform, and biochemical oxygen demand (BOD).

The 208 Program is presently preparing recommendations for revising the water quality standards to reflect sampling locations, season, and ambient water quality conditions. State standards being reviewed include phosphorus, nitrate, fecal coliform, BOD, suspended solid, turbidity, temperature and Muddy River salinity standard of 500 mg/l.

Best Management Practices (BMPs) identified by the Conservation District for the Virgin and Muddy Rivers have a total salt reduction potential of 16 to 24 thousand tons/yr by year 2000. This is approximately half of the salt reduction potential of the first stage of Las Vegas Wash Unit. It is

Table 8 . Preliminary Stormwater Quality Data¹ Compared with State Receiving Water Quality Standards² for Northshore Road.

(All parameters are in mg/l except coliform bacteria MPN/100ml)

Parameter	Northshore Road Data ¹	North Shore Road Standard ²	
		Mean Monthly Value	Single Value in 90% of Samples
Dissolved Oxygen	None	≥5.0	≥4.0
Biochemical Oxygen Demand	76.5	≤10.0	≤15.0
Chemical Oxygen Demand	121	≤40	≤50
Suspended Solids (Total non-filtrable residue)	2541-3333	≤2.0	≤5.0
Total Phosphorus	0.17	≤0.5 ³	≤1.0
Nitrate Nitrogen	2.97-2.99	None	None
Fecal Coliform	1.7x10 ⁷	200 ⁴	None
Turbidity	None	≤5.0	≤10.0

¹ Taken 17 August 1977 at North Shore Road (Surfact Water Management, Interim Report No. 2) Note: This data is preliminary and subject to error. Further sampling and analysis will confirm test results.

² State of Nevada, 1975.

³ But not to exceed 400 pounds/day during April-October.

⁴ The fecal coliform concentration, based on minimum of 5 samples during any 30-day period shall not exceed a geometric mean of 200 per 100 milliliters nor shall 10% of the total samples during a 30-day period exceed 400 per 100 milliliters.

anticipated that positive reductions in other parameters will also be effectuated with implementation of the recommended practices. Levels of phosphorus, nitrogen and fecal coliform in the Virgin River are occasionally above the present standards, and if standards are maintained, may remain in violation. However, with implementation of BMP's, water quality is expected to improve (Agriculturally Related Diffuse Sources Study, CCCD). Existing standards are being reviewed to reflect natural conditions. Levels of phosphate, fecal coliform and TDS in the Muddy River also violate present standards. Revised standards and improved data may prove the Muddy River to be in compliance with standards, although phosphorus and coliform concentrations may be problematic. Agricultural pesticide applications are predicted to continue at a low level to the Virgin Valley and at increasing levels (due to urbanization impacts) to the Moapa Valley. No pesticide control plan was indicated, on the assumption that phasing-in of biodegradable pesticides will occur in coming years.

Mitigating Measures

Subsidence Hazard. Measures to prevent further subsidence in the Valley would necessitate (1) accurate establishment of the safe recharge of the principal aquifers and (2) reduction of Valley groundwater withdrawals to this level. Implementation of these measures would be rendered difficult by the unavailability of adequate data on subsurface hydrogeologic characteristics, the existence of groundwater pumping permits in excess of the likely safe recharge quantity, and demand for high quality water.

Flood Hazard. No mitigating measures are recommended for flood hazard from storms of greater than the 10-year frequency presently used as a criterion for design of flood control facilities. However, a cost-benefit analysis of the effectiveness of the 10-year criterion may indicate the desirability of larger facilities to accommodate less frequent, higher volume storms.

High Near Surface Groundwater Levels. No mitigating measures beyond the proposed Subsurface Water Management Program are recommended.

Subsurface Water Quality Impacts. No mitigating measures are recommended beyond the proposed plan as discussed above.

Surface Water Quality Impacts. No mitigating measures are necessary for Las Vegas Wash water quality, beyond the proposed management programs.

Although stormwater quality impacts upon Las Vegas Bay may cause exceedance of standards as described above, the proposed stormwater management program represents the most viable mitigating measures presently available which can be implemented within the existing financial constraints. Phase II of the proposed Stormwater Management Program would investigate stormwater detention and treatment facilities, although this would likely be extremely costly. Although maximization of marsh area within Las Vegas Wash would be an effective natural treatment mechanism, the degree of pollutant removal to be expected is unknown; additionally, marsh expansion would impact operation of the Bureau of Reclamation Salinity Control Project.

Water quality impacts upon the Virgin and Muddy Rivers will be more accurately determined with additional data and continued investigations into

the adequacy of present standards. Present knowledge of the effectiveness of the pollutant removal capabilities of BMPs is insufficient to require formulation of additional control strategies, and it is recommended that present monitoring be continued and expanded where necessary until adequate data have been collected.

Traffic and Transportation

Increased Traffic Congestions

The majority of the major roadways in Las Vegas (especially the east-west arteries in the downtown area) are projected to be overcapacity by the year 2000 under the proposed land use strategy, according to traffic estimates developed by the State of Nevada Department of Highways (Clark County Transportation Study, 1978). Peak hour traffic volumes are projected to be above the capacity of many major roadways, even with completion of currently planned improvements. Peak hour speeds on many of these traffic arterials are predicted to be less than 10 miles per hour*. Table 9 shows the volume to capacity ratio and peak hour speeds estimated for various major roadways in Las Vegas. Additional roadway expansions (other than those already planned) would be impractical in the already developed areas of Las Vegas, and would probably be prohibitively expensive in many cases. Increased traffic volumes and reduced vehicle speeds will also have significant adverse impacts upon air quality conditions in the Valley (see Air Quality Impacts).

Low Transit Feasibility

Mass transit appears to be an essential part of any future transportation system envisioned for the Las Vegas area. A continued reliance on private motor vehicle usage is not an adequate solution to the transportation problem. Based upon land use projections for the recommended development strategy, residential densities may not be sufficiently high to make an expansion of the existing transit system economically feasible (except possibly in limited areas, such as along the Strip). Alternate modes of mass transit suitable for low density development patterns (such as jitneys, park and ride services, company van pools) are being investigated. A land use development plan that calls for high density residential areas could be recommended by the developing Clark County Air Quality Implementation Plan. This could make other types of transit solutions possible in the Valley.

Mitigating Measures

The following recommendations would increase the usefulness of existing and planned roadways in the Las Vegas area:

- Various transit systems are being investigated to determine which could be most effective in alleviating the peak hour traffic congestion problems anticipated for the Valley. The effect of land use configurations upon transit feasibility should be thoroughly investigated;
- the signalization system in Las Vegas is being studied in order to handle the increasing traffic volumes and allow for coordination between city and county signal systems;

* assuming no roadway improvements beyond those presently planned

Table 9 . Volume to Capacity Ratio and Peak Hour Speed for Selected Major Roadways, Year 2000

Roadway	Volume to Capacity Ratio	Peak Hour Speed (miles per hour)
Flamingo Road at Las Vegas Boulevard	1.77	7.6
Sahara Avenue at Eastern Avenue	1.66	7.6
Charleston Boulevard at Las Vegas Boulevard	1.09	5.7
Charleston Boulevard at Decatur Boulevard	1.05	9.9
Lake Mead Boulevard at Las Vegas Boulevard	0.61	8.2
Eastern Avenue at Sahara Avenue	0.80	6.2
Las Vegas Boulevard at Charleston Boulevard	0.92	7.1
Las Vegas Boulevard at Flamingo Road	1.22	7.8
Las Vegas Boulevard at Lake Mead Boulevard	0.51	6.2
Decatur Boulevard at Charleston Boulevard	1.00	7.1

Source: Clark County Transportation Study, 1978.

Note: This information should be considered to be tentative since the ongoing Transportation Study will identify future improvements to mitigate traffic congestion.

- car pooling is being encouraged/(with preferential lanes and/or parking facilities)/to achieve a higher occupancy rate for private motor vehicles;
- on street parking and left hand turns should be prohibited on major roadways during the peak hour traffic periods;
- left and right hand turning lanes should be added wherever it is necessary to separate turning and through traffic; and
- access to major arterials from commercial developments should be limited in order to reduce turning movements on these roadways.

Air Quality

Based upon preliminary assumptions of the ongoing Air Quality Implementation Plan (AQIP) process, the analysis below outlines future trends in the air quality of the Las Vegas Valley with respect to the three problematic pollutants for which the Valley was designated an Air Quality Nonattainment Area: carbon monoxide (CO), photochemical oxidant, and total suspended particulate (TSP). The Las Vegas Valley Air Quality Implementation Plan, to be completed by January 1, 1979, will present refined analyses based upon comprehensive control strategies intended to achieve the ambient air quality standards.

Table 10 presents the ambient air quality standards applicable to the Las Vegas Valley. Developed to protect human health and well-being, the standards are the criteria by which year 2000 air quality in the Valley is assessed. Hence, the present analysis is indicative of the degree to which additional control strategies may be required in order to meet the ambient air quality standards.

Carbon Monoxide

Carbon monoxide levels are most sensitive to transportation factors because a large portion of this pollutant is emitted by motor vehicles. Table 4 presents the year 2000 forecast emission of CO under Land Use Alternative II versus baseline CO emission for the year 1975. CO emission was calculated for two cases: 0.2 percent and 15 percent transit ridership, respectively. Little difference in resultant air quality was found to result between the two. Assuming implementation of preliminary AQIP control strategies, calculations of year 2000 CO emissions indicate only a 45 percent reduction from baseline year 1975 CO emissions; moreover, the magnitude of the reduction indicates that, on days of worst case meteorology, citywide violations of the 10 milligram per cubic meter, eight-hour standard for CO will result. In particular, the central metropolitan area, especially Main Street, Las Vegas Boulevard/Fremont Street, and Charleston Boulevard will exceed the standard without implementation of additional control strategies beyond those listed below in Table 11.

Microscale CO levels were modeled at five critical intersections in the Valley. Table 12 presents ~~expected~~ worst case, eight-hour CO levels along the modeled roadways. With addition of the CO background level, Las Vegas Boulevard and Charleston Boulevard are predicted to be in violation of the 10 milligram per cubic meter standard in the year 2000. Without further control strategies beyond those noted, the other intersections in Table 12 will approach or exceed the standard for eight-hour levels of carbon monoxide.

Photochemical Oxidant

Oxidant formation in the Las Vegas Valley is highly dependent on the emission of non-methane hydrocarbons and nitrogen oxides, precursor molecules of oxidant. Future oxidant levels under Land Use Alternative II were approximated through review of expected reduction of year 2000 non-methane hydro-

carbons tonnage below that of baseline year 1975. These tonnages are displayed in Table 11. The 25 percent reduction in year 2000 emissions of reactive hydrocarbons would be approximately reflected in a similar reduction of oxidant levels below those monitored in 1975; without additional control strategies, violations of the ambient air quality standard for oxidant are expected in the Las Vegas Valley in the year 2000. Future oxidant levels are not strongly affected by alternate land use strategies because off road sources comprise 50 to 60 percent of the total reactive hydrocarbons tonnage in the year 2000. In other words, measures other than land use/transportation planning would likely be needed to achieve the oxidant standard in the year 2000.

Total Suspended Particulate

Although total suspended particulates are a problem air pollutant in the Valley, TSP emissions are only marginally sensitive to land use/transportation alternatives. Critical sources include construction activities, unpaved roads, and cleared areas, not considered in the present analysis. Since construction, the paving of roads, and the building up of cleared areas are inherently an aspect of growth in the Valley, these are being considered as control measures in the Las Vegas Valley Air Quality Implementation Plan. While construction will likely remain a major source of total suspended particulate emission, street sweeping and improvements in construction management practices posed under the stormwater management program will also serve to reduce particulate blowoff and ambient TSP levels, to a degree which has not yet been determined.

Mitigating Measures

The Clark County Transportation Study and Las Vegas Valley AQIP will develop transportation, land development and other control measures necessary for attainment of Federal and State air quality standards. This may entail an overall land development plan designed to maximize transit use and minimize private auto use, and it is recommended that the proposed development strategy (Alternative II) be designated as temporary until such time as evaluation of the effects of land use upon air quality are fully developed.

Table 10 . Ambient Air Quality Standards

Pollutant	Averaging Time	Nevada and Clark County Standards	National Standards	
			Primary	Secondary
Oxidant (Ozone)	1 Hour	160 ug/m ³ (0.08 ppm)	160 ug/m ³ (0.08 ppm)	Same as Primary Std.
Carbon Monoxide	8 Hour	10 mg/m ³ (9 ppm)	10 mg/m ³ (9 ppm)	Same as Primary Standard
	1 Hour	40 mg/m ³ (35 ppm)	40 mg/m ³ (35 ppm)	
Nitrogen Dioxide	Annual Average	100 ug/m ³ (0.05 ppm)	100 ug/m ³ (0.05 ppm)	Same as Primary Std.
Sulfur Dioxide	Annual Average	60 ug/m ³ (0.02 ppm)	80 ug/m ³ (0.03 ppm)	--
	24 Hour	260 ug/m ³ (0.10 ppm)	365 ug/m ³ (0.14 ppm)	--
	3 Hour	1300 ug/m ³ (0.5 ppm)	--	1300 ug/m ³ (0.05 ppm)
Suspended Particulate Matter	Annual Geometric Mean	60 ug/m ³	75 ug/m ³	60 ug/m ³
	24 Hour	150 ug/m ³	260 ug/m ³	150 ug/m ³
Hydrocarbons (Corrected)	3 Hour (6-9 A M)	160 ug/m ³ (0.21 ppm)	160 ug/m ³ (0.21 ppm)	Same as

Table 11. Las Vegas Valley Year 2000 Emission of CO and HC Under Land Use Alternative II.*

Emission Source	Daily CO Tonnage		Daily Hydrocarbons Tonnage	
	1975	2000	1975	2000
Industry	12	12	0.0	0.0
Petroleum Marketing	0	0	5.2	7.2
Organic Solvent Use	0	0	1.5	3.6
Fuel Combustion	1	3	0.3	0.7
Off Road Vehicles	6	7	1.4	2.5
Jet Aircraft	11	6	4.0	2.1
Piston Aircraft	2	3	0.1	0.1
Railroads	1	2	1.1	2.4
On Road Vehicles	221	107(1)	30.2	14.4(2)
Mobile Total	241	125	36.8	21.5
Stationary Total	13	15	7.0	11.5
Grand Total	254	140	43.8	33

(1) 107 ± 20 tons daily, uncertainty only in percent transit ridership/average travel speed.

(2) 14.4 ± 2 tons daily, uncertainty only in percent transit ridership/average travel speed.

Notes. The following lists assumptions used in developing the year 2000 emission inventory for CO and HC:

- CO On Road Vehicles emission factors as in Mobile Source Emission Factors, EPA, (1978);
- Inspection and maintenance (I/M) program to control CO and HC, with a 40 percent failure rate;
- On Road Vehicles fleet consisting of 3.0 percent heavy duty vehicles, 11.3 percent light duty trucks, 77.4 percent light duty vehicles subject to I/M, and 8.6 percent light duty vehicles not subject to I/M, for 0.2 percent transit ridership case;
- For 15 percent transit ridership case, On Road Vehicles fleet consisting of 7.5 percent heavy duty vehicles, 11.3 percent light duty trucks, 72.6 percent light duty vehicles subject to I/M, and 8.6 percent light duty vehicles not subject to I/M;
- Ambient temperature of 75 degrees Fahrenheit; and
- For hydrocarbons, Stage I Vapor Recovery.

*This information should be considered tentative since the ongoing air quality planning study will update the emission inventories and projections.

Table 12. Land Use Alternative II Microscale CO Modelling Results for the Year 2000 (mg/m³)

Roadway Segments	Predicted CO Eight-Hour Levels at 50 Feet				
	Without Background			With Background	
Sahara Avenue/Eastern Avenue	3-5			8-11	
north	1-2			7-8	
west east	2-3	2-3		7-9	7-8
south	1-2			6-7	
Las Vegas Boulevard/Lake Mead	2			9-10	
north	1			8-9	
west east	1	1		8-9	8-9
south	1			8-9	
Decatur Boulevard/Charleston	3-4			7-8	
north	2			5-6	
west east	1	2		5	6
south	1			5-6	
Las Vegas Boulevard/Charleston	3-5			13-16	
north	1			11-12	
west east	2	2-3		11-13	11-14
south	1-2			11-12	
Las Vegas Boulevard/Flamingo	5-7			9-11	
north	3			6-7	
west east	2-3	2-3		6-7	6-7
south	3-4			6-8	

Noise

The prominent noise sources in the future in Clark County will continue to be aircraft and roadways. In the vicinity of the Union Pacific Railroad lines, railroad noise will also continue to be important. Under the proposed Land Use Alternative II the impacts of aircraft noise will be minimized, as new noise sensitive land uses would be discouraged in aircraft noise impact zones. Land uses impacted by roadway and railroad noise would not be protected through development restrictions, and other means of reducing or eliminating the noise impact may be required.

Roadway and Railroad Noise/Land Use Conflicts

Traffic volumes in the Las Vegas Valley will increase significantly in the future as the population expands. This will result in an increasing potential for conflicts to arise between noise sensitive land uses such as new residential developments and high roadway noise levels. However, future quieter motor vehicles should be in use by the year 2000 as a result of Federal legislation, which should limit the amount by which noise levels will increase. In those areas which experience limited growth in traffic levels, a decrease in noise levels below existing levels may even be expected.

Table 13 presents estimated distances at which pertinent noise levels are achieved for the year 2000, for selected segments of roadways, based upon traffic projections developed by the Clark County Transportation Study (1978). The predictions were made using the noise prediction model described in 208 Environmental Report No. 2, Land Development Suitability Analysis. For future roadway noise predictions this model has been modified to account for quieter future vehicles. The predictions in Table 13 are in terms of Federal Highway Administration (FHWA) noise standards using the L_{10} noise scale (noise level exceeded ten percent of the time) of 70 dBA for residential land uses. Also, using the L_{dn} noise scale (Day-Night Average Noise Level), the suggested L_{dn} standard of 60 dBA for residential land uses is presented. See 208 Environmental Report No. 2, Land Development Suitability Analysis for complete description of the above noise scales and standards.

As can be seen from Table 13, residential developments which are located near major roadways in the Las Vegas Valley will have a significant potential for being impacted by the roadway noise, even if located adjacent to lesser travelled arteries. The relative degree of acknowledged impact would depend upon the noise standard used (L_{dn} or the more lenient L_{10}). Due to the extensive roadway network in Las Vegas Valley, it may only be practical to determine the noise levels emanating from roadways as they impact new noise sensitive land uses proposed for development.

The Union Pacific Railroad is also a very significant noise source, although only at locations in the vicinity of the railroad tracks. Existing L_{dn} contours are currently available for the main line tracks, but not for the spur lines which extend out from the main line. Existing contours for the spur lines need to be developed. It is difficult to assess what

Table 13 . Estimated Distances from Selected Roadway to L_{10} and L_{dn} Noise Standard Contours for the Year 2000 (meters (feet)).

Roadway Segment	Projected Average Daily Traffic	Noise Standard	
		70 L_{10}	60 L_{dn}
Sahara Avenue at Eastern Ave	55,000	45(150)	75(255)
Las Vegas Boulevard at Lake Mead Boulevard	16,000	20(70)	35(120)
Decatur Boulevard south of Charleston Boulevard	27,000	30(105)	50(165)
Charleston Boulevard at Las Vegas Boulevard	37,000	35(120)	60(200)
Las Vegas Boulevard at Flamingo Road	75,000	60(200)	105(350)

change in railroad noise levels may occur in the future, due to uncertainties in the future use of railroads. As a result, unless estimates to the contrary can be made, it must be assumed that future railroad noise levels will be similar to the existing levels.

Aircraft Noise/Land Use Conflicts

The recommended land development strategy would prohibit the development of new noise sensitive land uses in the areas of Las Vegas Valley impacted either now or in the future, by aircraft noise. For residences, schools, hospitals, and similar land uses, this would require that only noise tolerant types of development take place within the 30 NEF (Noise Exposure Forecast) contour surrounding Las Vegas Valley airports. Noise tolerant land uses, such as commercial and industrial uses, could still be located in areas with noise levels well above 30 NEF, provided that adequate sound attenuation measures are developed for areas with normally low noise levels, such as office areas or portions of buildings where the public is received. Refer to Table 10 "Residential Exposure to Aircraft Noise", Figure 11 "Noise Exposure Forecast (NEF) Values Recommended for Various Land Uses", and Table 16 "Generalized Land Use Compatibility Guidelines", in 208 Environmental Report No. 2, Land Development Suitability Analysis, for more detailed NEF noise levels at which various land uses are normally considered compatible. Accident potential should also be considered.

The above mentioned land use compatibility guidelines define the maximum NEF noise levels which typically can be allowed while still protecting the public against activity interference or annoyance. These levels are not of critical relevance to protecting the public from physiological effects such as premature hearing loss in typical airport environs, as the levels defined by the 30 NEF contour are not high enough or of long enough duration to induce hearing loss problems except at selected locations very close to airports.

To quantify the areas of Las Vegas Valley which are now, and in the future will be, exposed to high aircraft noise levels incompatible with various land uses, it is essential that the locations of the critical NEF contours be accurately known. Where new contours are necessary to assess future (or existing) operating conditions, either local government or airport authorities should be responsible for insuring that such noise planning takes place. Subsequently, local government must also insure that land use development patterns occur in a manner compatible with the airport noise levels. This may be accomplished by effective zoning or other regulatory methods. Existing developments found to be in areas with incompatible noise levels should be examined, to determine if any measures, such as soundproofing of buildings, are practical, or desirable, to relieve the incompatibility. Presently available contours and the need for development of new contours at the three major airports in Las Vegas Valley (Nellis Air Force Base, McCarran International Airport, North Las Vegas Air Terminal) are examined below.

At Nellis Air Force Base existing NEF contours are presently available. These contours are not expected to change substantially in the future, based

upon future aircraft operations. However, if changes in projected operation should occur in the future, the existing contours should be updated.

McCarran International Airport also has existing NEF contours available. However, these contours are not valid for future years for the following reasons: (1) significant annual increases in aircraft operations are expected to continue in the future (approximately 4.8 percent increase per year), both by transport jet aircraft as well as general aviation aircraft; (2) future transport jet aircraft also must be quieter than existing aircraft to meet Federal regulations; (3) expansion of the facilities to meet projected operational demands will result in new areas, chiefly to the south of the existing airfield, becoming noise impacted. As a result of these expected changes at McCarran International Airport, future NEF contours must be developed if the areas which will be exposed to significant aircraft noise levels are to be accurately defined.

North Las Vegas Air Terminal currently has neither existing nor future NEF noise contours available. Existing noise levels certainly must be considerably lower than the levels associated with McCarran International Airport, due to fewer aircraft operations and no transport jet aircraft operations. Small general aviation aircraft comprise the vast majority of the current operations. Some of the developable land near the airport most likely is exposed to noise levels above compatible levels. As the number of operations continues to increase, with potential for an increased portion of noisier air cargo and corporate aircraft, the area surrounding North Las Vegas Air Terminal exposed to incompatible noise levels will increase. Future contours should be developed to determine the extent of the high noise levels associated with the airport, such that development patterns compatible with the aircraft noise may take place.

Even with compatible development strategies based upon computed noise contours for North Las Vegas Air Terminal, increasing small aircraft training operations may produce noise annoyance to developments outside contours. This would be due to training and touch-and-go operations, and may necessitate a local community survey and noise monitoring to adequately define noise impacted areas.

Mitigating Measures

The following measures are suggested to minimize impacts described above:

- Local government should insure that impacts from roadway and railroad noise on proposed developments are determined. Appropriate measures to relieve the noise impacts must be implemented. These could include construction of noise barriers, soundproofing of buildings, relocation of noise impacted portion of development to quieter areas, or other appropriate measures;
- NEF contours for future operational conditions at McCarran International Airport and North Las Vegas Air Terminal should be produced. Existing contours should also be produced for North Las Vegas Air Terminal;

- Land use patterns which are compatible with revised contours and those from Nellis Air Force Base should be formulated by local government; and
- Existing developments which are found to be incompatible with airport noise zones should be examined, to determine if any noise control measures are practicable or desirable to relieve the incompatibility.

Visual Factors

Two important components of the visual environment in the Las Vegas Valley planning area are the natural setting and urban form. Growth as it is projected by the recommended land use pattern will affect both components in a variety of ways, which are summarized below. The major adverse impacts of the projected land use pattern will result from a continuation of the current dispersed, scattered mode of development. The major advantage of the recommended land use pattern is protection of the 100-year floodplain from further development, which indirectly provides protection of a significant visual element of the natural setting. The recommended land use plan also will result in industrial zones around McCarran Airport and Nellis Air Force Base within the 30-40 NEF noise impacted areas, where only industrial and residential uses at densities of one dwelling unit per five acres are permitted, and inner zones immediately around the airports with NEF levels above 40 where no further development of any kind is permitted. The visual effect of this measure will be a gradual isolation of the existing residential uses within these zones, and eventual replacement of them with industrial uses in the outer zone and airport-related uses within the inner zone.

Summary of Impacts

Natural Setting. Growth will affect the natural setting through direct preemption of now vacant land, where development will occupy open space, and through a changed perception of the natural setting, resulting from intensified building, where structures will block views, and increased air pollution which will lower visibility and decrease sight distances.*

The desert which now surrounds the urban area and forms an important part of the visual setting will be encroached upon by low density residential development. An additional 22,000 acres of low density development is projected for areas outside the presently urbanized center. If the current development pattern continues, large areas of the desert will be covered randomly. Continuation of this scattered, dispersed land use pattern will seriously degrade the integrity of the natural setting.

A significant visual alteration of the mountain backdrop could occur as a result of the projected land use pattern, if development is allowed on the slopes of the surrounding mountains. Highly reflective building materials and grading of slopes or alteration of landforms would disrupt the present natural character of the mountains.

*Increased air pollution will result from a continued low rate of transit ridership (presently .2%). It is estimated that an increased transit ridership to 15% would serve to improve visibility. Findings of the Clark County Air Quality Implementation Plan will provide further information on this matter.

The desert floor and mountain ranges as perceived from a distance will be altered by new development on the outskirts of the urbanized area, by infilling of the already developed area, and by construction of new high rises and buildings over two stories.

Without further development of the floodplain areas for recreation or visual purposes, the washes will function primarily as open space corridors, preserving some views of the mountains from within urbanized areas. With landscape and recreational development, the washes could become important landscape buffer zones to visually separate communities and neighborhoods, providing visual interest and contrast as well as accessible recreational opportunity in close proximity to residential areas.

Urban Form. Two major impacts on urban form will result from the recommended land use pattern: the emergence of a central core area, and continued dispersed low density residential development.

Projected increases in commercial, gaming and multiple residential development indicate the emergence of a large centralized core area. The center of this core area will be the Strip and nearby McCarran Airport, bounded by Maryland Parkway on the east, Sunset Road on the south, Interstate 15 on the west, and Sahara on the north. This area will undergo intensive development of gaming and commercial interests with high rise hotel towers and office buildings. The larger central area is expected to develop expanded commercial facilities and multiple housing units. The boundaries of this larger area are Interstate 15 on the west, Charleston Avenue on the north, Nellis Boulevard on the east, and Tropicana Boulevard on the south. Intensification of development in this area will result in a new visual structure for Las Vegas, with a denser, more consistent pattern, visibly distinguished from the low density surrounding areas. The potential disadvantages of this new visual structure are lack of definition, disorientation, obstruction of views, and congestion, not only from cars, but congestion of building types and styles with no visual coherence.

The second major impact would result from continuing the loose disorganized pattern of low density development with scattered vacant lands between developments, causing a degradation of the desert setting, and a homogeneous, visually undistinguished urban sprawl. Heavy residential growth is projected for the areas west and southwest of the presently urbanized area, and for the Green Valley-Paradise Valley area west of Henderson. Both these areas are expected to undergo rapid, large scale residential development. Development in the Green Valley-Paradise Valley area is expected to radically change the visual character of the rural area, and visually link the now separate cities of Henderson and Las Vegas.

The projected urban growth indicates a relatively low rate of residential development for North Las Vegas. This City already suffers from problems of physically substandard development and its attendant effects on visual quality; these problems are expected to continue, since major development investments are scheduled for the west and south areas.

The older "downtown" area will remain essentially stable, since little vacant land is available for development. The major problem for this area will be that of retaining its present character, and intensifying and upgrading its existing historic quality so that it will continue to function as a viable part of the city, rather than be overshadowed by the emerging new core area.

With the exception of removal of development from the floodplain and noise impacted areas, the recommended land use pattern will have the same visual impacts as the base case land use pattern, Alternative I. (Visual impacts of the base case pattern are detailed in Environmental Report No. 4, Growth Impacts.)

Mitigating Measures

In the absence of natural constraints to direct growth, a number of design measures are available to accommodate the level of development projected for Las Vegas Valley without further degradation of the visual environment. Future development can be guided to avoid preemption of the natural setting, and to enhance and preserve existing visual quality within the urban area. A plan for a new development pattern, if implemented by the Cities and Clark County, would address location of buildings, relationships between structures, preservation of views, provisions for a functional pedestrian system, community and neighborhood visual identity, and full development of wash areas.

RecreationSummary of Impacts

Urban Park and Recreation Provisions. Urban park and recreation acreage needs for all jurisdictions within the Las Vegas Valley planning area are substantial for both 1985 and the year 2000. Provision of adequate service for the projected population includes development and maintenance costs, in addition to acquisition costs indicated by needs for additional acreage. Assuming Clark County Regional Planning Council standards, which are comparable to the National Parks and Recreation Association standards, the total 1985 demand for additional acreage is 4285 acres; by 2000, the total demand is 7801 acres. The standards assumed by individual jurisdictions are considerably lower than those of the Clark County Regional Planning Council's; however, even if the standards of local jurisdictions are assumed, the demand for park acquisition and development will be significant. In 1985, the demand would be 1455 acres; in 2000, the demand would be 3080 acres.

The recommended land use pattern with its dispersed residential growth will place an added burden on jurisdictions providing facilities since duplication of services and facilities will be required to serve low density residential areas.

The recommended land use pattern will make it possible to reserve floodplains as potential urban recreation areas, since floodplain vacant land will be zoned to prevent development, and therefore will be less expensive than if development potential existed. In this respect, the recommended land use pattern is an improvement over the base case projected land use pattern. The floodplains could satisfy a substantial portion of community park acreage needs, and a certain portion of neighborhood park acreage needs, but the location of the floodplains precludes the possibility of their satisfying all community and neighborhood park needs.

Regional Park and Recreation Provisions. Regional recreation acreage provisions are adequate. Facilities to serve the projected population will not be sufficient without new development. Table 14 indicates regional recreation needs for 1985 and the year 2000. A problem exists now of access to regional recreation provisions. The closest regional provision, Red Rock Canyon Recreational Area, is 18 miles from urban Las Vegas.

The recommended land use pattern will make it feasible to develop floodplain areas as accessible regional park provisions. In addition, the recommended Las Vegas Wash strategy provides for maintenance of marsh areas through limited release of effluent, thereby making possible

the proposed Clark County Wetlands Park, now under study by the Clark County Department of Parks and Recreation as a regional recreation area.

TABLE 14

Clark County Regional Recreational Facilities, 1980 Supply,
and Projected Need for the Years 1985 and 2000

Activity	Programmed Supply to 1980	Unmet Need 1985	Unmet Need 2000
Boat Launching (no. of lanes)	36	502	772
Stream Fishing (miles of stream)	16	103	160
Snowskiing (acres)	40*	1,394	2,276
Picnicking (tables)	1,223	865	1,776
Tent/Trailer Camping (sites)	1,674	1,615	3,118
Backpacking Trails (miles)	151	85	76
Swimming Beach (linear feet)	11,800	---	6,919
Horse Trails (miles)	151+	114	114

* In public and private ownership

Mitigating Measures

Full recreational development of floodplain areas will partially mitigate projected acreage deficiencies of neighborhood and community park provisions. Without intensive development, however, these areas are not suitable for recreational use. Most jurisdictions are limited by lack of funds for maintenance and operation of facilities. Through development regulations cities and the County can require developer's fees or contributions to on-going maintenance and operation costs. A countywide plan for urban park and recreation development could be administered with the cooperation of individual jurisdictions through the respective planning departments of each entity. The proposed development of the Las Vegas Wash as a regional facility will mitigate partially the impacts of growth by providing a major accessible regional park.

SchoolsSummary of Impacts

The major impact on the Clark County School District will result from the projected population increase rather than the projected land use pattern. The estimated costs of providing services for this population would be approximately the same for the three alternative land use strategies. (The impact of the projected population increase for the base case was described in detail in Environmental Report No. 4, Growth Impacts.) Clark County School District now employs busing to even out student distributions from areas of overcrowding to areas of declining enrollments. It is anticipated that busing will continue from areas of expanding residential growth on the perimeter of the urban area to inner-city areas; however, a large percentage of the busing is required to meet federal requirements for racial integration, and therefore will not represent a significant impact resulting from the land use pattern.

Mitigating Measures

Because impacts on schools are not related to the recommended land use pattern, but to population increases, no mitigating measures are proposed.

Biology

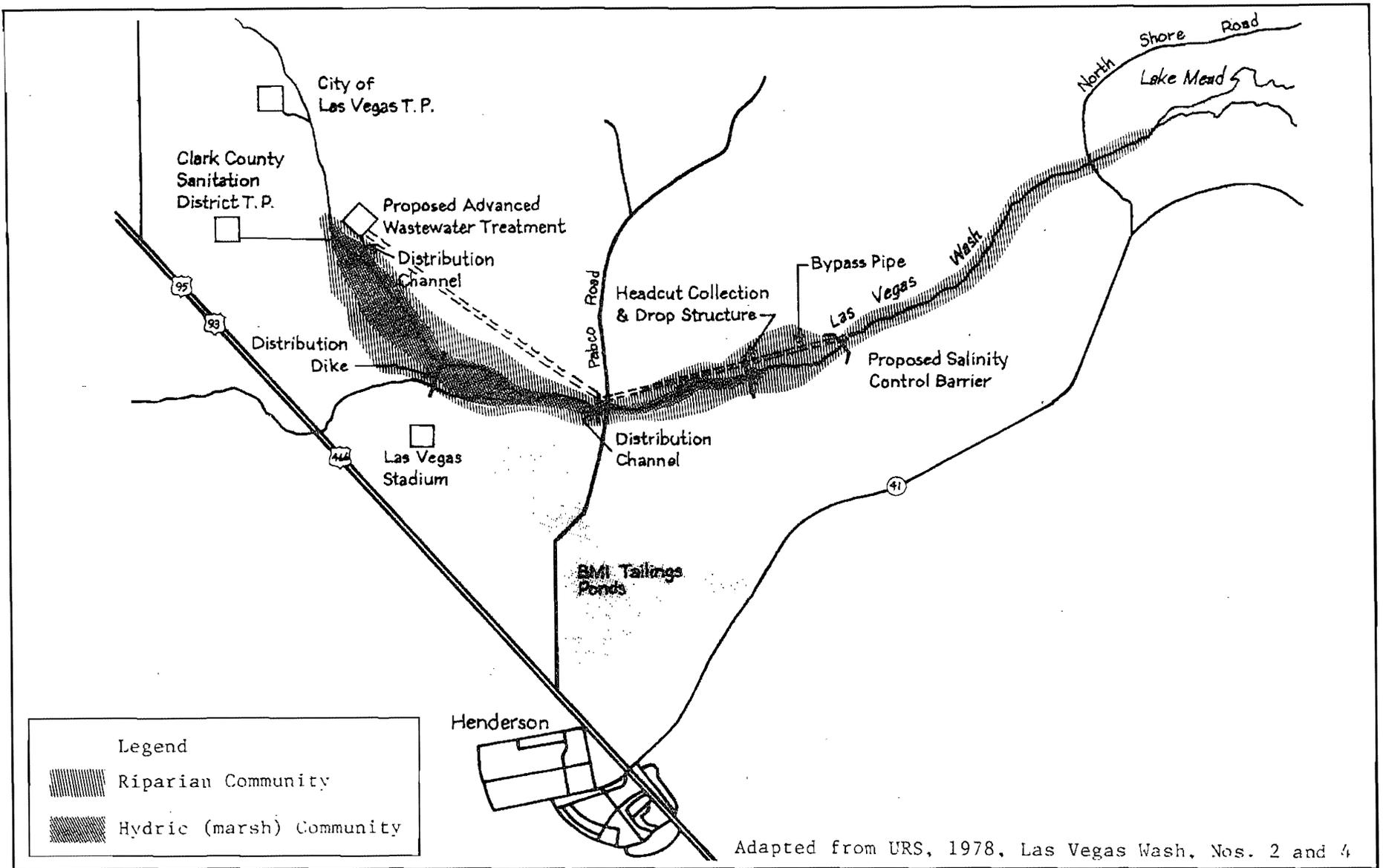
Impacts on Las Vegas Wash Biota

Although the major marsh area which is located upstream from Pabco Road will be maintained, some marsh area below Pabco Road will be converted to riparian communities. The prime limiting factor on marsh vegetation is water availability. The replacement of marsh species, predominately cattail (*Typha angustifolia*) and bulrush (*Scirpus paludosus*), by riparian species will largely result from decreased effluent flow to the lower marsh. The corresponding increase in soil salinity also favors the growth of halophytic riparian vegetation (e.g., salt cedar, honey mesquite, and pickleweed) over cattails which currently exist at salt levels near their salinity threshold. Figure 10 shows estimated extent of marsh vegetation under the recommended plan

Fauna dependent on the marsh, particularly waterfowl, will decline due to direct habitat loss. Indirect impacts on all Wash biota will result from improved public access to the area and park development. These impacts include increased harassment, collection, hunting, destruction of vegetative cover, roadkill, and increased noise.

Rare and Endangered Species

All federally recognized endangered species are protected by law against takes and destruction of their critical habitats. However, it is unlikely that all disturbances to endangered species and other limited wild-life populations can be avoided. These impacts will primarily include the indirect effects of human encroachment on habitat areas (e.g., increased noise, roadkill, predation by domestic pets, illegal hunting and collecting, incompatible recreational uses, etc.), rather than direct development of habitat areas. Species with the most limited habitat areas are likely to be most severely impacted; these species include the Vegas Valley leopard frog and several endemic fish species. The Vegas Valley leopard frog (*Rana pipiens fisheri*) is known to exist only in the lower Las Vegas Wash and at Bluepoint Springs. Increased recreational use of both areas and the anticipated change in Wash vegetation may be detrimental to frog populations. Rare, protected, threatened, or endangered fish species possibly impacted by future growth include: The Pahrump killifish (*Empetrichthys latos*), moapa dace (*Moapa coriacea*), white river springfish (*Crenichthys baileyi*), Colorado bonytail (*Gila robusta elegans*), Colorado squawfish (*Ptychocheilus lucius*), humpback sucker (*Xyrauchen texanus*), woundfin (*Plagopterus argentissimus*), and Virgin River spindace (*Lepidomeda mollispinis mollispinis*). The endangered Pahrump killifish maintains a population of 1500 to 2000 at two Corn Creek ponds which are dependent upon water from the municipally used principal aquifer. Though Corn Creek is at the upper end of groundwater flow, the Department of Fish and Game is concerned that overdraft of the aquifer could eliminate the killifish, the only surviving member of the genus *Empetrichthys*. Extinction is likely for the endangered moapa dace (*Moapa coriacea*), which maintains a small remnant population at the outflow of the warm springs on the Muddy River. Increased utilization of the two major private recreational facilities and potential recreational developments in that area may cause the disappearance of the genus *Moapa*. Adverse impacts to other fish species identified above will result from increased recreational uses (e.g., greater occurrences of accidental catches due to increased angling pressure). The endangered



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FIGURE 10. AREAL EXTENT OF VEGETATION, RECOMMENDED LAS VEGAS WASH PLAN

woundfin and other endemic fish of the Virgin River may additionally suffer from habitat alterations resulting from the Warner Valley Water Project, Bureau of Reclamation Salinity Control Program and agricultural BMP's delineated in the Clark County 208 Program. Currently, the Virgin River is of marginal habitat quality. The success of existing species is largely due to lack of competition, rather than optimal habitat. Factors contributing to the selectivity of this environment include: high salinity, high summer temperatures, low dissolved oxygen, high turbidity, extreme shifting of substrates during flooding, periodic seiches, and relatively sparse food communities. Proposed measures meant to improve water quality could be detrimental to existing species. By improving the habitat, these measures could result in the proliferation of other native and exotic fishes which are able to outcompete the existing endemic species. These measures include:

- 1) decrease in irrigation return flows which currently are beneficial to biota through supplying nutrients to macroinvertebrates, the food source for the woundfin, Virgin River spinedace, and other endemic fish;
- 2) decreased salinity; and
- 3) removal of LaVerkin Springs water which probably serves at present as a deterrent to the introduction of exotic fishes through its characteristic high temperature, low dissolved oxygen, and high sulfur content

Increased recreational use of Lake Mead and the Las Vegas Wash may discourage several rare, endangered, protected or threatened birds (which are only occasionally seen in the area now) from utilizing these water resources. These species include: the California brown pelican (Pelecanus occidentalis), wood ibis (Mycteria americana), ferruginous hawk (Buteo regalis), osprey (Pandion haliaetus), mountain plover (Eupoda montana), long billed curlew (Numenius americanus), and prairie falcon (Falco mexicanus)

Other threatened species possibly impacted by the projected growth in Clark County include the desert tortoise (Gopherus agassizi), spotted bat (Euderma maculata), peregrine falcon (Falco peregrinus), and greater sandhill crane (Grus canadensis; formerly endangered). Though the species range over most of the state and into other states, continued development in the western states as a whole could increase the habitat value of the Las Vegas Valley. The slow moving desert tortoise and gila monster are particularly susceptible to roadkill and harassment.

The protection of threatened plant species will largely depend on the establishment of refuges for their preservation and federal recognition of these species as rare or endangered. Any species designated as endangered on the federal list of Endangered and Threatened Wildlife and Plants will be protected by law against takes, with measures taken to preserve its critical habitat. Many species proposed as endangered exist in the Spring Mountain Range. The Nevada Division of Forestry has delineated three potential refuges in this area for their protection: Cold Creek, Mount Potosi, and Mount Charleston refuges. Two other refuges containing fewer threatened species are Black Mountain Refuge adjacent to southern boundary of Henderson

and Rainbow Garden-Gypsum Cave Refuge located east of Las Vegas near Lake Mead. To present, no action has been taken to implement these refuge plans. Unrestricted recreational uses, especially the operation of ORV's, in these areas could adversely impact these plant species.

Effects of Overall Growth on Surrounding Habitat Areas

Increased recreational uses of areas near the urban sphere could be detrimental to game and nongame habitats. The number of anglers is expected to rise at a steady rate to year 2000, with the popular Lake Mead, Lake Mohave, and Colorado River fisheries receiving the greatest angler pressure. All game fish will require more intensive management and fishing restrictions if adequate supplies are to be maintained for increased demand. The large-mouth bass fishery could be severely impacted due to this species' growing popularity and sensitivity to undesirable patterns of water level fluctuations. Some decrease in rainbow trout population can be expected, though impacts can be partially mitigated by increased stocking programs.

Off Road Vehicle (ORV) use, a popular pastime in the County, is particularly devastating to wildlife habitats. ORV's cause destruction of wildlife habitats through soil compaction and displacement, noise pollution, and removal of vegetation on which wildlife depend for food and cover. Small mammals and, to a greater extent, large animals are sensitive to habitat encroachment by ORV's. Areas of moderate to heavy ORV use will lose much biological vitality. (See Figure 29 in the Draft Environmental Report No. 4, Growth Impacts for a map of Off Road Vehicle Use Areas).

Other impacts resulting in habitat destruction and harassment of wildlife may be related to the general effects of human encroachment upon habitat areas and/or the limited development of outlying areas. Habitat destruction can result from road construction, rural housing, and foot traffic. The key potential habitat destruction areas for big game would be at water sources, with secondary areas of importance including escape cover and forage (primarily forbs and grasses). Small game and nongame wildlife also require protection of areas with water, cover, and forage. Harassment includes illegal hunting and collecting, roadkill, prevention of access to water, contamination of water sources, noise pollution, predation by domestic pets (e.g., dogs and cats), and a variety of other factors. Protection of wildlife from these types of impacts may require the implementation of refuges with strict controls on all major destructive activities.

Mitigating Measures

The following measures are suggested to mitigate the impacts of future population increases on flora and fauna in Clark County:

- adoption of the five refuges proposed by the Nevada Division of Forestry for protection of threatened and endangered plants. These refuges would also provide protection of big game habitats. All activities detrimental to flora and fauna would be prohibited in the refuge areas, including hunting, ORV use, etc.;

- adjustment of current controls on game in response to greater hunting and fishing demands. These measures may include more intensive management of game, limitation on the issuance of fishing licenses, hunting licenses and quotas ;
- continued close monitoring of protected, rare, threatened, or endangered species and strict prohibition of all activities detrimental to their critical habitats; and
- stricter controls on all off road vehicle use, including the issuance of permits, the restriction of ORV's to designated roads and trails in areas of least habitat value, and close monitoring of ORV activity to assure controls are followed.

Agriculture

Agricultural Best Management Practices would generally serve to minimize or eliminate return flow of diverted irrigation waters to receiving waters. Although this would result in precipitation and retention of salts and other agricultural pollutants in agricultural soils, effects upon plant growth are anticipated to be minimal. No adverse salinity impacts are expected to result upon the production of alfalfa, barley and wheat, the major irrigated crops in Clark County (Clark County Conservation District, 1977). Benefits to agriculture in Virgin and Moapa Valleys would include lower diversion flows needed for irrigation, with attendant increased water availability for downstream beneficial uses such as habitat preservation and agricultural irrigation.

The principal impact upon agriculture in the County will be financial in the event that 100 percent outside funding for BMP implementation is not available. Presently, many Clark County farmers are operating under existing debts, and further expenditures for canal improvements would represent an extreme hardship upon the agricultural community.

Feasible mitigating measures would include cost sharing by the Bureau of Reclamation (agricultural BMPs are expected to be at least as cost-effective in Colorado River salt reduction as the proposed Salinity Control Unit) and other Federal monies available through the Agricultural Stabilization and Conservation Service (in cooperation with the Soil Conservation Service and U.S. Department of Agriculture) and the 1977 Clean Water Act.

History and Archaeology

Summary of Impacts

Archaeology. The recommended land use pattern will have a major adverse impact on potential archaeological resources, unless regulation of the development process includes measures for identification and protection of these resources. Approximately 9,000 acres with primary potential archaeological significance will be subject to potential conflict with development as a result of the recommended land use pattern. These acres are concentrated in the Duck Creek Wash area.

Although Clark County archaeological resources are expected to be of great value, only a small area of the county has been surveyed or excavated. Identified sites represent only a small portion of the potential resources. Assessment of archaeological resources, therefore, is made on the basis of identification of potential resource areas. Identification of areas of potential significance does not exclude the possibility of significant findings outside these areas.

History. A number of historic sites are included within the planning area for which growth has been projected in the recommended land use pattern. Four of these are listed in the National Register and are entitled to protection under section 106 of the National Historic Preservation Act of 1966, as amended, and the procedures of the Advisory Council on Historic Preservation, 36 CFR Part 800. Before any federal agency may undertake a project that may affect a site, the Advisory Council on Historic Preservation must be given the opportunity to comment on the proposal. Those registered sites on which non-federal projects occur, and unregistered sites are not afforded protection and are subject to local planning policy.

Because of the site-specific nature of historical resources, it is not possible to measure conflict potential between historic resource protection and the recommended land use pattern. Indiscriminate development without regard to location of historic resources will have a major negative impact on historic resources.

Table 15 lists historic sites within the planning area, listing with the National Register where applicable, and the statistical area or areas in which the sites fall. Sites not listed with the National Register are those mapped by the Clark County Regional Planning Council.

TABLE 15

Planning Area Historic Sites, National Register Designation
and Statistical Area Locations

Name of Site	National Register Designation	Statistical Area(s)
Mormon Fort	*	1044A
Kyle Ranch	*	1039
Big Springs	*	1050
Tule Springs	*	1002, 1005
Warm Springs		1100
Gilcrease Ranch		1008
Whitney Ranch		1093
El Rancho Vegas		1066
J.T. McWilliams Original Townsite		1044
Flamingo Hotel		1066
Block 16		1044A
Las Vegas Air Corps Gunnery School		1033
Basic Manufacturing Industry		1094A
Arden (mining site)		1099

Mitigating Measures

Archaeology. Measures should be taken by local jurisdictions and the County Department of Comprehensive Planning to insure further investigation and assessment of archaeological resources, and protection of these resources from development. Local jurisdictions should require archaeological investigations of specific sites as part of development regulation.

History. Measures should be taken by local jurisdictions and the County Department of Comprehensive Planning to insure protection of historic resources. Local jurisdictions should be responsible for identifying historic resources within their boundaries, and regulating development on or near historic sites through the development process. The City of Las Vegas' inventory in progress of historic, cultural and architectural sites is an example of work which could mitigate the impacts of projected growth. Findings of this and similar inventories should be incorporated into future planning.

Mineral Resources

Summary of Impacts

Within the Las Vegas Valley planning area, sand and gravel are the only mineral resources mined commercially. The recommended land use pattern will affect mining both directly and indirectly. In a few cases, there will be a direct conflict between use of the land for development or for mining. In other cases, development in nearby areas may create pressures for halting mining operations. The number of acres of mining operations threatened by direct and indirect preemption through conflict with development is 1,725.

Five sand and gravel operations coincide with areas in which development is anticipated. These areas are the Spring Mountain Road-Tropicana Road area in the southwest, the Henderson area in the southeast, the Sunrise Mountains area in the east, the south area at the intersection of Blue Diamond Road and Interstate 15, and the northwest area near Cheyenne Road.

Because all these operations occur at the periphery of areas where growth is expected, and because the amount of available vacant land in these areas is large, it is unlikely that direct preemption of mining operations will occur except in the Spring Mountain-Tropicana area in the southwest (statistical area 1072), and in the Henderson area (statistical area 1096). Indirect pressure by future development for termination of mining operations may occur in almost all instances if the mines remain active.

Mitigating Measures

Preemption of mining operations by development can be minimized if the Cities and Clark County enact development regulations to prevent location of development in or near active mines.

Energy

Inadequate Petroleum Supply

Petroleum products presently provide approximately 65 percent of Clark County's total energy needs. Estimates of future petroleum products consumption indicate that increases in consumption over the base year 1975 would be 4.5 percent for 1985 and 57 percent for the year 2000. U.S. crude oil supplies will begin to decline around the year 1985 if present consumption trends continue (Oregon, State of, 1975). Clark County will most likely experience limitations in petroleum supplies from 1985 to 2000 due to the sharp increase in consumption projected for this period. Supply limitations are expected to contribute to the rising price of crude oil which will be further impacted by the continuing national dependency on foreign oil reserves.

Limitations of petroleum will primarily affect transportation, which presently consumes about 75 percent of the energy derived from petroleum products (Clark County Health District, 1977). An expanded system of mass transit may become necessary to reduce consumption while accommodating Valley transportation needs.

Fuel oil limitations may impact some industries and power plants, forcing a conversion from fuel oil to coal as an energy source. The principal planned coal source for Clark County will be the southern Utah coal fields, with coal transport via a coal-slurry pipeline. Critical environmental issues related to mining and reclaiming the coal fields and the proposed pipeline alignment are currently under review.

Inadequate Natural Gas Supply

Consumption of natural gas in Clark County is expected to increase over 1975 base year figures by 43 percent in 1985 and 122 percent in the year 2000 (Environmental Report No. 4, Growth Impacts). Production of natural gas in the United States has nearly reached its maximum level, and availability of this resource is expected to decline in the future years (Oregon, State of, 1969). Various areas have already felt the impact of diminishing supplies in the form of natural gas shortages, preferential allocations, and associated price increases.

Natural gas supply limitations will result in future curtailment of this fuel source for industrial purposes. Nevada Power Company (NPC), which generates nearly all of the electricity used in Clark County, has experienced complete curtailment of natural gas deliveries during winter months.

Mitigating Measures

Although a comprehensive analysis of potential energy conservation measures for reducing Valley consumption of depletable energy supplies is beyond the scope of the 208 Plan, the following plans and programs will

serve to somewhat reduce stationary and mobile energy consumption in the Valley.

- Implementation of measures identified in the Nevada State Energy Conservation Program.
- Implementation of measures required through Federal energy legislation, which may be forthcoming in the near future.
- Deemphasis of the automobile as may be required through the Clark County Transportation Study and the Air Quality Implementation Pl

With the lack of the three planning measures discussed above, energy supplies will become critical and decreased consumption will come about in response to a crisis situation. This situation and attendant severe economic impacts may only be avoided through comprehensive and responsible planning on the part of entities within the Valley.

Solid Waste

Figure 11 shows projected annual solid waste volumes for Clark County based on estimates and assumptions detailed in Environmental Report No. 4, Growth Impacts. Total solid waste quantities in Clark County including garbage, rubbish, and sewage sludge are expected to increase over 1975 base year quantities by 100 percent in 1985 and 255 percent in 2000. Based on a landfill operation utilizing one cubic yard per 1000 pounds and burial to depths presently practiced in Clark County (URS Systems, 1974), a total of approximately 406 acres will be necessary to dispose of the 22.5 million tons of solid waste projected to be generated from 1975 to 2000. The 1440 acres of additional land available at the Sunrise Mountain Sanitary Landfill site is adequate to accommodate this volume.

Increased Solid Waste Management Costs

At present, plans for an adequate system of solid waste collection and disposal have been formulated. However, the large amounts of waste generated will necessitate annual solid waste management costs of about \$1,500,000 increase over 1975 costs. If warranted by new technology and materials shortages, resource recovery methods presently in limited use may become more widespread. With maximum resource recovery operations, as much as 50 percent of all solid waste generated could be eliminated from sanitary landfill operations (URS Systems, 1974). The savings in land over and operating costs would be significant, particularly when offset by potential revenue from sale or regulated materials.

Energy extraction from the burning of solid waste may also be considered as fuel costs increase. Chemical decomposition of solid waste to a type of fuel oil (garboil), and to a gas similar to methane has been studied (URS Systems, 1974). If economic means of burning these fuels for electricity generation are developed, savings in solid waste management costs, and fuel costs for energy would be reduced.

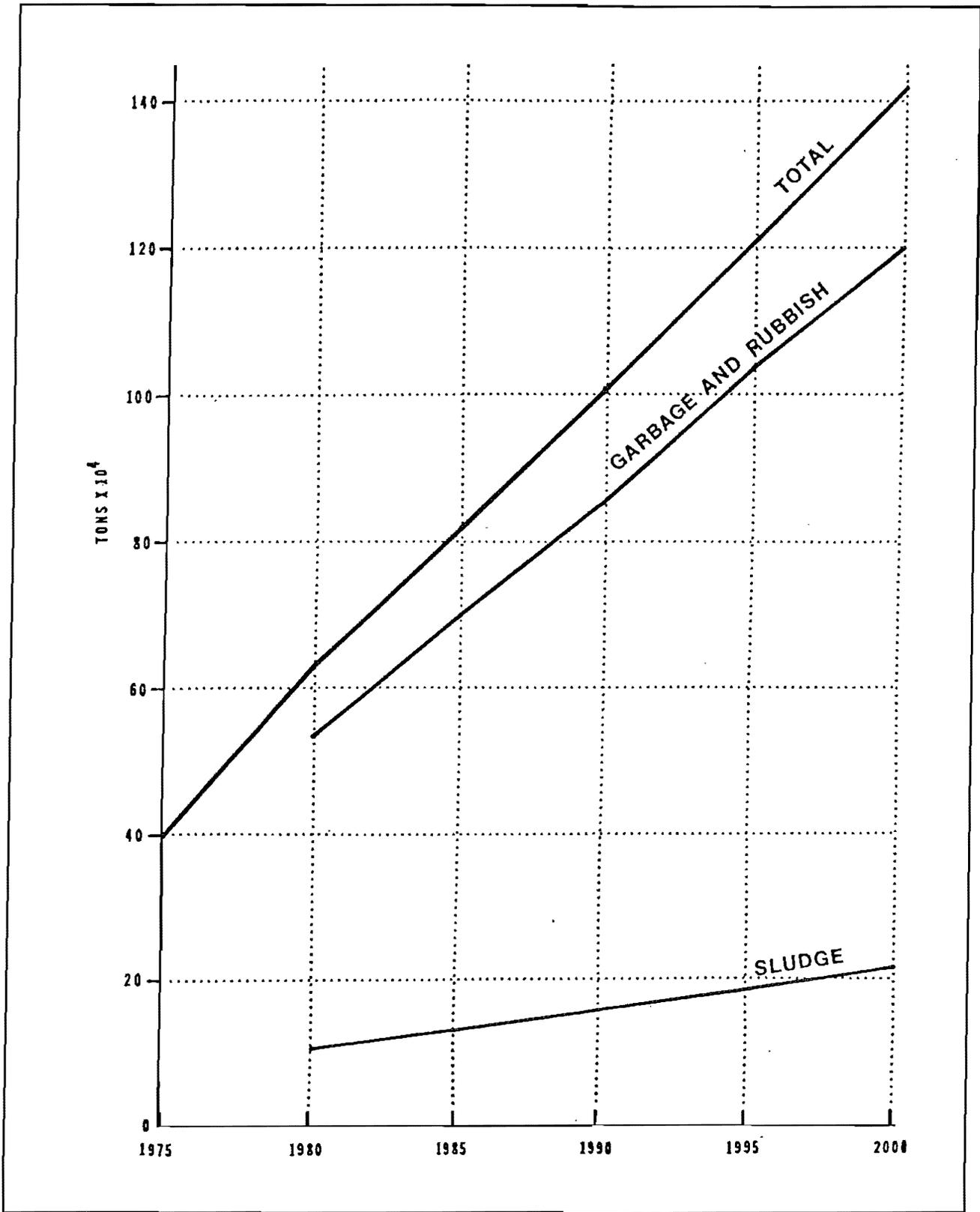
Lack of an Expedient Areawide Solid Waste Plan

Clark County Health District presently regulates solid waste disposal, and has formulated plans for areawide solid waste management. However, until entities within the Valley have adopted solid waste plans for implementation the Health District areawide plan can not be put into effect. Portions of the proposed Stormwater Management Program which would reduce urban runoff by eliminating sources of litter and illegally disposed refuse may best be implemented through an areawide solid waste plan, indicating a need to coordinate and activate local entities to form and ratify a comprehensive plan. Also, the proposed ban on garbage grinders in new housing should be evaluated for its impacts on solid waste disposal sites, including health considerations.

Indirect Solid Waste Impacts.

Indirect impacts resulting from solid waste collection and disposal practices will include:

- small contribution to traffic congestion and air quality problem attributable to collection vehicle operation; and
- total suspended particulate (TSP) emissions attributable to land fill procedures, to be regulated by TSP control strategies developed by the Clark County Air Quality Implementation Plan.



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FIGURE 11. CLARK COUNTY PROJECTED ANNUAL SOLID WASTE PRODUCTION

Economic Factors

The impact of the proposed Clark County 208 Water Quality Management Plan can best be determined by comparing what would happen under the 208 Plan, to what would happen if no plan were adopted. In either case it is assumed that sufficient wastewater treatment capacity will be provided to accommodate expected growth. Likewise, it is assumed that no limitation of natural resources (e.g., water), or factors of production (e.g., building sites suitable for casinos and resorts) would constrain growth.

The economic impacts analyzed include the impacts that the proposed 208 Water Quality Management Plan will have on the private sector economy, the costs of public services and the tax base, and a composite assessment of what this will mean to the homeowner.

Private Sector Impacts

Employment. There are no significant employment impacts under the proposed 208 Water Quality Management Plan. Table 16 shows projected employment levels both 1985 and 2000 are virtually the same for each jurisdiction under both the Base Case urban development strategy and under the proposed 208 Plan.

Employment allocations under the Base Case land use strategy, and under the proposed 208 Plan are almost identical. This similarity is due to the dependence of commercial and industrial growth on easy access from existing and planned transportation facilities, and availability of sewer service. Such factors are the same under both alternatives.

The Environmental Protection Agency (EPA) requires that user charges based on quantity and strength of effluent be used to finance waste treatment facilities. This means that certain industries, nationwide, may be expected to incur increased wastewater treatment costs but this effect is not expected to be of major concern in Clark County. Currently, only BMI industries may be required to pre-treat any discharges to municipal wastewater treatment plants.

Land Values

The proposed 208 Plan recommends, in part, a nonstructural approach to stormwater management. As a part of the recommended Las Vegas Valley stormwater management plan, an evaluation will be undertaken on nonstructural approaches to flood control, for example, flood plain management. This approach safeguards against hazard to life and property, while mitigating the need for extensive capital intensive flood control facilities.

Changes in land value because of these newly imposed use restrictions may occur as the market responds to buyers' and sellers' perceptions about the potential for development on lands subject to flooding. Individual instances of land value decline, for land parcels located within the use-restricted areas may occur.

Scarcity-induced land value increases will not occur for the remaining developable land, since there is an ample supply of vacant land in the Las Vegas Valley.

Table 16

EMPLOYMENT IN EACH JURISDICTION

	<u>Base Case</u>		<u>Localized Management</u>	
	<u>1985</u>	<u>2000</u>	<u>1985</u>	<u>2000</u>
CITY OF LAS VEGAS				
Manufacturing	9,428	9,503	9,428	9,503
Transportation	5,873	6,390	5,873	6,090
Retailing	16,819	18,142	16,819	18,142
Professional	13,900	16,958	13,900	16,958
Gaming	10,665	13,615	10,665	13,615
Hotel/Motel	6,141	9,946	6,141	9,946
Total Employment	62,826	74,555	62,826	74,255
CITY OF NORTH LAS VEGAS				
Manufacturing	1,302	1,951	1,302	1,951
Transportation	802	1,649	802	1,949
Retailing	1,763	1,835	1,763	1,835
Professional	497	557	497	557
Gaming	748	748	748	748
Hotel/Motel	63	63	63	63
Total Employment	5,175	6,802	5,175	7,102
CITY OF HENDERSON				
Manufacturing	3,541	5,576	3,541	5,576
Transportation	279	1,289	279	1,289
Retailing	1,416	6,558	1,416	6,558
Professional	888	3,345	888	3,377
Gaming	450	1,373	450	1,373
Hotel/Motel	1,750	4,399	1,750	4,399
Total Employment	8,324	22,541	8,324	22,572
LAS VEGAS VALLEY				
Manufacturing	20,512	24,597	20,512	24,597
Transportation	9,644	15,627	9,644	15,627
Retailing	37,251	57,727	37,539	58,015
Professional	26,746	39,526	27,646	39,796
Gaming	36,317	58,375	36,317	58,375
Hotel/Motel	50,692	91,382	50,692	91,382
Total Employment	181,162	287,234	182,350	288,192

The Costs of the 208 Plan

Identifying the costs of implementing the proposed 208 Plan as opposed to no plan is difficult. For example, the proposed Plan does not recommend any change in existing sewer extension policy, but does identify major sewer interceptor costs of the Las Vegas Valley until the year 2000. These costs would be borne by the residents of Las Vegas Valley whether or not a 208 Plan was implemented. Likewise, the proposed 208 Plan identifies future wastewater treatment expansion needs to meet existing water quality standards and future growth. Moreover, for certain recommended programs, stormwater management, it is estimated that significant cost savings could result (approximately \$29 million, 1978 costs for projected flood control needs). As a result, identifying the "true costs" of the proposed 208 Plan is not as direct and straightforward as one might expect. The estimated initial costs of the water quality programs recommended for Las Vegas Valley are shown on Table 7b (page 88).

The impact of each of these costs is addressed separately since they will be financed from different sources and, thus, ultimately funded by different groups. The impact of streetsweeping and flood control costs is not assessed pending development of the Las Vegas Valley stormwater management plan.

The costs of the Water Quality Management Plan may be considered a measure of the environmental damages that would occur (or have already occurred). Economists refer to these costs as "external social costs." External social costs reflect the ability of one entity - e.g., a company - to use the water or air as a free resource for waste disposal, while others pay the cost in contaminated air or water.

The impact of these water quality costs is therefore difficult to assess. In any impact assessment, the proposed plan is compared to some alternate strategy. However, the alternative of no new wastewater treatment facilities is not an acceptable alternate strategy since it would violate the federal Clean Water Act. It would not make any sense to conclude that the penalties for wilful or negligent violations under Section 309(c)(1) [33 USC 01319(c)(1)] of up to \$25,000 per day of violation represent the costs of the "no-treatment" alternative.

Wastewater Treatment

Wastewater treatment costs for the Las Vegas Valley, Boulder City and outlying areas are discussed below.

Las Vegas Valley. Table 17 shows the expected costs for wastewater treatment programs/facilities. The costs of the sewer interceptors under the proposed 208 Plan are the same as under the Base Case land use projections. Generally, sewer connection charges are the major source of revenues for collection facilities.

TABLE 17

EXPECTED COSTS FOR LAS VEGAS VALLEY
SEWERAGE FACILITIES TO THE YEAR 2000
(1978 Cost)

Las Vegas Valley

<u>Program/Facilities</u>	<u>Costs (\$1000)</u>
Water Conservation Program	\$ 10
Salinity Control Program	75
Sewer Interceptors	
City of Las Vegas	11,619
City of North Las Vegas	3,308
City of Henderson	16,988
Clark County Sanitation District	<u>23,877</u>
	\$55,792
Secondary Treatment ^a :	
Las Vegas Valley Regional Secondary	75,355
City of Henderson	<u>0-13,000</u>
	\$75,355
Advanced Treatment ^b :	
AWT	\$53,000/ 70,000
Water Reclamation:	<u>0-10,900</u>
Total Projected Costs:	\$184,232/ 225,232

N.A. - Not available at this time.

^a - The Henderson 201 study will determine the future staging costs for both the regional secondary and Henderson secondary facilities.

^b - Future expansion of the AWT depends on two things: whether Henderson utilizes the facility; and how much wastewater reclamation with secondary treated wastewater is carried out.

The costs for wastewater treatment for the proposed 208 Plan are shown on Table 17. For financing the AWT, a sewer rate system has been adopted by the Cities of North Las Vegas, Las Vegas, and the Clark County Sanitation District. This rate system, as required by the Clean Water Act (Section 204(b)), is based upon the users flow and strength. The common measure for the rate system is the equivalent residential unit (ERU). Currently, a \$5/yr/ERU charge is being assessed for the debt service on the AWT construction. Projected AWT ERU costs are shown on Table 18.

Current single family monthly and annual rates for secondary treatment are shown on Table 19. With the planning and design of the Las Vegas Valley Regional Secondary Treatment Facility and the Henderson 201 study, these rates will probably increase. A comparison of the local rates for secondary treatment compared across the country is shown on Table 20.

Boulder City. Boulder City is currently initiating a 201 wastewater facilities study so it is difficult to project future costs for the service area. Existing sewer rates for a single family house are shown on Table 19.

Rural Areas. Existing sewer rates for a single family house are shown on Table 19. Since no additional expansions are planned (except for possibly Laughlin) no projected increase in rates is expected at this time.

Subsurface Water Management

The Las Vegas Valley groundwater element of the proposed Plan identifies basically an ongoing resource management program. These costs, although significant, approximately \$662,000 initially and \$328,000 annually thereafter, ought to be readily financed through existing revenue sources.

Surface Water Management

The proposed 208 Plan recommends a multi-faceted approach to Las Vegas Valley stormwater management. Initially, the primary expense is the \$250,000 valleywide stormwater management planning effort to be carried out jointly by the three cities and the County. Since much of this cost will probably be carried out by existing staff, little budget impact is expected.

Other expenditures of the surface water plan are future flood control facilities and street sweeping practices. For flood control facilities, significant cost savings of \$29 million are projected over existing practice by potentially utilizing non-structural measures (e.g. flood plain management) to prevent flooding. However, financing of flood control still remains a difficult problem and is recommended to be examined as a part of the Las Vegas Valley stormwater management plan. Since no improvements in street sweeping are being recommended (not until more monitoring data reflecting water quality impacts is available) an assessment of these costs is not possible.

TABLE 18

PROJECTED AWT O&M AND DEBT SERVICE COSTS PER ERU

	Per ERU Cost ^c	
	<u>1985</u>	<u>2000</u>
Worst Case ^a	\$23.80	\$52.5
Best Case ^b	18.75	39.6

^a - Projected ERU's, including Henderson, are 402,925 (1985) and 651,770 (2000). Worst case identifies valleywide use of regional AWT plant and no increase in wastewater reclamation.

^b - Projected ERU's, excluding Henderson, are 359,685 (1985) and 551,770 (2000). Best case identifies increased wastewater reclamation in the Valley with secondary treated and Henderson not utilizing the regional AWT plant.

^c - ERU - Equivalent Residential Unit, based upon monthly average of 7,500 gallons of wastewater for a single family unit.

TABLE 19
 EXISTING SEWER RATES FOR WASTEWATER
 TREATMENT IN CLARK COUNTY
 (Per Single Family Unit)

<u>Service Area</u>	<u>Sewer Rate</u>	
	<u>Monthly</u>	<u>Annual</u>
Boulder City	\$3.00	\$36.00
CCSD:		
Las Vegas Valley ^a	2.25	27.00
Mesquite	2.25	27.00
Overton	2.25	27.00
Searchlight	2.25	27.00
Las Vegas ^a	2.25	27.00
North Las Vegas ^a	3.50	42.00
Henderson	4.00	48.00

^a - An additional \$5 annual charge will be assessed for the debt service for the construction of the AWT facility.

TABLE 20

SEWER SERVICE FEES
FOR
SINGLE FAMILY RESIDENTS (SELECTED CITIES)

LOCATION	POPULATION	TREATMENT	PLANT SIZE	MONTHLY RATE
1. Spokane, WA.	170,516	Activated Sludge	40 MGD	\$ 3.20/mo.
2. Seattle, WA.	530,831	Activated Sludge*	80 MGD	6.07/mo.
3. Vancouver, WA.	42,493	Activated Sludge	12 MGD	7.50/mo.
4. Belleville, WA.	61,102	Activated Sludge	25 MGD	6.10/mo.
5. Des Moines, IA.	200,587	Trickling Filters	50 MGD	6.00/mo.
6. Akron, OH.	375,000	Trickling Filters	85 MGD	6.35/mo.
7. Scranton, PA.	103,564	Activated Sludge	60 MGD	22.47/mo.
8. Tucson, AZ.	380,000	Activated Sludge	36 MGD	3.00/mo.
9. Laguna, CA.	12,000	Trickling Filters	3.1 MGD	4.00/mo.
10. Orange County, CA.	460,000	Trickling Filters	184 MGD	5.00/mo.
11. Rochester, NY.	296,233	Trickling Filters	100 MGD	3.79/mo.
12. Denver, CO.	500,000	Activated Sludge	130 MGD	4.50/mo.
13. Kenosha, WA.	90,000	Activated Sludge	23 MGD	1.50/mo.
14. El Paso, TX.	370,000	Activated Sludge	60 MGD & 22 MGD	2.50/mo.
15. Riverside, CA.	160,000	Activated Sludge	25 MGD	3.00/mo.
16. Ann Arbor, MI.	112,999	Activated Sludge	18 MGD	7.20/mo.
17. Grand Rapids, MI.	350,000	Activated Sludge	90 MGD	4.11/mo.
18. Newark, NJ.	800,000	Trickling Filters	280 MGD	7.50/mo.
19. Lincoln, NE.	180,000	Activated Sludge	30 MGD	3.80/mo.
20. Shreveport, LA.	200,000	Activated Sludge	24 MGD	2.70/mo.**
21. CCSD#1	170,000	Trickling Filters	32 MGD	2.25/mo.
CLV	200,000	Trickling Filters	30 MGD	2.25/mo.
Average				\$ 5.51/mo.

* Primary - 40 MGD

** \$4.05/mo. - Outside City Limits

Las Vegas Wash. Capital expenditure estimates for the management of the Las Vegas Wash include \$4.05 million for headcut stabilization facilities and \$1.07 million for flow distribution. Because significant savings in operation and maintenance costs at the AWT plant, due to reduced effluent volumes, are associated with this management plan, the costs of the Wash management could be funded out of wastewater treatment revenues.

Fiscal Impacts

The land use restrictions associated with the proposed 208 Water Quality Management Plan will have no significant impact on the tax base of the jurisdiction within Clark County, or on the costs of providing non-water-quality-related public services.

The Tax Base. Any land use plan or zoning ordinance has an effect on the tax base of the jurisdictions within a county, because development in a particular jurisdiction also brings with it the taxable value of the improvement (as well as, of course, the requirement to provide public services). The effect on the tax base of each jurisdiction, as development is restricted from occurring in the floodplain and noise-impacted areas, is shown in Table 21. The only shifts occur in the period 1985 to 2000 with the primary effect of shifting assessed property value from the unincorporated area of the County to the cities. A smaller shift of assessed value from the unincorporated area of the County to the City of Las Vegas occurs in the earlier time period.

Table 21

IMPACT OF FLOODPLAIN ZONING ON ASSESSED PROPERTY^a
(In millions of 1975 dollars)

<u>Jurisdiction</u>	<u>Total Value of Taxable Property</u>			
	<u>Unconstrained Growth</u>		<u>Floodplain Zoning</u>	
	<u>1985</u>	<u>2000</u>	<u>1985</u>	<u>2000</u>
City of Las Vegas	527.8 ^b	707.5	540.3	751.5
City of North Las Vegas	141.7	215.5	141.7	229.2
City of Henderson	303.0	769.5	303.0	770.4
Clark County Total	2,178.1	4,061.7	2,182.3	4,063.1

Source: McDonald & Greffe, Inc.

- a. Shift in assessed value does not include price effect of land with newly imposed use restrictions.
- b. Estimates for 1985 are subject to revision because of known anomalies in the estimate of population for the City of Las Vegas in that year.

The tax base of general revenues for each jurisdiction was projected over the study period. This tax base includes all nondedicated revenues in the General Fund, including nondedicated Federal Revenue Sharing monies and population-related federal grants. Dedicated revenues, such as those allocated to the Streets and Highway Fund, were not included. Revenue sources included three major categories: property-related revenue, people-related revenue, and user fees.

The revenue forecasts, shown in Table 22, are expressed in constant 1975 dollars and do not include an estimated increase due to inflation. The 1975-1976 tax rates in each jurisdiction were applied to the estimates of future tax base. The estimates thus include a consideration of growth in population, dwelling units and employment, and allow for any shifts in relative rates of growth between the various cities and the unincorporated areas of the County. They do not include an allowance for increasing values of lands or improvements, either because of inflation or in real terms.

The one exception to the constant-dollar assumption was an approximate procedure to account for the fact that, as urbanization takes place, land values of rural and agricultural land will tend to increase. In other words, land that is scheduled for development in the period 1995-2000 will begin to approach urban values significantly before that date. The approximation that was used to allow for this increase was to include the present value of all lands in the County as part of the 1975-1976 base, and to add onto that base the estimated total value of lands plus improvements for added dwelling units and added employment. In effect, the land that is urbanized is "double-counted" to allow for the fact that its value, in real or constant-dollar terms, will increase as urbanization will take place.

As Table 22 shows, the only impact on the tax base of Clark County jurisdiction is the slight increase in the tax base of the City of Las Vegas. This effect is due to an increase in the number of dwelling units allocated to the City of Las Vegas under the proposed land use controls. These dwelling units were allocated to the flood plain unincorporated areas of Clark County under the Base Case land use strategy.

Public Service Costs.

Operating Costs. Public service costs for each jurisdiction were projected for each of the study periods and expressed in constant 1975 dollars. These cost estimates represent the present per capita costs of service applied to future population levels and do not include an estimated increase due to inflation. Operating costs of programs funded from funds other than the General Fund or Federal Reserve Sharing Fund of each jurisdiction are not included in the analysis. As Table 23 shows, costs of public service (other than water quality related services) are quite similar for both the Base Case land use strategy and the land use strategy proposed under the 208 Water Quality Management Plan.

Capital Costs. Capital expenditures in five major areas — transportation, schools, public safety, parks and general government — were considered for each of the jurisdictions in the Las Vegas Valley, and for Clark County as a whole. Capital expenditures for enterprises such as the airport were not considered, since they are usually self-financing from user charges through revenue bonds.

Table 22

IMPACT OF PROPOSED LAND USE CONTROLS ON GENERAL REVENUES
IN EACH JURISDICTION

	<u>Base Case</u>				<u>Proposed 208 Land Use Plan</u>			
	<u>1985</u>	<u>%</u>	<u>2000</u>	<u>%</u>	<u>1985</u>	<u>%</u>	<u>2000</u>	<u>%</u>
CITY OF LAS VEGAS^a								
Property Taxes	7,480,534	22	10,027,365	23	7,657,489	22	10,650,881	23
Licenses & Permits	4,623,107	14	5,486,251	13	4,623,107	13	5,464,171	13
Intergovernmental	15,580,798	46	19,470,342	45	15,944,381	46	20,810,431	46
Fines & Fees	2,231,121	7	2,788,091	7	2,283,185	7	2,979,981	7
Franchise Tax	2,983,850	9	3,728,729	9	3,053,479	9	3,985,361	9
Money Use	1,036,205	3	1,294,880	3	1,060,385	3	1,384,001	3
Total	33,935,613	100	42,795,659	100	34,625,026	100	45,274,851	100
CITY OF NORTH LAS VEGAS								
Property Taxes	2,007,558	28	3,053,637	31	2,007,558	28	3,248,681	31
Licenses & Permits	568,200	8	746,849	8	568,200	8	779,781	8
Intergovernmental	3,621,719	50	4,575,547	47	3,621,719	50	4,575,541	47
Fines & Fees	335,691	5	424,099	4	335,691	5	424,091	4
Franchise Tax	307,480	4	388,459	4	307,480	4	388,451	4
Money Use	456,033	6	576,135	6	456,033	6	576,131	6
Total	7,296,681	100	9,764,725	100	7,296,681	100	9,992,711	100
CITY OF HENDERSON								
Property Taxes	4,294,430	32	10,905,528	33	4,294,430	32	10,918,541	33
Licenses & Permits	948,164	7	2,567,598	8	948,164	7	2,571,181	8
Intergovernmental	5,965,826	44	14,266,763	43	5,965,826	44	14,279,061	43
Fines & Fees	695,161	5	1,662,417	5	695,161	5	1,663,851	5
Franchise Tax	724,446	5	1,732,451	5	724,446	5	1,733,941	5
Money Use	909,262	7	2,174,422	7	909,262	7	2,176,291	7
Total	13,537,288	100	33,309,180	100	13,537,288	100	33,342,891	100
CLARK COUNTY								
Property Taxes	24,623,739	35	45,917,072	38	24,670,727	35	45,934,411	38
Licenses & Permits	14,833,742	21	23,519,033	19	14,931,017	21	23,597,471	19
Intergovernmental	8,639,889	12	14,275,046	12	8,639,889	12	14,275,041	12
Fines & Fees	15,711,763	22	25,959,376	21	15,711,763	22	25,959,371	21
Franchise Tax	1,213,474	2	2,004,932	2	1,213,474	2	2,004,931	2
Money Use	5,873,180	8	9,703,819	8	5,873,180	8	9,703,811	8
Total	70,895,788	100	121,379,278	100	71,040,051	100	121,475,061	100

Source: McDonald & Greffe, Inc.

a. Note: Estimates for 1985 are subject to revision because of known anomalies in the estimates of population for the City of Las Vegas in that year.

Table 23

IMPACT OF PROPOSED LAND USE CONTROLS ON
SERVICE COSTS IN EACH JURISDICTION

	<u>Base Case</u>		<u>Proposed 208 Land Use Plan</u>	
	1985	2000	1985	2000
CITY OF LAS VEGAS^a				
Public Safety	19,896,993	24,864,020	20,361,297	26,575,348
Health & Welfare	452,005	564,842	462,552	603,718
Culture & Recreation	3,946,463	4,931,646	4,038,555	5,271,079
Transportation	2,728,016	3,409,030	2,791,675	3,643,664
General Government Support	6,300,919	7,873,862	6,447,954	8,415,801
Total Expenditures	33,324,395	41,643,400	31,102,032	44,509,610
CITY OF NORTH LAS VEGAS				
Public Safety	3,608,233	4,558,509	3,608,233	4,558,509
Health & Welfare	10,378	13,111	10,378	13,111
Culture & Recreation	737,711	931,996	737,711	931,996
Transportation	930,355	1,175,376	930,355	1,175,376
General Government Support	1,125,853	1,422,362	1,125,853	1,142,362
Total Expenditures	6,412,529	8,101,353	6,412,529	8,101,353
CITY OF HENDERSON				
Public Safety	4,788,872	11,452,178	4,788,872	11,462,053
Health & Welfare	0	0	0	0
Culture & Recreation	993,420	2,375,680	993,420	2,377,729
Transportation	2,250,552	5,382,002	2,250,552	5,386,642
General Government Support	3,209,245	7,674,635	3,209,245	7,681,253
Total Expenditures	11,242,089	26,884,494	11,242,089	26,907,677
CLARK COUNTY				
Public Safety	30,001,960	49,570,004	30,001,960	49,570,004
Health & Welfare	1,734,957	2,066,540	1,734,957	2,866,540
Culture & Recreation	3,060,444	5,056,544	3,060,444	5,056,544
Transportation	7,337,359	12,122,972	7,337,359	12,122,972
General Government Support	15,242,760	25,184,478	15,242,760	25,184,478
Total Expenditures	57,377,481	94,800,539	57,377,481	94,800,539

Source: McDonald & Greffe, Inc.

a. Note: Estimates for 1985 are subject to revision because of known anomalies in the estimates of population for the City of Las Vegas in that year.

No significant cost savings were discovered under the proposed 208 Water Quality Management Plan. Unfortunately, cost data for future transportation needs was unexpectedly unavailable. Therefore, data on cost savings that might have been expected under the 208 Management Plan, associated with the costs of road construction in the flood plain (costs of drains, bridges etc.) was not available.

Impact on the Homeowner

The economic impact of the proposed Clark County 208 Water Quality Management Plan cannot be measured in the abstract. A major concern of homeowners will be the tax burden on the individual. The prospective homebuyer will be concerned with the impact that sewer connection and development fees will have on the price of a new home.

The proposed 208 Plan has no impact on the average property tax burden. Per capita costs for sewer service for users of the AWT plant can expect increasing rates over the next twenty years. However, compared to national figures for secondary treatment, these costs do not place an undue burden on the users.

Increased development fees for the improvements in construction management practices and flood control facilities cannot be estimated at this time. These impacts on the cost of housing will be analyzed as a part of the development of these programs.

CHAPTER XIII

UNAVOIDABLE ADVERSE IMPACTS

The following summarizes adverse impacts discussed in the preceding section which are considered to be unavoidable if the proposed plan is implemented. Mitigating measures for each identified impact are described in Chapter XII. Unavoidable adverse impacts are identified as PRIMARY where the proposed 208 Plan would have a direct effect upon the environment, and as SECONDARY where impacts would result from population growth and land development which would be accommodated by the 208 Plan. Impacts are as follow::

Surface Water Quality

PRIMARY IMPACT: Receiving water quality standards for Las Vegas Wash/Bay at Northshore Road may be exceeded by urban runoff pollutants following storm events.

Traffic and Transportation

SECONDARY IMPACT: With increasing population and transportation needs, roadways within Las Vegas Valley will suffer increased congestion, reduced vehicle speeds, longer travel times and associated adverse air quality impacts. However, the ongoing Clark County Transportation Study is examining measures to mitigate these impacts.

Air Quality

SECONDARY IMPACT: With increasing population and transportation needs, vehicle emissions within Las Vegas Valley may cause exceedance of State and Federal air quality standards for carbon monoxide, photochemical oxidants, and total suspended particulates. The Clark County air quality planning (AQIP) will be required to mitigate these impacts.

Biology

PRIMARY IMPACT: Reduction of wastewater effluent flow in Las Vegas Wash will cause reduction of existing hydric areas and corresponding decrease in biota dependent upon marsh habitat.

SECONDARY IMPACT: Increasing use of outlying habitat areas for fishing, hunting, ORVs and other forms of outdoor recreation will impact fish and game populations and cause additional stress upon resident wildlife and vegetation species.

Energy

SECONDARY IMPACT: Increasing energy needs for transportation and electric power generation in Las Vegas Valley will cause demand to exceed available domestic supply for petroleum and natural gas, with shortages of fossil fuel experienced as soon as 1990.

CHAPTER XIV

GROWTH INDUCING ASPECTS

Overall Growth in Clark County

Population and employment projections for Clark County were developed in Environmental Report No. 3, Growth Forecasts. The predictive model used was economically based; that is, the future work force and population was estimated on the basis of projected economic growth in the County and the population necessary to support such growth. Projections for the year 2000 indicate an overall population of approximately 890,000 and a total work force of about 360,000.

The economy of Clark County, which is largely based on gaming and service enterprises, is essentially the principal factor inducing growth in the urban study area. However, other political and environmental factors may exert control over overall growth in the County, including:

- adequacy of water supply to meet urban needs;
- adequacy to wastewater collection and treatment system to accommodate and treat increased wastewater flows to levels meeting State and Federal criteria;
- adequacy of power supply and distribution systems to meet urban needs;
- adequacy of transportation systems to meet user needs;
- land availability and suitability; and
- willingness and financial ability of existing population to expand utilities and infrastructure to accommodate future population growth and additional supporting services.

In general, the most feasible and economically sound method by which an entity may consciously restrict growth within its jurisdiction is by refusing to remove existing constraints. Examples are the unwillingness on the part of a city to develop a larger water supply when existing supplies are limited, or the intentional underdesign of wastewater collection facilities to allow only limited sewer hookups within a developing area. In these cases, where growth pressure exists due to other factors (e.g., economic growth), the removal of existing constraints is best considered as a "growth accommodating" rather than a "growth inducing" action.

In Clark County, the expanding economy is the principal growth inducing factor, although the proposed 208 Plan would serve to accommodate growth by removing two principal constraints to expansion of the Las Vegas Valley urban sphere:

- 1) Wastewater Collection and Treatment Capacity. The recommended wastewater treatment and reuse plan would provide for adequate sewer capacities to accommodate the needs of land development as proposed under the recommended Land Use Alternative II (Localized Management Strategy). Capacities of the regional secondary treatment facility and the AWT would be increased incrementally to the year 2000 to accommodate the projected flows of an overall population of approximately 890,000 persons and 350,000 households.
- 2) Colorado River Water Supply. The recommended treatment and reuse plan would serve to maintain adequate water supply for Las Vegas Valley through (a) developing facilities for the irrigation of parks and golf courses with reclaimed effluent, (b) preserving the future option of maximizing return flow credit to the Colorado River to increase water delivery through the Southern Nevada Water Project.

Distribution of Growth within Clark County

While the proposed 208 Plan would not serve to constrain overall growth within Clark County, the recommended land development strategy would reduce development in areas subject to flood hazard and aircraft noise impact. Although short term impacts upon real estate values may result, the overall effect of the development strategy would be to reduce future public costs attributable to flooding and construction of flood control facilities, and to maximize compatibility of McCarran Airport, Nellis Air Force Base, and North Las Vegas Air Terminal with surrounding land uses.

A more compact land development scenario (i.e., less sprawl and more infilling) may be formulated by the ongoing Air Quality Implementation Plan. This plan would serve to increase mass transit feasibility and deemphasize private auto use, if these steps are found to be necessary to attain compliance with State and Federal air quality standards. In this case, a compact type of development strategy would necessarily be recommended for inclusion with the 208 Plan. Insofar as wastewater collection and treatment facilities are concerned, design and cost characteristics for sewerage facilities would likely be similar to those presently recommended (Wastewater Treatment and Reuse, Interim Report No.4), and the 208 Plan would not be greatly affected by more compact growth allocations.

CHAPTER XV
IRREVERSIBLE ENVIRONMENTAL CHANGES AND
COMMITMENT OF IRRETRIEVABLE RESOURCES

Primary Effects

Construction

Implementation of the proposed 208 Plan would entail commitment of irretrievable construction materials and energy resources for the following purposes:

- construction of wastewater collection, treatment and reuse facilities;
- construction of headcut drop and flow distribution facilities in Las Vegas Wash;
- construction of flood control facilities; and
- lining of irrigation canals and installation of water measuring devices in Virgin and Moapa Valleys in accordance with proposed agricultural BMPs.

AWT and Las Vegas Wash

The implications of the proposed Plan as it relates to AWT and Las Vegas Wash are more complex. Presently, utilization of the Wash for effluent polishing is impracticable as this would impact the Bureau of Reclamation's proposed Salinity Control Project. Consequently, a commitment is implicit to consume large amounts of irretrievable chemicals and energy in operation of the AWT plant. Design characteristics of the AWT plant are such that a large part of operating costs are attributable to chemicals and energy (URS, 1978); increasing scarcity of both commodities may cause future costs to exceed beyond what presently acknowledged cost projections indicate (McDonald & Grefe, 1978).

Although effluent flow limitations to Las Vegas Wash will cause the partial disappearance of macrophytes which are fundamental to nutrient removal, this phenomenon is not irreversible. Should the mechanism of Wash treatment become feasible in coming years, inundation and flushing of an expanded Wash area may be expected to result in eventual reestablishment of the hydric vegetation, although the ability of existing ecological communities to become reestablished is indeterminate.

Water Consumption

The allocation of AWT effluent to lower Las Vegas Wash via the AWT bypass is essentially the only case in which use of water does not represent an irretrievable commitment of water resources. In-Valley water uses which

presently are and will be irretrievable commitment of water resources include:

- irrigation of urban lawns, golf courses and parks with either Southern Nevada Water Project water or secondary effluent (presuming that underlying shallow groundwater is not pumped for further use in these locations);
- use of reclaimed effluent by present and planned Nevada Power Company generating stations for cooling water;
- consumptive use for marsh maintenance in Las Vegas Wash; and
- losses by leakage and evaporation in water and wastewater conveyance facilities.

Secondary Effects

Land development in Clark County will necessarily consume large quantities of land, construction materials, energy and water. Although this represents a commitment of irretrievable resources, it is an inevitable result of population growth. Efforts to optimize growth distribution to provide for long-term air quality, transportation and energy benefits (see Chapter VIII) may be recommended through ongoing transportation and air quality studies. These would serve to minimize consumption of resources in future development of land and infrastructure.

CHAPTER XVI

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE
MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITYPrimary EffectsSubsurface Water Quality

Principal aquifers in Las Vegas Valley are a valuable source of inexpensive and high quality water. The attractiveness of the deep groundwater resource has resulted in past years in localized overdraft in areas of intensive pumping and in a regional basin overdraft in excess of the safe recharge volume of approximately 35,000 acre-feet per year. Consequences of the overdraft have been discussed in the preceding assessment and include water table drawdown, groundwater gradient reversal (i.e., reduced pressure in lower aquifers allowing downward percolation of lower quality, near surface groundwater), and land subsidence.

The recommended Subsurface Water Management Plan addresses all of these issues through proposing comprehensive monitoring and modelling programs to further study the Las Vegas Valley hydrogeology, which currently is poorly understood. Adequate research, however, will rely on de facto data and evidence before recommendations may be made to reduce total groundwater withdrawals to the level of safe yield to the basin. During the research period, short-term mining of the principal groundwater resource will continue (although at a lower level than in past years) and the effect upon the long-term productivity of the principal aquifers and overlying lands is indeterminate.

Surface Water Quality

With respect to Las Vegas Wash and Lake Mead, several issues are relevant to short-term use and long-term productivity. These are;

- potential for maximizing return flow credit in the future through minimizing or eliminating irretrievable water consumption in Las Vegas Wash; this is a relatively short-term benefit for purposes of temporarily meeting increasing water needs in Las Vegas Valley;
- long-term productivity of a limited Wash environment;
- objective and intent of the Bureau of Reclamation Salinity Control Unit to achieve a long-term decrease in salt loading to the Colorado River, requiring that only limited effluent flows be distributed in upper Las Vegas Wash; and
- potential for long-term, inexpensive, non-capital intensive effluent nutrient removal and partial stormwater treatment in an expanded Wash eco-system.

The long-term productivity of the limited Wash marsh area which would be maintained in the proposed 208 Plan may come in conflict with urban water needs in future years. Should controlling entities decide that full utilization of the Southern Nevada Water Project (i.e. maximization of return flow credits) is desirable or necessary, reallocation of the Wash maintenance flow could become possible unless full water rights have, by that time, been established for marsh maintenance.

The conflict between the proposed Salinity Control Project and potential for total effluent release to the Wash has been exhaustively discussed and will be subject to further study to identify (1) cost-effectiveness of the Bureau's project as this relates to other salinity control efforts in the Colorado River Basin and (2) the cost-effectiveness of an expanded marsh area in the Wash as it relates to a reduction of AWT plant construction and operation costs. Both proposals have short and long-term benefits; however, impending shortages of energy and materials may cause the long-term operating costs of both the Salinity Control Project and the AWT plant to increase in excess of what is presently anticipated.

Secondary Effects

The role which Federal air quality legislation will play in affecting Valley land use patterns is indeterminate. In the absence of stronger land use controls than those recommended under the 208 Plan, sprawl development patterns will likely continue in response to (1) short-term benefits to developers and real estate dealers' marketing fringe areas of the urban sphere, and (2) short-term benefits to homeowners realized through lower real estate costs, larger affordable lot sizes and proximity of open space. Long-term impacts upon the urban system are discussed in Chapter IV and include:

- continued low mass transit feasibility resulting in continued use of the automobile as the principal means of transportation;
- severe traffic congestion and air quality degradation; and
- limited mobility resulting from congestion of the roadway system and ultimate petroleum shortages.

In short, pending transportation, air quality and energy constraints will have profound long-term effects upon the Las Vegas Valley environment. Although air pollution control and energy conservation measures may mitigate and temporarily postpone future environmental problems, a more compact and energy-efficient growth scenario will likely be necessary to adequately maintain Valley productivity and environmental integrity in the coming years. Although development of such a land use scenario is beyond the scope of the 208 Plan, future development and coordination of regional water quality, transportation, air quality, energy, and land use plans should serve to achieve this purpose.