Clark County 208
Area-Wide Water Quality Management Plan



DAQEM
DEPARTMENT OF AIR QUALITY & ENVIRONMENTAL MANAGEMENT

A CENTURY OF SERVICE

FINAL
March 2009

Acknowledgments





ACKNOWLEDGMENTS

CLARK COUNTY DEPARTMENT OF AIR QUALITY AND ENVIRONMENTAL MANAGEMENT

FINAL
CLARK COUNTY AREA-WIDE WATER QUALITY MANAGEMENT PLAN

MARCH 2009

CLARK COUNTY BOARD OF COUNTY COMMISSIONERS

Rory Reid, Chair
Susan Brager, Vice Chair
Steve Sisolak
Tom Collins
Larry Brown
Lawrence Weekly
Chris Giunchigliani

OFFICE OF THE COUNTY MANAGER

Virginia Valentine, County Manager
Darryl Martin, Assistant County Manager
Jeff Wells, Assistant County Manager
Phil Rosenquist, Assistant County Manager

CLARK COUNTY DEPARTMENT OF AIR QUALITY AND ENVIRONMENTAL MANAGEMENT

Lewis Wallenmeyer, Director
Alan Pinkerton, Assistant Director
Ebrahim Juma, Project Manager
Kathryn Hoffmann, Project Manager
Mark Silverstein, Senior Planner
Catherine Jorgenson, Deputy District Attorney

PROJECT OVERSIGHT COMMITTEE

Julie Chadburn, Clark County Water Reclamation District
Dennis Porter, P.E., City of Henderson
Don Pelissier, P.E., City of Henderson
Nick Braybrooke, P.E., Las Vegas Valley Water District
Keiba Crear, Southern Nevada Water Authority
Michael Johnson, Virgin Valley Water District

STATE OF NEVADA

Sam Stegeman, Nevada Division of Environmental Protection

SEWAGE AND WASTEWATER ADVISORY COMMITTEE

MEMBERS

David Mendenhall – Chair	City of Las Vegas
Dan Fischer – Vice Chair	City of Las Vegas
Nick Braybrooke	Las Vegas Valley Water District
Doug Drury	Clark County Water Reclamation District
Scott Hansen	City of Boulder City
Terry Hughes	City of Las Vegas
Brad Huza	Moapa Valley Water District
Michael Johnson	Virgin Valley Water District
Ebrahim Juma	Clark County
Kirk Medina	City of North Las Vegas
Dennis Porter	City of Henderson
Barney Rabold	City of Henderson
Bill Tanner	City of Mesquite
Kathryn Hoffmann	Clark County Department of Air Quality and Environmental Management

ALTERNATES

Adrian Edwards	City of Henderson
Gary Grinnell	Las Vegas Valley Water District
Jim Keane	City of Boulder City
Leslie Long	City of North Las Vegas
Rob McLaughlin	City of North Las Vegas
Susan Rose	Moapa Valley Water District
Bill Shepherd	Clark County Water Reclamation District
Mark Silverstein	Clark County
Charles Trushel	City of Las Vegas
Keni Whalen	City of Henderson

MWH AMERICAS, INC.

Planning
Steven Mano, Project Manager
Mark Nelson, P.E., Lead Project Engineer
Angela MacKinnon, P.E., Project Engineer
Gabriela Estrada
Sarah Garber
Courtney Hill
Tracy Kosloff
Chip Paulson, P.E.
Michael Priest
Eric Hawkins, Alpha Communications

Quality Control
JaNell Cook, P.E.
Janet L. Fahey, Ph.D
Margaret Regan

Production
Tynesha Ingram
Nicole Rivera
Larvonnie Rooks
Christine Smith

PBS&J

Engineering
Wayne Horlacher, P.E., Vice President

Public Outreach
Kristine Absher, Public Outreach Manager
Susan Berkley, Senior Public Information Officer
Gregory E. Gonzalez, Public Information Specialist

Graphic Design
Susan Berkley, Senior Graphic Designer
Gregory E. Gonzalez, Graphic Designer

Table of Contents

Table of Contents

ACKNOWLEDGMENTS

EXECUTIVE SUMMARY

ES.1 Introduction ES-1
ES.2 Background ES-1
ES.3 Purpose of the Clark County Area-Wide Water Quality Management Plan ES-3
ES.4 Summary ES-4
ES.4.1 Section 1 – Background ES-4
ES.4.2 Section 2 – Population Projections ES-5
ES.4.3 Section 3 – Wastewater Flow Projections ES-9
ES.4.4 Section 4 – Water Quality Standards/Planning ES-13
ES.4.5 Section 5 – Wastewater Collection, Treatment and Disposal ES-14
ES.4.6 Section 6 – Water Reclamation/Reuse ES-18
ES.4.7 Section 7 – Point Sources ES-18
ES.4.7.1 Surface Water Discharge Permits ES-18
ES.4.7.2 Mining Fluid Management ES-19
ES.4.7.3 Groundwater Discharge Permits ES-19
ES.4.7.4 Leaking Underground Storage Tanks and Chemical Spills ES-19
ES.4.8 Section 8 – Nonpoint Sources ES-20
ES.4.9 Section 9 – Best Management Practices and Alternative Treatment Methods and Disposal ES-24
ES.4.9.1 Best Management Practices ES-24
ES.4.9.2 Alternative Treatment Methods and Disposal ES-25
ES.4.10 Section 10 – Wellhead Protection ES-26
ES.4.11 Section 11 – Colorado River and Lake Mead ES-27
ES.4.12 Section 12 – Environmental/Integrated Planning Coordination ES-29
ES.4.13 Section 13 – Planning Recommendations/Implementation ES-32

SECTION 1 – BACKGROUND

1.1 Introduction 1-1
1.2 Purpose of the Clark County Area-Wide Water Quality Management Plan .. 1-3
1.3 Study Area 1-9
1.3.1 Planning Area 1: Sand Spring – Tikaboo Valleys 1-9
1.3.2 Planning Area 2: Muddy River – Meadow Valley Wash 1-9
1.3.2.1 Moapa Valley, Logandale, and Overton 1-12
1.3.2.2 Moapa and Glendale 1-12

1.3.2.3 Apex 1-12
1.3.2.4 Moapa Indian Reservation 1-13
1.3.2.5 Coyote Springs 1-13
1.3.3 Planning Area 3: Lower Virgin River 1-13
1.3.3.1 Mesquite, Bunkerville, and Riverside 1-14
1.3.4 Planning Area 4: Grand Wash – Lake Mead 1-14
1.3.5 Planning Area 5: Las Vegas Wash 1-14
1.3.6 Planning Area 6: Ivanpah – Pahrump Valleys 1-15
1.3.7 Planning Area 7: Havasu – Mohave Lakes 1-15
1.3.7.1 Laughlin 1-16
1.3.7.1.1 Topography and Geology 1-16
1.3.7.1.2 Watershed 1-17
1.3.7.1.3 Land Use and Zoning 1-17
1.3.8 Planning Area 8: Paiute Wash 1-17
1.4 References 1-18

SECTION 2 – POPULATION PROJECTIONS

2.1 Introduction 2-1
2.2 Current Population in Clark County 2-1
2.2.1 Planning Area 1: Sand Spring – Tikaboo Valleys 2-2
2.2.2 Planning Area 2: Muddy River – Meadow Valley Wash 2-2
2.2.3 Planning Area 3: Lower Virgin River 2-2
2.2.4 Planning Area 4: Grand Wash – Lake Mead 2-2
2.2.5 Planning Area 5: Las Vegas Wash 2-3
2.2.6 Planning Area 6: Ivanpah – Pahrump Valleys 2-3
2.2.7 Planning Area 7: Havasu – Mohave Lakes 2-3
2.2.8 Planning Area 8: Paiute Wash 2-4
2.2.9 Summary 2-4
2.3 Population Projections for Clark County 2-4
2.3.1 Planning Area 1: Sand Spring – Tikaboo Valleys 2-6
2.3.2 Planning Area 2: Muddy River – Meadow Valley Wash 2-6
2.3.3 Planning Area 3: Lower Virgin River 2-6
2.3.4 Planning Area 4: Grand Wash – Lake Mead 2-11
2.3.5 Planning Area 5: Las Vegas Wash 2-11
2.3.6 Planning Area 6: Ivanpah – Pahrump Valleys 2-11
2.3.7 Planning Area 7: Havasu – Mohave Lakes 2-14
2.3.8 Planning Area 8: Paiute Wash 2-14
2.4 Comparison of Clark County Population Projections 2-14
2.5 Clark County Population Projections by Hydrographic Area 2-18
2.6 Recommendations 2-20
2.7 References 2-21

SECTION 3 – WASTEWATER FLOW PROJECTIONS

3.1 Introduction 3-1
3.2 Wastewater Flow Contributions 3-1
3.2.1 Unincorporated County Areas 3-1
3.2.2 Cities 3-2
3.3 Wastewater Flow Projections 3-3
3.3.1 Planning Area 1: Sand Spring – Tikaboo Valleys 3-3
3.3.2 Planning Area 2: Muddy River – Meadow Valley Wash 3-3
3.3.3 Planning Area 3: Lower Virgin River 3-4
3.3.4 Planning Area 4: Grand Wash – Lake Mead 3-4
3.3.5 Planning Area 5: Las Vegas Wash 3-8
3.3.5.1 Proposed Southern Nevada Regional Heliport 3-8
3.3.6 Planning Area 6: Ivanpah – Pahrump Valleys 3-10
3.3.7 Planning Area 7: Havasu – Mohave Lakes 3-13
3.3.8 Planning Area 8: Paiute Wash 3-15
3.4 Recommendations 3-16
3.5 References 3-18

SECTION 4 – WATER QUALITY STANDARDS / PLANNING

4.1 Introduction 4-1
4.2 Major Surface Waters 4-3
4.3 Beneficial Uses and Water Quality Criteria 4-4
4.3.1 Beneficial Uses 4-4
4.3.2 Narrative Water Quality Criteria 4-7
4.3.3 Water Quality Requirements to Maintain Existing Higher Quality 4-8
4.3.4 Water Quality Requirements to Maintain Beneficial uses 4-10
4.4 Permits 4-10
4.5 Water Quality Limited Segments and Total Maximum Daily Loads 4-13
4.5.1 Existing Total Maximum Daily Loads 4-16
4.5.1.1 Las Vegas Wash / Lake Mead 4-16
4.5.1.2 Virgin River 4-16
4.6 Recommendations 4-17
4.7 References 4-19

SECTION 5 – WASTEWATER COLLECTION, TREATMENT, AND DISPOSAL

5.1 Introduction 5-1
5.2 Regulations 5-1
5.3 Wastewater Treatment Facilities 5-2
5.3.1 Planning Area 1: Sand Spring – Tikaboo Valleys 5-5

5.3.1.1 Indian Springs 5-5
5.3.1.1.1 Existing Collection System 5-5
5.3.1.1.2 Existing Treatment Facilities 5-5
5.3.1.1.3 Indian Springs Septic Systems 5-5
5.3.1.1.4 Future Collection System 5-7
5.3.1.1.5 Future Treatment Facilities 5-7
5.3.1.1.6 Solids Handling and Effluent Disposal 5-10
5.3.1.1.7 Water Quality Monitoring 5-10
5.3.1.2 Planning Area 1 Septic Systems 5-10
5.3.1.3 Pretreatment Program 5-10
5.3.1.4 Planning Area 1 Summary 5-10
5.3.2 Planning Area 2: Muddy River and Meadow Valley Wash 5-11
5.3.2.1 Moapa Valley Township 5-11
5.3.2.1.1 Existing Collection System 5-11
5.3.2.1.2 Existing Treatment Facilities 5-12
5.3.2.1.3 Moapa Valley Township Septic Systems 5-12
5.3.2.1.4 Future Collection System 5-12
5.3.2.1.5 Future Treatment Facilities 5-12
5.3.2.1.6 Solids Handling and Effluent Disposal 5-14
5.3.2.1.7 Water Quality Monitoring 5-14
5.3.2.2 Coyote Springs 5-17
5.3.2.2.1 Proposed Treatment Facilities 5-17
5.3.2.2.2 Solids Handling and Effluent Disposal 5-17
5.3.2.3 Moapa Township 5-20
5.3.2.4 Moapa Indian Reservation 5-20
5.3.2.5 Apex 5-20
5.3.2.6 Planning Area 2 Septic Systems 5-21
5.3.2.7 Pretreatment Program 5-21
5.3.2.8 Planning Area 2 Summary 5-21
5.3.3 Planning Area 3: Lower Virgin River 5-22
5.3.3.1 City of Mesquite 5-22
5.3.3.1.1 Existing Collection System 5-22
5.3.3.1.2 Existing Treatment Facilities 5-23
5.3.3.1.3 Future Collection System 5-23
5.3.3.1.4 Future Treatment Facilities 5-23
5.3.3.1.5 Solids Handling and Effluent Disposal 5-23
5.3.3.1.6 Water Quality Monitoring 5-26
5.3.3.2 Township of Bunkerville 5-26
5.3.3.3 Planning Area 3 Septic Systems 5-26
5.3.3.4 Pretreatment Program 5-26
5.3.3.5 Planning Area 3 Summary 5-27
5.3.4 Planning Area 4: Grand Wash – Lake Mead 5-27

5.3.4.1 Boulder Beach 5-27
5.3.4.1.1 Existing Treatment Plant 5-27
5.3.4.1.2 Effluent Disposal 5-28
5.3.4.2 Callville Bay 5-28
5.3.4.2.1 Existing Treatment Plant 5-28
5.3.4.2.2 Effluent Disposal 5-28
5.3.4.3 Echo Bay 5-28
5.3.4.3.1 Existing Treatment Plant 5-28
5.3.4.3.2 Effluent Disposal 5-29
5.3.4.4 Las Vegas Bay 5-29
5.3.4.4.1 Existing Treatment Plant 5-29
5.3.4.4.2 Effluent Disposal 5-29
5.3.4.5 Overton Beach 5-29
5.3.4.5.1 Existing Treatment Plant 5-29
5.3.4.5.2 Effluent Disposal 5-30
5.3.4.6 Future Wastewater Collection and Treatment Systems 5-30
5.3.4.7 Pretreatment Program 5-30
5.3.4.8 Planning Area 4 Summary 5-30
5.3.5 Planning Area 5 - Las Vegas Wash 5-31
5.3.5.1 Clark County Water Reclamation District 5-33
5.3.5.1.1 Existing Collection Systems 5-33
5.3.5.1.2 Existing Treatment Facilities 5-33
5.3.5.1.2.1 Clark County Water Reclamation District Main Plant 5-34
5.3.5.1.2.2 Desert Breeze Water Resource Center 5-34
5.3.5.1.3 Pretreatment Program 5-38
5.3.5.1.4 Future Collection System 5-38
5.3.5.1.5 Future Treatment Facilities 5-39
5.3.5.1.6 Solids Handling and Effluent Disposal 5-39
5.3.5.2 City of Henderson 5-41
5.3.5.2.1 Existing Collection System 5-41
5.3.5.2.2 Existing Treatment Facilities 5-41
5.3.5.2.2.1 City of Henderson Water Reclamation Facility 5-41
5.3.5.2.2.2 Wastewater Treatment Plant No. 3 5-42
5.3.5.2.3 Pretreatment Program 5-42
5.3.5.2.4 Future Collection System 5-42
5.3.5.2.5 Future Treatment Facilities 5-42

5.3.5.2.5.1 City of Henderson Water Reclamation Facility 5-44
5.3.5.2.5.2 Wastewater Treatment Plant No. 3 5-44
5.3.5.2.5.3 Southwest Water Reclamation Facility 5-44
5.3.5.2.5.4 Planning Wastewater Treatment Facility Expansions 5-46
5.3.5.2.6 Solids Handling and Effluent Disposal 5-46
5.3.5.3 City of Las Vegas 5-48
5.3.5.3.1 Existing Collection System 5-48
5.3.5.3.2 Existing Treatment Facilities 5-48
5.3.5.3.2.1 City of Las Vegas Water Pollution Control Facility 5-49
5.3.5.3.2.2 Durango Hills Water Resource Center 5-49
5.3.5.3.2.3 Bonanza/Mojave Water Resource Center 5-49
5.3.5.3.3 Pretreatment Program 5-49
5.3.5.3.4 Future Collection System 5-51
5.3.5.3.5 Future Treatment Facilities 5-51
5.3.5.3.5.1 City of North Las Vegas Water Reclamation Facility and Deer Springs Water Resource Center Constructed (Cases 1 and 3) 5-51
5.3.5.3.5.2 City of North Las Vegas Reclamation Facility and Deer Springs Water Resource Center Not Constructed (Cases 2 and 4) 5-52
5.3.5.3.5.3 Planning Wastewater Treatment Facility Expansion 5-52
5.3.5.3.6 Solids Handling and Effluent Disposal 5-52
5.3.5.4 City of North Las Vegas 5-55
5.3.5.4.1 Existing Collection System 5-55
5.3.5.4.2 Pretreatment Program 5-55
5.3.5.4.3 Future Collection System 5-56
5.3.5.4.4 Proposed Treatment Facilities 5-56
5.3.5.4.5 Solids Handling and Effluent Disposal 5-58
5.3.5.5 Blue Diamond 5-59
5.3.5.5.1 Existing Collection Systems 5-59
5.3.5.5.2 Existing Treatment Facilities 5-59
5.3.5.5.3 Blue Diamond Septic Systems 5-59

5.3.5.5.4 Pretreatment Program 5-61
5.3.5.5.5 Future Collection System 5-61
5.3.5.5.6 Future Treatment Facilities 5-61
5.3.5.5.7 Solids Handling and Effluent Disposal 5-63
5.3.5.5.8 Water Quality Monitoring 5-63
5.3.5.6 Sloan 5-63
5.3.5.6.1 Proposed Southern NV Regional Heliport 5-63
5.3.5.7 Planning Area 5 Septic Systems 5-63
5.3.5.8 Planning Area 5 Summary 5-63
5.3.6 Planning Area 6 - Ivanpah – Pahrump Valleys 5-64
5.3.6.1 Boulder City 5-64
5.3.6.1.1 Existing Collection System 5-67
5.3.6.1.2 Existing Treatment Facilities 5-67
5.3.6.1.3 Future Collection System 5-67
5.3.6.1.4 Future Treatment Facilities 5-67
5.3.6.1.5 Solids Handling and Effluent Disposal 5-70
5.3.6.2 Jean 5-70
5.3.6.2.1 Existing Collection System 5-70
5.3.6.2.2 Existing Treatment Facilities 5-70
5.3.6.2.3 Solids Handling and Effluent Disposal 5-72
5.3.6.2.4 Jean Septic Systems 5-72
5.3.6.3 Primm 5-72
5.3.6.3.1 Existing Collection System 5-72
5.3.6.3.2 Existing Treatment Facilities 5-73
5.3.6.3.3 Solids Handling and Effluent Disposal 5-73
5.3.6.3.4 Primm Septic Systems 5-73
5.3.6.4 Proposed Ivanpah Airport 5-75
5.3.6.5 Planning Area 6 Wastewater Flows (Unincorporated Areas) 5-75
5.3.6.6 Sandy Valley 5-76
5.3.6.7 Goodsprings 5-76
5.3.6.8 Planning Area 6 Septic Systems 5-77
5.3.6.9 Pretreatment Program 5-77
5.3.6.10 Planning Area 6 Summary 5-77
5.3.7 Planning Area 7 - Havasu – Mohave Lakes 5-78
5.3.7.1 Laughlin 5-78
5.3.7.1.1 Existing Collection System 5-78
5.3.7.1.2 Existing Treatment Facilities 5-78
5.3.7.1.3 Laughlin Septic Systems 5-78
5.3.7.1.4 Future Collection System 5-78
5.3.7.1.5 Future Treatment Facilities 5-81
5.3.7.1.6 Solids Handling and Effluent Disposal 5-81

5.3.7.1.7 Water Quality Monitoring 5-83
5.3.7.2 Cottonwood Cove 5-83
5.3.7.2.1 Existing Treatment Facility 5-83
5.3.7.2.2 Effluent Disposal 5-83
5.3.7.2.3 Water Quality Monitoring 5-83
5.3.7.3 Community of Nelson 5-83
5.3.7.4 Planning Area 7 Septic Systems 5-83
5.3.7.5 Pretreatment Program 5-84
5.3.7.6 Planning Area 7 Summary 5-84
5.3.8 Planning Area 8 - Paiute Wash 5-84
5.3.8.1 Community of Searchlight 5-84
5.3.8.1.1 Existing Collection System 5-85
5.3.8.1.2 Existing Treatment Facilities 5-85
5.3.8.1.3 Searchlight Septic Systems 5-87
5.3.8.1.4 Future Collection System 5-87
5.3.8.1.5 Future Treatment Facilities 5-87
5.3.8.1.6 Solids Handling and Effluent Disposal 5-90
5.3.8.1.7 Water Quality Monitoring 5-90
5.3.8.2 Cal-Nev-Ari 5-90
5.3.8.3 Planning Area 8 Septic Systems 5-90
5.3.8.4 Pretreatment Program 5-91
5.3.8.5 Planning Area 8 Summary 5-91
5.4 Costs and Financing 5-91
5.5 Summary 5-92
5.6 Recommendations 5-94
5.7 References 5-97

SECTION 6 – WATER RECLAMATION / REUSE

6.1 Introduction 6-1
6.2 Purpose of the Reuse Plan 6-1
6.3 Water Reuse Regulations 6-1
6.4 Southern Nevada Water Authority 6-6
6.4.1 Water Conservation 6-6
6.4.2 Groundwater 6-6
6.4.3 Colorado River Water 6-7
6.4.4 Reclaimed Water 6-8
6.5 Reuse and Reclamation Potential 6-9
6.5.1 Planning Area 1 – Sand Spring – Tikaboo Valleys 6-10
6.5.1.1 Indian Springs 6-10
6.5.1.2 Summary of Planning Area 1 6-10
6.5.2 Planning Area 2 – Muddy River – Meadow Valley Wash 6-11

6.5.2.1 Moapa Valley Township 6-11
6.5.2.2 Apex 6-12
6.5.2.3 Coyote Springs 6-13
6.5.2.4 Moapa Township 6-13
6.5.2.5 Summary of Planning Area 2 6-14
6.5.3 Planning Area 3 – Lower Virgin River 6-16
6.5.3.1 Mesquite 6-16
6.5.3.2 Bunkerville 6-17
6.5.3.3 Summary of Planning Area 3 6-19
6.5.4 Planning Area 4 – Grand Wash and Lake Mead 6-20
6.5.5 Planning Area 5 – Las Vegas Wash 6-20
6.5.5.1 Southern Nevada Water Authority Reuse Threshold 6-20
6.5.5.2 Reclaimed Water Quantity 6-21
6.5.5.3 Unincorporated Clark County 6-22
6.5.5.3.1 Clark County Water Reclamation District Main Plant 6-22
6.5.5.3.2 Existing Water Reuse Systems 6-22
6.5.5.3.3 Future Reuse Opportunities 6-23
6.5.5.4 City of Henderson 6-27
6.5.5.4.1 Existing Water Reuse Systems 6-27
6.5.5.4.2 Future Reuse Opportunities 6-28
6.5.5.5 City of Las Vegas 6-31
6.5.5.5.1 Existing Water Reuse Systems 6-32
6.5.5.5.2 Future Reuse Opportunities 6-32
6.5.5.6 City of North Las Vegas 6-36
6.5.5.7 Blue Diamond 6-41
6.5.5.8 Sloan 6-41
6.5.5.9 Summary of Planning Area 5 6-41
6.5.6 Planning Area 6 – Ivanpah-Pahrump Valleys 6-43
6.5.6.1 Boulder City 6-43
6.5.6.1.1 Existing Water Reuse System 6-44
6.5.6.1.2 Future Reuse Opportunities 6-44
6.5.6.2 Jean 6-45
6.5.6.3 Primm 6-45
6.5.6.4 Sandy Valley 6-45
6.5.6.5 Proposed Ivanpah Airport 6-46
6.5.6.6 Summary of Planning Area 6 6-46
6.5.7 Planning Area 7 – Havasu-Mohave Lakes 6-47
6.5.7.1 Laughlin 6-47
6.5.7.2 Summary of Planning Area 7 6-47
6.5.8 Planning Area 8 – Paiute Wash 6-48
6.5.8.1 Searchlight 6-48

6.5.8.2 Cal-Nev-Ari 6-48
6.5.8.3 Summary of Planning Area 8 6-48
6.6 Emerging Trends in Reclaimed Water Application 6-48
6.7 Recommendations 6-49
6.8 References 6-52

SECTION 7 – POINT SOURCES

7.1 Introduction 7-1
7.2 Surface Water Discharge Permits 7-1
7.3 Mining Fluid Management 7-7
7.4 Groundwater Discharge Permits 7-10
7.4.1 Underground Injection Control Discharge Permits 7-16
7.4.1.1 Underground Injection Control Well Class I (Prohibited in Nevada) 7-20
7.4.1.2 Underground Injection Control Well Class II 7-20
7.4.1.3 Underground Injection Control Well Class III 7-20
7.4.1.4 Underground Injection Control Well Class IV (Prohibited in Nevada) 7-21
7.4.1.5 Underground Injection Control Well Class V 7-21
7.5 Leaking Underground Storage Tanks and Chemical Spills 7-22
7.6 Recommendations 7-23
7.7 References 7-25

SECTION 8 – NONPOINT SOURCES

8.1 Introduction 8-1
8.2 General Nonpoint Source Conditions in Clark County 8-4
8.2.1 Clark County Dry Weather Water Quality 8-4
8.2.2 Clark County Rainfall, Runoff, and Wet Weather Water Quality .. 8-7
8.2.3 Individual Sewage Disposal Systems (Septic Systems) 8-12
8.2.4 Erosion 8-18
8.2.5 Groundwater Exfiltration 8-19
8.3 Nevada General Permits Applicable to Nonpoint Sources 8-20
8.3.1 Nevada's Industrial Facility Stormwater Permit Program 8-20
8.3.2 Nevada's Stormwater Construction Site Permit Program 8-21
8.4 Planning Area 5 8-22
8.4.1 Stormwater 8-22
8.4.1.1 Las Vegas Valley Industrial Pretreatment, Facility Monitoring and Control 8-25
8.4.1.2 Las Vegas Valley Construction Site Runoff Management Program 8-26
8.4.1.3 Las Vegas Valley Illicit Discharge Detection & Control 8-28

8.4.2 Groundwater Exfiltration 8-29
8.4.3 Miscellaneous Urban Activities 8-30
8.4.4 Erosion 8-31
8.4.5 Wellhead Protection 8-31
8.5 Nonpoint Sources Outside of the Las Vegas Valley 8-31
8.5.1 Agricultural Return Flows 8-31
8.5.2 Runoff From Livestock Land Uses 8-34
8.5.3 Urban Stormwater Runoff 8-34
8.5.4 Construction 8-35
8.5.5 Mining and Industrial Nonpoint Sources 8-35
8.5.6 Channel Erosion 8-38
8.6 Recommendations 8-41
8.7 References 8-44

SECTION 9 – BEST MANAGEMENT PRACTICES AND ALTERNATIVE TREATMENT METHODS AND DISPOSAL

9.1 Introduction 9-1
9.2 Best Management Practices for Nonpoint Sources 9-1
9.2.1 MS4 Permits and Best Management Practices 9-1
9.2.2 Applicable Best Management Practices for Clark County 9-1
9.2.3 Nevada General Stormwater Permits 9-3
9.3 Planning Area 5 9-5
9.3.1 Source Control Program (Non-Structural Best Management Practices) 9-5
9.3.1.1 Additional Source Control Best Management Practices 9-5
9.3.2 Structural Control Program 9-9
9.3.2.1 Detention Basin Program 9-9
9.3.2.2 Post Construction Program 9-11
9.3.2.3 Construction Best Management Practices 9-11
9.4 Planning Areas 2, 3 and 4 9-12
9.4.1 Urban Best Management Practices 9-12
9.4.2 Agricultural Best Management Practices 9-12
9.5 Alternative Wastewater Treatment Methods and Disposal 9-14
9.5.1 Treatment Approaches 9-15
9.5.1.1 Satellite Water Reclamation 9-15
9.5.1.2 Package Plants and Interim Package Plants 9-15
9.5.2 Treatment Technologies 9-16
9.5.2.1 Sequencing Batch Reactors 9-16
9.5.2.2 Membrane Bioreactors 9-16
9.5.2.3 Wetlands Treatment 9-17
9.5.2.4 Advanced Ecologically Engineered System 9-18

9.5.2.5 Ozone Disinfection 9-19
9.5.3 Effluent Disposal 9-19
9.5.3.1 Groundwater Recharge of Treated Effluent 9-19
9.5.3.2 Nonpotable Reuse 9-20
9.5.3.3 Return to Waterways 9-20
9.5.4 Treatment Matrix 9-20
9.6 Recommendations 9-21
9.7 References 9-23

SECTION 10 – WELLHEAD PROTECTION

10.1 Introduction 10-1
10.2 Nevada Wellhead Protection Program 10-1
10.2.1 Formation of a Wellhead Protection Program Team 10-1
10.2.2 Delineation of Wellhead Protection Areas 10-2
10.2.3 Inventory of Potential Contaminant Sources Within Wellhead Protection Areas 10-2
10.2.4 Selection and Implementation of Management Strategies 10-2
10.2.5 New Well Planning 10-3
10.2.6 Contingency Plan Development 10-3
10.2.7 Public Participation 10-3
10.3 Clark County Wellhead Protection Programs 10-3
10.3.1 Indian Springs 10-4
10.3.2 Creech Air Force Base 10-4
10.3.3 Moapa Valley Wellhead Protection Program 10-4
10.3.4 Blue Diamond Village 10-7
10.3.5 Nellis Air Force Base 10-7
10.3.6 Sandy Valley Wellhead Protection Program 10-7
10.3.7 Searchlight Wellhead Protection Program 10-7
10.3.8 Underground Fuel Tanks 10-7
10.3.9 Las Valley Groundwater Management Program 10-8
10.4 Recommendations 10-9
10.5 References 10-10

SECTION 11 – COLORADO RIVER AND LAKE MEAD

11.1 Introduction 11-1
11.2 Las Vegas Wash 11-1
11.2.1 Water Quality Issues 11-7
11.2.1.1 Septic System Tributary Interaction Study 11-7
11.2.1.2 Perchlorates 11-8
11.2.1.3 Selenium 11-9

11.2.1.4 Emerging Contaminants 11-9
11.2.2 Sensitive Species and Habitats 11-10
11.2.3 Coordination Activities and Projects 11-13
11.2.3.1 Clark County Wetlands Park Master Plan 11-13
11.2.3.2 Las Vegas Wash Coordination Committee 11-14
11.2.3.3 Las Vegas Wash Weed Partnership 11-15
11.2.3.4 Clean Water Coalition Systems Conveyance and Operations Program 11-15
11.2.3.5 Las Vegas Valley Watershed Advisory Committee 11-16
11.3 Lake Mead 11-17
11.3.1 Recreation 11-17
11.3.2 Sensitive Species and Habitats 11-18
11.3.3 Water Quality and Volume Coordination Activities 11-19
11.3.3.1 Lake Mead Water Quality Forum 11-19
11.3.3.2 Colorado River Commission 11-20
11.3.3.3 Boulder Basin Adaptive Management Plan 11-20
11.3.3.4 Southern Nevada Water Authority 11-23
11.4 Recommendations 11-23
11.5 References 11-25

SECTION 12 – ENVIRONMENTAL / INTEGRATED PLANNING COORDINATION

12.1 Introduction 12-1
12.2 Environmental Agencies and Organizations 12-1
12.2.1 Clark County 12-3
12.2.1.1 Clark County Department of Air Quality and Environmental Management 12-4
12.2.1.1.1 State Implementation Plan for PM10 12-5
12.2.1.1.2 Clark County Multiple Species Habitat Conservation Plan 12-6
12.2.1.1.3 Eco-County Initiative 12-7
12.2.1.2 Clark County Department of Comprehensive Planning 12-9
12.2.1.3 Clark County Regional Flood Control District 12-9
12.2.2 Conservation District of Southern Nevada 12-10
12.2.3 High Desert Resource Conservation and Development Council 12-10
12.2.4 U.S. Fish and Wildlife Service 12-10
12.2.4.1 Virgin River Restoration Program 12-11
12.2.4.2 Muddy River Restoration Efforts 12-13
12.2.5 U.S. Army Corps of Engineers 12-14
12.2.6 Bureau of Land Management 12-14
12.2.7 Bureau of Indian Affairs 12-16
12.2.8 Nevada Division of Environmental Protection 12-16

12.2.9 Southern Nevada Water Authority 12-16
12.3 Clark County Water Quality Management Plan Planning Process Flow Diagram 12-18
12.4 Summary 12-18
12.5 Recommendations 12-20
12.6 References 12-22

SECTION 13 – RECOMMENDATIONS

13.1 Recommendations 13-1
13.1.1 Section 2 – Population Projections 13-1
13.1.2 Section 3 – Wastewater Flow Projections 13-1
13.1.3 Section 4 – Water Quality Standards/Planning 13-1
13.1.4 Section 5 – Wastewater Collection, Treatment, and Disposal 13-1
13.1.5 Section 6 – Water Reclamation 13-2
13.1.6 Section 7 – Point Sources 13-2
13.1.7 Section 8 – Nonpoint Sources 13-3
13.1.8 Section 9 – Best Management Practices and Alternative Treatment Methods and Disposal 13-3
13.1.9 Section 10 – Wellhead Protection 13-4
13.1.10 Section 11 – Colorado River and Lake Mead 13-4
13.1.11 Section 12 – Environmental/Integrated Planning Coordination 13-4

APPENDIX A – CHRONOLOGY OF MAJOR 208 EVENTS
APPENDIX B – FEDERAL AND STATE OF NEVADA WATER QUALITY LEGISLATION
APPENDIX C – PLANNING AREA DELINEATION
APPENDIX D – LAS VEGAS WATERSHED ADVISORY COMMITTEE REGIONAL WATER QUALITY PLAN

LIST OF TABLES

Table Number	Title	Following/ Page
ES-1	Comparison of Clark County Population Projections	ES-9
ES-2	Per Capita Wastewater Flow Contributions	ES-10
ES-3	Wastewater Flows for Planning Areas	ES-12
ES-4	Wastewater Treatment Facilities in Clark County	ES-15
ES-5	Summary of WWTF Capacity and Flows in Clark County	ES-17
ES-6	Comparison of Wet Weather and Dry Weather Pollutant Concentrations in Las Vegas Valley (1991-2007)	ES-22
ES-7	Clark County Communities With Completed Wellhead Protection Plans (April 2007)	ES-27
ES-8	Agencies and Organizations Responsible for Environmental Planning in Clark County	ES-30
1-1	Legislative Requirements	1-5
2-1	Population Estimate for Planning Area 5 (2006)	2-3
2-2	Population Estimate for 2006 in Clark County	2-4
2-3	Population Projections for Planning Area 1	2-7
2-4	Population Projections for Planning Area 2	2-9
2-5	Population Projections for Planning Area 3	2-10
2-6	Population Projections for Planning Area 5	2-12
2-7	Population Projections for Planning Area 6	2-13
2-8	Population Projections for Planning Area 7	2-15
2-9	Population Projections for Planning Area 8	2-16
2-10	Comparison of Clark County Population Projections	2-17
2-11	Population Projections By Planning Area	2-18
2-12	Unincorporated County Areas and Incorporated Population Projections by Planning Area	2-19
3-1	Per Capita Wastewater Flow Contributions	3-3
3-2	Wastewater Flow Projections for Planning Area 1	3-5
3-3	Wastewater Flow Projections for Planning Area 2	3-6
3-4	Wastewater Flow Projections for Planning Area 3	3-7
3-5	Wastewater Flow Projections for Planning Area 5	3-8
3-6	Proposed Southern Nevada Regional Heliport Forecasted Number of Passengers Per Year and Estimated Wastewater Flows	3-9

3-7	Proposed Invanpah Airport Forecasted Number of Passengers Per Year and Estimated Wastewater Flows	3-11
3-8	Planning Area 6 Unincorporated County Areas Population Projections and Wastewater Flows	3-11
3-9	Wastewater Flow Projections for Planning Area 6	3-12
3-10	Wastewater Flow Projections for Planning Area 7	3-14
3-11	Wastewater Flow Projections for Planning Area 8	3-15
4-1	Beneficial Uses of Nevada Surface Waters	4-5
4-2	Beneficial Uses of Major Surface Waters in Clark County	4-6
4-3	Summary of Water Quality Requirements to Maintain Existing Higher Quality for Surface Waters in Clark County	4-9
4-4	Summary of Water Quality Criteria to Protect Beneficial Uses of Designated Surface Waters in Clark County	4-11
4-5	Nevada's Draft 2006 303(d) Impaired Waters List – Clark County Surface Waters	4-14
4-6	Las Vegas Wash Wasteload and Load Allocations	4-16
5-1	Wastewater Treatment Facilities in Clark County	5-3
5-2	Indian Springs Population Projections, Wastewater Flows, and Treatment Facility Capacity	5-9
5-3	Planning Area 1 Summary Table	5-11
5-4	Moapa Valley Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-16
5-5	Coyote Springs Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-19
5-6	Planning Area 2 Summary Table	5-22
5-7	Mesquite Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-25
5-8	Planning Area 3 Summary Table	5-27
5-9	Summary of WWTPs in Planning Area 4	5-31
5-10	CCWRD Wastewater Treatment Facilities	5-34
5-11	CCWRD Population Projections, Wastewater Flows and Treatment Facilities Capacity	5-40
5-12	COH Treatment Facility Planned Capacity Expansions	5-46

LIST OF TABLES (Continued)

Table Number	Title	Following/ Page
5-13	COH Population Projections, Wastewater Flows, and Treatment Facilities Capacity	5-47
5-14	CLV Wastewater Treatment Facilities	5-48
5-15	CLV Future Flow Scenarios	5-51
5-16	CLV Case 3: Population Projections, Wastewater Flows, and Treatment Facilities Capacity	5-53
5-17	CLV Case 4: Population Projections, Wastewater Flows, and Treatment Facilities Capacity	5-54
5-18	CNLV Wastewater Flows and Treatment Plant Capacity	5-57
5-19	Blue Diamond Population Projections, Wastewater Flows and WWTF Capacity	5-62
5-20	Planning Area 5 Wastewater Treatment Facilities	5-64
5-21	Summary of WWTPs in Planning Area 5	5-66
5-22	Boulder City Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-69
5-23	Planning Area 6 (Unincorporated Areas) Population Projections, Wastewater Flows, and WWTF Capacity	5-75
5-24	Planning Area 6 Summary Table	5-78
5-25	Laughlin Population Projections, Wastewater Flows and Treatment Plant Capacity	5-82
5-26	Planning Area 7 Summary Table	5-84
5-27	Searchlight Population Projections, Wastewater Flows and WRC Capacity	5-89
5-28	Planning Area 8 Summary Table	5-91
5-29	Summary of WWTF Capacity and Flows in Clark County	5-93
6-1	NAC 445A.276 Disinfection Requirements	6-3
6-2	Reuse Category and Approved Uses	6-3
6-3	Planning Area 1 – 2006 Reclaimed Water Use	6-11
6-4	Planning Area 2 Wastewater Treatment Facilities and 2006 Reclaimed Water Use	6-14
6-5	Reclaimed Water Demands By Potential Land Use Customer in Planning Area 2	6-15
6-6	Planning Area 3 Summary Table and 2006 Reclaimed Water Use	6-19
6-7	Reclaimed Water Demands By Customers in Planning Area 3	6-19

LIST OF TABLES (Continued)

Table Number	Title	Following/ Page
6-8	SNWA Reuse Threshold By Agency	6-21
6-9	Existing Golf Courses Within Unincorporated Clark County Water Usage Summary	6-24
6-10	Proposed and Future Golf Courses Within Unincorporated Clark County Water Usage Summary	6-25
6-11	Summary of Parks Water Usage in Unincorporated County Areas of Planning Area 5	6-26
6-12	Summary of Industrial Reclaimed Water Demand in Unincorporated County Areas of Planning Area 5	6-26
6-13	Existing Golf Courses Within COH Water Usage Summary	6-29
6-14	Proposed and Future Golf Courses Within COH Water Usage Summary	6-30
6-15	Summary of COH Parks Water Usage	6-31
6-16	Summary of COH Industrial Reclaimed Water Demand	6-31
6-17	Existing Golf Courses in CLV Water Usage Summary	6-34
6-18	Proposed and Future Golf Courses CLV – Water Usage Estimates	6-35
6-19	Summary of CLV Parks Water Usage	6-36
6-20	Summary of CLV Industrial Reclaimed Water Demand	6-36
6-21	Golf Courses in CNLV Water Usage Summary	6-37
6-22	Summary of CNLV Parks Water Usage	6-39
6-23	CNLV Industrial Facilities Water Usage Summary	6-40
6-24	Planning Area 5 Wastewater Treatment Facilities and 2006 Reclaimed Water Use	6-42
6-25	Potential Reclaimed Water Demand in Planning Area 5	6-43
6-26	Planning Area 6 Wastewater Treatment Facilities and 2006 Reclaimed Water Use	6-46
6-27	Reclaimed Water Demands By Potential Land Use Customer in Planning Area 6	6-47
6-28	Planning Area 7 Wastewater Treatment Facilities and 2006 Reclaimed Water Use	6-47
6-29	Planning Area 8 Wastewater Treatment Facilities and 2006 Reclaimed Water Use	6-48
7-1	Major NPDES Discharge Permits in Clark County	7-2
7-2	Surface Water Discharge Permits Within Clark County	7-4

LIST OF TABLES (Continued)

Table Number	Title	Following/ Page
7-3	Clark County Mining and Milling Operations	7-8
7-4	Groundwater Discharge Permits in Clark County	7-11
7-5	UIC Permits Within Clark County	7-17
8-1	Nonpoint Source Contributions	8-1
8-2	Summary of Las Vegas Valley Dry Weather Water Quality For 1991 to 2007	8-6
8-3	NPDES Constituents Measured in Las Vegas Valley During Wet Weather	8-9
8-4	Comparison of Wet Weather and Dry Weather Pollutant Concentrations in Las Vegas Valley (1991-2007)	8-11
8-5	Minimum Lot Size Requirements For Septic Systems in Nevada	8-13
8-6	Clark County Allowed Septic Density Per Square Mile	8-14
8-7	Septic System Permits Within Clark County	8-16
8-8	Historical and Projected Agricultural Water Use for Clark County	8-32
9-1	Maintenance Goals for Municipal Permittees	9-6
9-2	Maintenance BMP Summary Report for 2006-2007	9-7
9-3	Farming and Livestock BMPs Recommended in Nevada BMP Handbook	9-13
9-4	Typical MBR Plant Effluent Quality	9-17
9-5	Reliability Achieved Treatment Goals of the Living Machine®	9-18
9-6	Issues and Applicable Wastewater Methods and/or Technology by Planning Area	9-21
10-1	NDEP -- Examples of Management Strategies for a WHPP	10-3
10-2	Clark County Communities with Completed Wellhead Protection Plans (April 2007)	10-4
11-1	Chronology of Activities Influencing Las Vegas Wash	11-2
12-1	Agencies and Organizations Responsible for Environmental Planning in Clark County	12-1

LIST OF FIGURES

Figure Number	Title	Following/ Page
ES-1	Planning Area Delineation for the Clark County Area-Wide WQMP	ES-7
1-1	Planning Area Delineations	1-1
2-1	Planning Area 1 – Population Projections	2-7
2-2	Planning Area 2 – Population Projections	2-9
2-3	Planning Area 3 – Population Projections	2-10
2-4	Planning Area 5 – Population Projections	2-12
2-5	Planning Area 6 – Population Projections	2-13
2-6	Planning Area 7 – Population Projections	2-15
2-7	Planning Area 8 – Population Projections	2-16
2-8	Comparison of Clark County Population Projections	2-17
3-1	Planning Area 1 – Wastewater Flow Projections	3-5
3-2	Planning Area 2 – Wastewater Flow Projections	3-6
3-3	Planning Area 3 – Wastewater Flow Projections	3-7
3-4	Planning Area 5 – Wastewater Flow Projections	3-9
3-5	Planning Area 6 – Wastewater Flow Projections	3-13
3-6	Planning Area 7 – Wastewater Flow Projections	3-14
3-7	Planning Area 8 – Wastewater Flow Projections	3-16
5-1	Wastewater Treatment Facilities in Clark County	5-4
5-2	Indian Springs Wastewater Treatment System Site Plan	5-6
5-3	Indian Springs Wastewater Treatment System Upgrade Site Plan	5-8
5-4	Indian Springs Population Projections, Wastewater Flows, and Treatment Facility Capacity	5-9
5-5	Overton Ponds Site Plan	5-13
5-6	Moapa Valley WRC Modification Site Plan	5-15
5-7	Moapa Valley Population Projections, Wastewater Flows, and WRC Capacity	5-16
5-8	Coyote Springs Development WWTF Process Flow Diagram	5-18
5-9	Coyote Springs Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-19
5-10	Mesquite WWTP Process Schematic	5-24

LIST OF FIGURES (Continued)

Figure Number	Title	Following/ Page
5-11	Mesquite Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-25
5-12	SCOP Layout	5-33
5-13	CCWRD Central Plant Site Plan	5-36
5-14	CCWRD AWT Facility Site Plan	5-37
5-15	CCWRD Population Projections, Wastewater Flows, And Treatment Facilities Capacity	5-40
5-16	COH WRF Site Plan	5-43
5-17	Southwest WRF Site Plan	5-45
5-18	COH Population Projections, Wastewater Flows, and Treatment Facilities Capacity	5-47
5-19	CLV WPCF Site Plan	5-50
5-20	CLV Case 3: Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-53
5-21	CLV Case 4: Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-54
5-22	CNLV Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-57
5-23	Blue Diamond WWTF Site Plan	5-60
5-24	Blue Diamond Population Projections, Wastewater Flows, and WWTF Capacity	5-62
5-25	Boulder City WWTF Process Schematic	5-68
5-26	Boulder City Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-69
5-27	Jean WWTF Site Plan	5-71
5-28	Primm WWTF Site Plan	5-74
5-29	Planning Area 6 (Unincorporated Areas) Population Projections, Wastewater Flows, and Treatment Plant Capacity	5-76
5-30	Laughlin WRF Site Plan	5-80
5-31	Laughlin Population Projections, Wastewater Flows, and Treatment Facility Capacity	5-82
5-32	Searchlight WRC Site Plan	5-86
5-33	Searchlight WRC Expansion Site Plan	5-88
5-34	Searchlight Population Projections, Wastewater Flows, and WRC Capacity	5-89

Figure Number	Title	Following/ Page
6-1	NAC 445A.275 General Requirements and Restrictions	6-2
6-2	Mesquite Reclaimed Water System Map	6-18
6-3	CNLV Potential Water Sites	6-38
7-1	Surface Water Discharge Permits Within Clark County	7-3
7-2	Groundwater Discharge Permits Within Clark County	7-9
7-3	Underground Injection Control (UIC) Permits Within Clark County	7-15
8-1	Designated Groundwater Basins of Clark County	8-15
8-2	Septic System Permits Within Clark County	8-17
8-3	Concentrations of Nitrate in Groundwater in Clark County	8-18
8-4	Dissolved Solids Concentrations in Groundwater in Clark County	8-20
8-5	BLM Inventory of Abandoned Mines in Clark County	8-37
8-6	Active Mining, Oil and Gas Leases in Clark County	8-39
9-1	Areas Draining to Regional Detention Basins in the Las Vegas Valley	9-10
10-1	Wellhead Protection Areas	10-6
12-1	Water Quality Management Planning Process for Clark County, Nevada	12-19

Acronyms and Abbreviations

208 Plan	208 Water Quality Management Plan
AACEI	Association for the Advancement of Cost Engineering International
ACEC	Areas of Critical Environmental Concern
acre-ft/year	acre-feet per year
AEES	Advanced Ecologically Engineered System
AS	Activated Sludge
AWRS (2000)	Area Wide Reuse Study for the Las Vegas Valley
AWT	Advanced Wastewater Treatment
AWWARF	American Water Works Association Research Foundation
BACM	Best Available Control Measure
BACT	Best Available Control Technology
BBAMP	Boulder Basin Adaptive Management Plan
BBWD	Big Bend Water District
BCC	Clark County Board of County Commissioners
BIA	U.S Bureau of Indian Affairs
BLM	Bureau of Land Management
BMI	Black Mountain Industries
BMP	Best Management Practices
BMRR	Bureau of Mining Regulation and Reclamation
BNR	Biological Nutrient Removal
BOD	Biological Oxygen Demand
Boulder City	City of Boulder City
B&V	Black & Veatch
BWPC	Bureau of Water Pollution Control
BWQP	Bureau of Water Quality Planning
CBER	Center for Business and Economic Research
CCDCP	Clark County Department of Comprehensive Planning
CCDOA	Clark County Department of Aviation
CCPRO	Clark County Public Response Office
CCRFCD	Clark County Regional Flood Control District
CCWRD	Clark County Water Reclamation District
CDSN	Conservation District of Southern Nevada
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIUs	Categorical Industrial Users
CLV	City of Las Vegas

CMA	Compatibility Management Area
CNLV	City of North Las Vegas
CNLV WRF Amendment (2005)	City of North Las Vegas Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 WQMP
CNMPs	Comprehensive Nutrient Management Plans
COD	Chemical Oxygen Demand
COH	City of Henderson
CRC	Colorado River Commission
CWA	Federal Water Pollution Control Act
CWC	Clean Water Coalition
DAQEM	Clark County Department of Air Quality and Environmental Management
DBA	Doing Business As
DDT	dichlorodiphenyltrichloroethane
DCNR	Department of Conservation and Natural Resources
du/ac	Dwelling Units per Acre
EA	Environmental Assessment
ECS	Erosion Control Structure
EDC	Endocrine Disrupting Compound
EI	Effluent Interceptor
EIS	Environmental Impact Statement
EMP	Effluent Management Plan
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERU	Equivalent Residential Unit
FAA	Federal Aviation Administration
FE	Endangered Species
FESA	Federal Endangered Species Act of 1973
FLPMA	Federal Land Policy and Management Act of 1976
FT	Threatened Species
GCS	Grade Control Structure
GID	General Improvement District
GILIS	Geographically Integrated Land Use Information System
GIS	Geographic Information System
GISMO	Geographic Information System Management Office
gpd	gallons per day

gpcd	gallons per capita per day
gpm	gallons per minute
GWPC	Ground Water Protection Council
HCT	Habitat Conservation Plan
Heliport	Southern Nevada Regional Heliport
HUC	Hydrologic Unit Code
ICMP	Integrated & Comprehensive Management Program
ICS	Intentionally Created Surplus
IEC	Ivanpah Energy Center
LA	Load Allocations
Laughlin	Township of Laughlin
LEPC	Local Emergency Planning Committee
LEED	Leadership in Energy and Environmental Design
LID	Low Impact Development
LMWQF	Lake Mead Water Quality Forum
LRP	Long-Range Plan
LUSTs	Leaking Underground Storage Tanks
LVVL	Las Vegas Valley Lateral
LVVWAC	Las Vegas Valley Watershed Advisory Committee
LVVWD	Las Vegas Valley Water District
LVWCAMP	Las Vegas Wash Comprehensive Adaptive Management Plan
LVWCC	Las Vegas Wash Coordination Committee
LVWWP	Las Vegas Wash Weed Partnership
MBR	Membrane Bioreactor
MBTA	Migratory Bird Treaty Act of 1986
MCL	Maximum Contaminant level
MEP	Maximum Extent Practicable
Mesquite	City of Mesquite
mg	Million Gallons
mg/L	milligram(s) per liter
mgd	million gallons per day
MOA	Memorandum of Agreement
MRREIAC	Muddy River Regional Environmental Impact Alleviation Committee
MS4	Municipal Separate Storm Sewer System
MSHCP	Multiple Species Habitat Conservation Plan
msl	Mean Sea Level
MTBE	methyl tertiary-butyl ether

MW	Megawatt
MWH	MWH Americas, Inc.
N	Nitrogen
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NBMG	Nevada Bureau of Mines and Geology
NCA	National Conservation Area
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Division of Wildlife
NEPA	National Environmental Policy Act
NH_4	Ammonia
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRA	National Recreational Area
NRCS	National Resources Conservation Service
NRS	Nevada Revised Statute
NWR	National Wildlife Refuge
P	Phosphorus
PCBs	Polychlorinated Biphenyls
PM10	Particulate matter less than 10 microns in diameter
POC	Project Oversight Committee
POTW	Publicly Owned Treatment Works
ppb	parts per billion
PPCPs	Pharmaceuticals and Personal Care Products
RAS	Return Activated Sludge
RC&D	High Desert Resource Conservation & Development Council
RCRA	Resource Conservation and Recovery Act
Reclamation	U.S Bureau of Reclamation
REMI	Regional Economics Models, Inc.
RIB	Rapid Infiltration Basins
RIP	Recovery Implementation Program
RMHQs	Requirments to Maintain Higher Quality
RO	reverse osmosis
ROD	Record of Decision
ROM	Rough Order of Magnitude
RWDS	Recycled Water Distribution System

RV	Recreational Vehicle
SARA	Superfund Amendments and Reauthorization Act of 1986
SBRs	Sequencing Batch Reactors
SCOP	Systems Conveyance and Operations Program
SDWA	Safe Drinking Water Act
SEC	State Environmental Commission
septic systems	Individual Sewage Disposal Systems
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SIU	Significant Industrial Users
SNCC	Southern Nevada Corrections Center
SNHBA	Southern Nevada Home Builders Association
SNHD	Southern Nevada Health District (formerly Clark County Health District)
SNWA	Southern Nevada Water Authority
SOC	Semivolatile Organic Compound
SQMC	Stormwater Quality Management Committee
S.U.	Standard Units
SWAC	Sewage and Wastewater Advisory Committee
SWAC 2006 Year End Summary	2006 Year End Summary for the Clark County Sewage and Wastewater Advisory Committee
SWEPT	Solid Waste Environmental Protection Team
SWMP	Storm Water Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TDS	Total Dissolved Solids
TE&S	Threatened, Endangered and Species of Concern
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
µg/L	micrograms per liter
UIC	Underground Injection Control
USACE	U.S. Army Corps of Engineers
USC	United Stated Code
USDA	United States Department of Agriculture
USDW	Underground Sources of Drinking Water
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

UST	Underground Storage Tanks
UV	Ultraviolet
VOC	Volatile Organic Compound
VVWD	Virgin Valley Water District
WAS	Waste Activated Sludge
Wash CIP	Las Vegas Wash Capital Improvements Plan
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Program
WLA	Wasteload Allocations
WPCF	Water Pollution Control Facility
WPCP	Water Pollution Control Permits
WQMP	Water Quality Management Plan
WRC	Water Resource Center
WRF	Water Reclamation Facility
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant

Executive Summary

DAQEM

DEPARTMENT OF AIR QUALITY & ENVIRONMENTAL MANAGEMENT

Executive Summary

ES.1 INTRODUCTION

Clark County, Nevada, has a population of 2 million, and with an estimated 5,000 people moving in each month, it is one of the fastest growing counties in the United States. The continuous growth highlights the need to address growing water pollution issues. Starting in 1978, the Clark County Board of County Commissioners (BCC) adopted the initial *208 Water Quality Management Plan* (*208 Plan*), followed by several revisions and amendments. The initial document was started because of the Federal Water Pollution Control Act, or Clean Water Act (CWA), Amendments of 1972 and 1977; Section 208 required the planning and management of activities associated with water pollution management through an area-wide water quality management program. Through the years, the amendments and revisions addressed such topics as providing management plans for controlling all point and nonpoint discharges to surface water and groundwater, revising or amending plans to address the effects of recent development, providing water quality planning for the future, and much more.

ES.2 BACKGROUND

The CWA Amendments of 1972 and 1977 require the control of all sources of water pollution to meet the goals of the CWA. Section 208 of the CWA requires that all activities associated with water pollution problems be planned and managed through an integrated area-wide water quality management program. It also defines the schedule and scope of area-wide wastewater treatment management plans.

After the Nevada State Legislature passed Senate Bill 468 in May 1975, area-wide water quality management planning duties and powers were vested in certain counties. The BCC was designated the area-wide water quality management planning organization within Clark County.

The BCC originally designated the Clark County Department of Comprehensive Planning (CCDCP) as the agency to manage and administer 208 planning. In 2006, the BCC designated the Clark County Department of Air Quality and Environmental Management (DAQEM) as the agency to manage and administer 208 planning in Clark County. DAQEM's responsibilities include the preparation of this *Clark County Area-Wide Water Quality Management Plan (WQMP).*

The initial *208 Plan* presented objectives, policies, and programs for managing water quality in the county. It was adopted by the BCC in 1978 and approved by the U.S. Environmental Protection Agency (EPA). The plan addressed municipal wastewater treatment, groundwater management, stormwater issues, Las Vegas Wash, diffuse agriculture sources, water quality standards and revisions, management reorganization, and financing necessary to carry out the *208 Plan* as well as an implementation schedule. The list below summarizes amendments and revisions to the original *208 Plan*.

- In October 1979, the original *208 Plan* was revised and certified by the State of Nevada in May 1980 and by EPA in October 1981. It was the first update of the original 1978 plan that address revised federal standards and guidelines, population projections, and new water quality control technologies. The update also reflected comments from local governments, special districts, citizens, and interested groups.

- In April 1988, the BCC revised the Las Vegas Wash Chapter of the *Clark County 208 Revised WQMP* and adopted the revision entitled City of Henderson (COH) – Lake at Las Vegas project. The completed project was titled *Amendment to the Revised Clark County 208 WQMP Lake at Las Vegas, April 1988*.

- In November 1988, the BCC adopted the *Revised Water Quality Management 208 Plan for the Rural Areas of Clark County, November 1988*. It revised Chapter II, *Wastewater Treatment of the Clark County 208 Revised WQMP*, by amending the sections on Rural Areas and Package Plants for Sewage Treatment, and including a new section on Native American Indian Reservations.

- In June 1990, the BCC adopted the Laughlin Amendment to the *Clark County 208 Revised WQMP Amendment*. The *208 WQMP Laughlin Amendment* outlines recommendations and conclusions for wastewater and sludge treatment and disposal in the Township of Laughlin (Laughlin).

- On June 18, 1996, the BCC approved an agreement to prepare the *Las Vegas Valley 208 WQMP Amendment* to revise the *1990 208 Plan Amendment*. It includes effects of sustained regional growth and development, revises stormwater permitting in a more inclusive nonpoint section, and provides

water-quality planning to a horizon year of 2020. The result was the *Las Vegas Valley 208 WQMP Amendment, July 1997*.

- In June 2000, the BCC adopted the *Northeast Clark County 208 WQMP Amendment, June 2000,* which revised the 1988 208 Plan Amendment and addressed the effects of recent development, and provided water quality planning to a horizon year of 2020.

- In 2001, the BCC adopted the *Las Vegas Valley Watershed Wastewater Needs Assessment Study* and the *Area Wide Reuse Study (AWRS [2000])* as an implementation amendment to the *Las Vegas Valley 208 WQMP Amendment, July 1997.*
- In June 2004, the BCC adopted the *South Clark County 208 WQMP, June 2004*, which addressed the effects of recent and potential future development in the south county area. It also provided water quality planning to a horizon year of 2023.

- The *City of North Las Vegas Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 WQMP, October 2005* included the City of North Las Vegas (CNLV) Water Reclamation Facility (WRF) which will treat wastewater generated within CNLV limits.

- The *Amendment to Northeast Clark County 208 WQMP, February 2007* acknowledges the lack of wastewater management options in the northeast area and provides package plant options for future residential subdivisions.

ES.3 PURPOSE OF THE CLARK COUNTY AREA-WIDE WATER QUALITY MANAGEMENT PLAN

On September 5, 2006, the BCC approved an agreement to prepare the *Clark County Area-Wide WQMP*. They subsequently issued a notice to proceed with the WQMP on September 18, 2006. The principal purpose of the *Clark County Area-Wide WQMP* is to:

- Combine and update information from the following Clark County plans into one comprehensive document:

- *Northeast Clark County 208 WQMP Amendment, Amendment to Northeast Clark County WQMP*
- *Las Vegas Valley 208 WQMP Amendment*
- *City of North Las Vegas Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 WQMP*
- *South County WQMP Amendment*
- *Amendment to Northeast Clark County WQMP*

- Provide an area-wide WQMP report that includes population and wastewater flow projections, planned sewer improvement and expansion projects (including estimated costs), and proposed schedules for implementation.
- Include effects of sustained regional growth and development.
- Revise stormwater permitting discussion in a more inclusive nonpoint source section.
- Provide water quality planning to a horizon year of 2030.

The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County.

ES.4 SUMMARY

The following summarizes each section in the *Clark County Area-Wide WQMP*.

ES.4.1 Section 1 – Background

Along with the amendments and revisions to the initial *208 Plan*, this section summarizes background information for geologic, soil, topographic, watershed/drainage and land use for major cities, towns and unincorporated areas within the eight planning areas. The information was gathered from various sources previously approved by the BCC. Other sources include Clark County Nevada Geologic and Topographic Maps as well as soil information provided by the Nevada Bureau of Mines and Geology. The Indian Reservations within Clark County are not

subject to the planning authority of the State of Nevada or its designees; thus, planning information for the Indian Reservations is not included in this WQMP.

For the WQMP, Clark County was delineated into eight planning areas, which are shown in **Figure ES-1**. These eight planning areas were created based on previous delineations by the United States Geological Survey (USGS) and the Division of Water Resources of the State Engineers Office. The planning areas are comprised of hydrographic regions as delineated by the Division of Water Resources of the State Engineers Office and the USGS. A map showing the boundaries of each WQMP planning area and the state hydrographic basins is shown in Appendix C, along with a table noting the hydrographic and planning areas each Clark County community falls into.

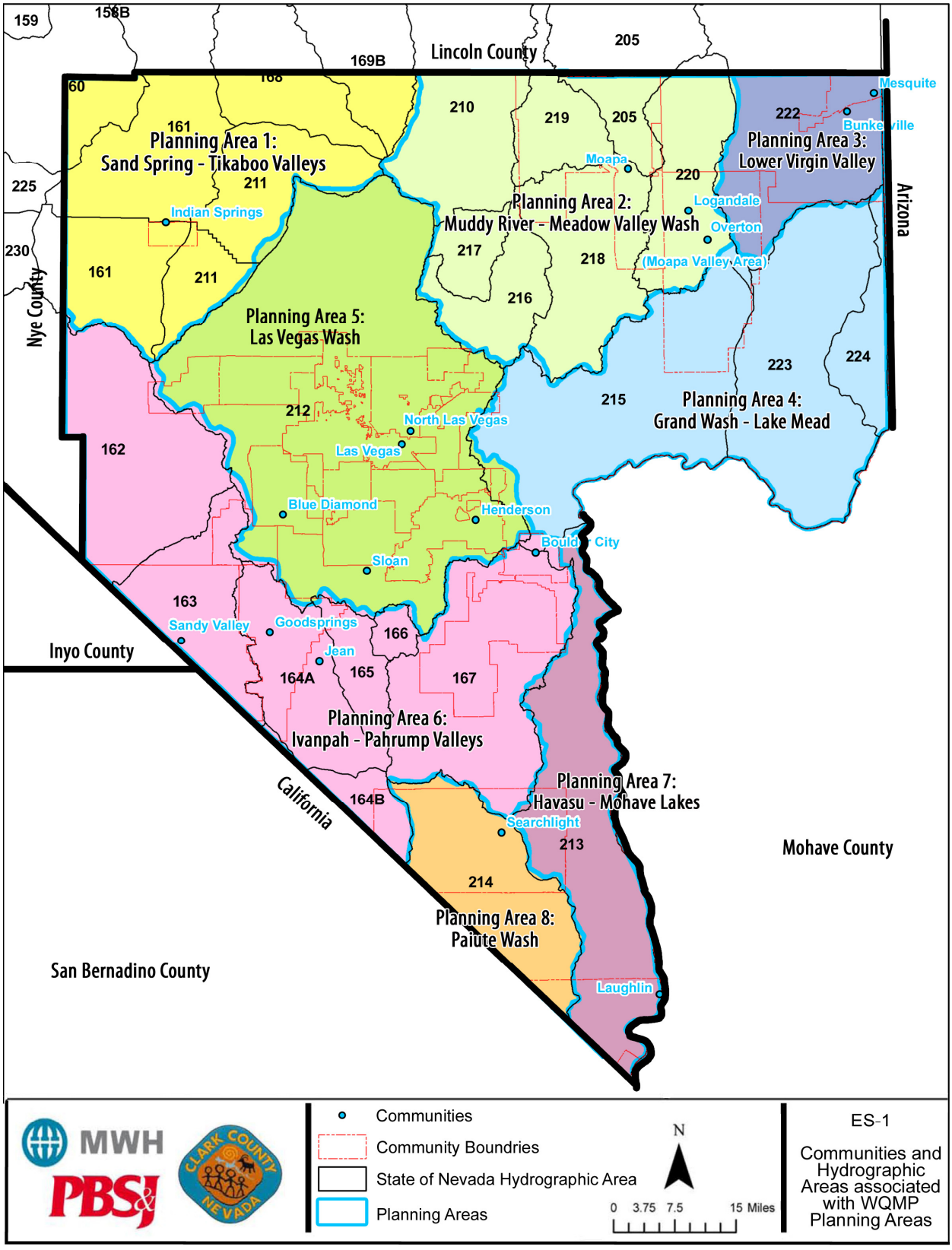
- Planning Area 1: Sand Spring - Tikaboo Valleys
- Planning Area 2: Muddy River - Meadow Valley Wash
- Planning Area 3: Lower Virgin River
- Planning Area 4: Grand Wash - Lake Mead
- Planning Area 5: Las Vegas Wash
- Planning Area 6: Ivanpah - Pahrump Valleys
- Planning Area 7: Havasu - Mohave Lakes
- Planning Area 8: Paiute Wash

ES.4.2 Section 2 – Population Projections

Current and future population projections in Clark County are summarized by planning area. Future population was projected for a 20-year planning period, from 2010 to 2030. Population estimates for the unincorporated county areas in 2006 were obtained from the Geographically Integrated Land Use Information System (GILIS) for 2006 for the unincorporated county areas, which include the areas within Clark County not included in a city jurisdiction, i.e., towns, reservations, and tribal lands. Each of the cities within Clark County provided population estimates for 2006:

- City of Boulder City (Boulder City)
- COH
- City of Las Vegas (CLV)
- City of Mesquite (Mesquite)
- CNLV

The *Nevada 2006 Resident Population Estimates* provided 2006 population estimates for the unincorporated towns/townships in Clark County. The total population for each planning area was determined by adding the population estimates for unincorporated county areas to the population estimates for the city/cities within the planning area.


159
158B
169B
Lincoln County
205
60
168
210
219
205
222
Mesquite
Bunkerville
161
Planning Area 1:
Sand Spring - Tikaboo Valleys
211
Moapa
220
Planning Area 3:
Lower Virgin Valley
225
Indian Springs
Logandale
Overton
Planning Area 2:
Muddy River - Meadow Valley Wash
Arizona
230
217
218
(Moapa Valley Area)
161
211
216
Nye County
Planning Area 5:
Las Vegas Wash
223
224
215
Planning Area 4:
Grand Wash - Lake Mead
212
North Las Vegas
Las Vegas
162
Blue Diamond
Henderson
Boulder City
Sloan
163
Sandy Valley
Goodsprings
166
Inyo County
Jean
164A
165
167
Planning Area 6:
Ivanpah - Pahrump Valleys
California
Planning Area 7:
Havasu - Mohave Lakes
164B
Searchlight
213
Mohave County
214
Planning Area 8:
Paiute Wash
San Bernadino County
Laughlin
MWH
PBS&J
Communities
Community Boundries
State of Nevada Hydrographic Area
Planning Areas
N
0 3.75 7.5 15 Miles
ES-1
Communities and Hydrographic Areas associated with WQMP Planning Areas

Using GILIS and information provided by the cities within Clark County, population projections were developed for 2010, 2015, 2020, 2025, and 2030. Although GILIS data from the land-use forecasting process do not match the smooth curve of the Center for Business and Economic Research's (CBER's) Regional Economic Models, Inc. (REMI) 2006 population projections, the CCDCP and the planning departments involved believe GILIS represents a more accurate model for future land-use development. The midterm populations may differ from the REMI population projections; however, the REMI population projections were used to help constrain the ultimate population. Population projections will be reviewed in subsequent WQMPs.

The population projections developed for the *Clark County Area-Wide WQMP* were compared to population projections developed by other sources to show consistency with other Clark County planning projects. **Table ES-1** summarizes the projections developed for the *Clark County Area-Wide WQMP* and the CBER population projections included in the Southern Nevada Water Authority (SNWA) *Water Resource Plan* (2008). The *Clark County Area-Wide WQMP* projections are similar to the CBER projections.

Table ES-1

Comparison of
Clark County Population Projections

Year	Population Projections	
	Clark County Area-Wide WQMP	CBER - SNWA Water Resource Plan 2008
2006	1,917,955	1,912,654
2010	2,313,954	2,288,942
2015	2,797,625	2,735,996
2020	3,167,402	3,059,584
2025	3,408,549	3,306,947
2030	3,590,337	3,516,688

ES.4.3 Section 3 – Wastewater Flow Projections

Wastewater flows were estimated for 2006 and projected for the 20-year planning period, from 2010 to 2030. The population is multiplied by the per capita wastewater flow contribution factor in gallons per capita per day (gpcd) to determine the wastewater flows. Historical data and current per capita wastewater flow contributions were provided for the unincorporated county areas and the cities within Clark County (as mentioned previously).

Information for the unincorporated county areas within Clark County was provided by the Clark County Water Reclamation District (CCWRD). An Equivalent Residential Unit (ERU) is the average amount of wastewater that a single-family residence discharges into the wastewater system. According to the *Design and Construction Standards for Wastewater Collection Systems 1997*, an ERU in Clark County is equivalent to the discharge of 90,000 gallons per year or approximately 250 gallons per day (gpd).

CCWRD has historically used 100 gpcd for wastewater flow projections for unincorporated county areas, except for the wastewater flows generated by the hotels and casinos in Laughlin. The flows contributed by the Laughlin hotels/casinos

compared to the Laughlin residential flows is disproportionately higher than a similar comparison in the Las Vegas Valley due to the smaller Laughlin population.

Laughlin currently contains 11 hotels, motels, and/or casinos, with an availability of more than 11,000 rooms. To address the high transient population related to these hotel/casino rooms, a contribution rate of 350 gpd/room at an 85 percent occupancy rate is used to calculate flows from the hotels/casinos.

The draft CCWRD *Integrated Facility Master Plan 2007 - Technical Memoranda Volume 2* included population-based wastewater flow projections that used average daily per-person wastewater contributions of 123 and 129 gpcd within unincorporated county areas in the Las Vegas Valley. The upper value of 129 gpcd was selected to calculate wastewater flow projections for the *Clark County Area-Wide WQMP*.

These data, combined with the population projections summarized in Section 2, were used to project wastewater flows for 2006 through 2030. **Table ES-2** summarizes the wastewater flow contributions used for the *Clark County Area-Wide WQMP*.

Table ES-2

Per Capita Wastewater Flow Contributions

County/City	Wastewater Flow Contributions (gpcd)
Unincorporated County Areas Outside Las Vegas Valley	100
Unincorporated County Areas Within Las Vegas Valley	129
Laughlin Hotels/Casinos	350 (gpd/room)
City of Boulder City	115
City of Henderson	95
City of Las Vegas	90
City of North Las Vegas	90
City of Mesquite	115

Wastewater flow projections for unincorporated county areas and the incorporated cities were computed using the population data described in Section 2 and the per capita wastewater flow contributions presented in **Table ES-2**. Wastewater flow projections for each planning area were calculated by adding the wastewater flow projections for unincorporated county areas to the wastewater flow projections for the cities. **Table ES-3** summarizes the wastewater flows for Planning Areas 1 through 8, excluding Planning Area 4, whose population is not projected to increase during the 20-year planning period, staying with average dry weather flows of 0.1 million gallons per day (mgd).

Table ES-3

Wastewater Flows for Planning Areas

Planning Area	1	2	3	4	5	6	7	8
Population	Unincorporated Areas	Unincorporated Areas	Mesquite and Other Areas	Unincorporated Areas	Unincorporated Areas, COH, CLV and CNLV	Unincorporated Areas and Boulder City	Residential and Laughlin Hotel/Casino	Unincorporated Areas
Year	Wastewater Flow (mgd)							
2006	0.55	0.8	1.9	0.1	190	2.2	2.4	0.13
2010	0.91	1.3	2.7	0.1	239	3	5.5	0.24
2015	0.96	2	3.8	0.1	288	3.2	6.9	0.27
2020	0.99	3.4	5.1	0.1	322	3.7	8.1	0.32
2025	1.04	5	6.7	0.1	341	4	9.9	0.32
2030	1.08	6.4	8.6	0.1	354	4.3	10.7	0.32

ES.4.4 Section 4 – Water Quality Standards/Planning

The State Environmental Commission (SEC) is responsible for rules and standards to control human health and the environment, including pollution of waters of the state. Nevada Division of Environmental Protection (NDEP) enforces these rules. NDEP monitors, assesses, reports under CWA Sections 303(d) and 305(b), and develops total maximum daily loads (TMDLs) for the state of Nevada. The State's Bureau of Water Quality Planning oversees the Nonpoint Source Pollution Management Program, performs water quality monitoring, petitions the SEC to set water quality standards, issues water quality certifications as mandated by CWA Section 401, and develops TMDLs. The Bureau of Water Pollution Control administers the National Pollutant Discharge Elimination System (NPDES) program and enforces compliance of permit conditions.

Nevada has been delegated permit authority for the NPDES permit program, including stormwater permits, for all areas of the state except Indian lands. Discharge permits define the quality of the discharge necessary to protect the quality of the waters of the state, enforcing the state's water pollution control laws and regulations. The Bureau of Water Pollution Control (BWPC) performs engineering reviews of the designs of permitted facilities, inspects permitted facilities, investigates violations of water pollution statutes and regulations, and provides technical and financial assistance to dischargers. The Bureau of Mining Regulation and Reclamation (BMRR) oversees the design, construction, operation, and closure of mining facilities.

The seven-member BCC is designated as the Area-Wide Water Quality Management Planning Organization (Nevada Revised Statutes [NRS] 244A). The BCC serves "ex-officio" as the governing body of the Las Vegas Valley Water District, CCWRD, the University Medical Center of Southern Nevada, the Big Bend and Kyle Canyon Water Districts, and the Clark County Liquor and Gaming Board. The BCC has delegated water quality management to the DAQEM, which administers the Water Quality Program with the intent "to protect, preserve and enhance the quality of Clark County's water resources for the benefit of present and future generations through proactive long-term planning, real-time monitoring, community education, regulations, compliance assurance, and working together with the public, federal, state and local agencies." The DAQEM Water Quality Planning Team works with the

municipalities, wastewater dischargers, affected industry, and concerned citizens to ensure compliance with water quality plans and policies.

The Nevada Administrative Code (NAC) Sections 445A.119 to 445A.225 contain the water quality standards for the state, including designation of beneficial uses of the waters and water quality criteria necessary to protect these beneficial uses. Water quality standards are defined for a water body, or a portion of a water body, and used to assess the health of the waters of the state, to set limits in surface water discharge permits, and to set goals for nonpoint source pollution control. In many cases, two or more reaches of a river system are defined, possibly with different beneficial uses and water quality standards.

Nevada's water quality standards include narrative standards applicable to all surface waters of the state, and site-specific numeric criteria for major "designated" water bodies. NAC Chapter 445 describes water quality standards that apply to all natural streams and lakes and reservoirs or impoundments on natural streams and other specified waterways, unless excepted on the basis of existing irreparable conditions that preclude such use.

ES.4.5 Section 5 – Wastewater Collection, Treatment and Disposal

Regulations for wastewater treatment works are defined in NAC Sections 445A.283 through 445A.292. In addition, the regulations for individual sewage disposal system (commonly termed or termed herein as septic system) construction, sewage disposal, and densities within Nevada are located in NAC Sections 278.390 through 278.530 and NAC Sections 444.750 through 444.839. NDEP requires that planning for a wastewater treatment facility (WWTF) capacity expansion is initiated when wastewater influent flows reach 85 percent of plant capacity.

Table ES-4 lists the existing and proposed WWTFs in Clark County. The table includes the planning area number, facility number, the managing entity, and the name of the treatment facility. **Table ES-5** summarizes wastewater flows and WWTF treatment capacity for each planning area and the total for Clark County over the planning horizon through 2030. Capacity increases are planned for every planning area, with the exception of Planning Area 4.

Table ES-4

Wastewater Treatment Facilities in Clark County

Planning Area	Facility No.	Managing Entity	Treatment Facility
1	1	CCWRD	Indian Springs Wastewater Treatment System
2	2	CCWRD	Overton Ponds (Future Moapa Valley Water Resource Center [WRC])
	3	CCWRD	Coyote Springs WWTF (Proposed)
3	4	City of Mesquite	Mesquite Wastewater Treatment Plant (WWTP)
4	5	National Park Service (NPS)	Boulder Beach WWTP
	6	NPS	Callville Bay WWTP
	7	NPS	Echo Bay WWTP
	8	NPS	Las Vegas Bay WWTP
	9	NPS	Overton Beach WWTP
5	10	CLV	CLV Water Pollution Control Facility
	11	CCWRD	CCWRD Main Plant (Includes the Central Plant and Advanced WWTP)
	12	COH	COH Water Reclamation Facility
	13	CNLV	CNLV Water Reclamation Facility (Proposed)
	14	CLV	Durango Hills WRC
	15	CLV	Bonanza/Mojave WRC
	16	CCWRD	Desert Breeze WRC
	17	CCWRD	Enterprise WRC (Proposed)
	18	COH	COH Southwest Water Reclamation Facility (Under Construction)
	19	CCWRD	Blue Diamond WWTF
6	20	Boulder City	Boulder City WWTF
	21	Privately Owned	Jean WWTF

	22	Privately Owned	Primm WWTP
7	23	CCWRD	Laughlin Water Reclamation Facility
	24	NPS	Cottonwood Cove WWTF
8	25	CCWRD	Searchlight WRC

Table ES-5

Summary of WWTF Capacity and Flows in Clark County

Year	Planning Area 1		Planning Area 2		Planning Area 3		Planning Area 4		Planning Area 5		Planning Area 6		Planning Area 7		Planning Area 8		Clark County	
	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Total Capacity (mgd)	Total WWTF Flows (mgd)
2006	0.114	0.12	0.2	0.22	3.5	1.8	0.13	N/A	232	190	3.4	2.2	8.0	2.4	0.09	0.05	247	197
2010	0.7	0.42	2.9	0.74	8.7	2.6	0.13	N/A	302	239	3.4	3.0	8.0	5.5	0.05	0.13	326	251
2015	0.7	0.46	2.9	1.49	8.7	3.7	0.13	N/A	350	288	3.9	3.2	8.0	6.9	0.05	0.16	374	303
2020	0.7	0.48	3.6	2.8	8.7	4.9	0.13	N/A	383	322	5.3	3.7	11.0	8.1	0.05	0.19	412	342
2025	0.7	0.53	5.7	4.2	8.7	6.3	0.13	N/A	391	341	5.3	4.0	11.0	9.9	0.05	0.19	422	366
2030	0.7	0.58	8.2	5.5	8.7	8.1	0.13	N/A	391	354	5.8	4.2	11.0	10.7	0.05	0.19	425	383

Note:

N/A – Not Available

ES.4.6 Section 6 – Water Reclamation/Reuse

Treated wastewater from the Las Vegas Valley is reclaimed and beneficially used by returning it to the Colorado River As return flow credits as well as direct reuse. In Southern Nevada, Colorado River return flow credits constitute a significant portion of the region's water resources, since Colorado River return flow credits are credited to Nevada's Colorado River diversions to calculate the total use of Nevada's 300,000 acre-foot annual Colorado River consumptive use allocation. Direct reuse opportunities can be, but are not limited to, irrigation of golf courses, parks, and other green spaces, and commercial or industrial uses such as process cooling water and temporary applications including construction and dust control. The implementation of reuse, where Colorado River return flow credits are available would not extend water resources, since the use of reuse would be offset by a corresponding reduction in Colorado River return flow credits only. In instances where Colorado River return flow credits through the Colorado River and Lake Mead are unavailable, reuse and other reclamation options may help optimize water resources. The coordination of various reclamation opportunities (e.g., parks, golf courses, etc.) should involve, planning departments, drinking water agencies, wastewater agencies and other parties to ensure that beneficial use opportunities are identified and thoroughly explored.

The NDEP is the regulatory agency that governs water quality protection and water reuse. The NAC contains technical requirements and standards for permitting wastewater facilities, including treatment plants. All aspects of wastewater facilities, including design, construction, and operation, must comply with NAC provisions. At this time, NDEP does not prohibit gray water use in residential areas.

ES.4.7 Section 7 – Point Sources

Point sources are pollution sources that can be traced back to a single, discrete location such as a particular pipe or WWTP. The following sections describe point source categories in Clark County:

ES.4.7.1 Surface Water Discharge Permits

The NDEP BWPC maintains a list of NPDES permits that authorize discharges to surface waters. According to NDEP, 46 municipal and industrial facilities have active discharge permits within the study area. Of these, 44 are in Planning Area 5, one is in Planning Area 4, and one is in Planning Area 7. Of the seven major discharges, four are municipal WWTPs and three are industries. All the major discharges are in

Planning Area 5, except the CCWRD Laughlin WRF discharge, which is in Planning Area 7.

ES.4.7.2 Mining Fluid Management

The NDEP BMRR regulates mining in Nevada under the authority of the NRS, Sections 445A.300 to NRS 445A.730 and the NAC 445A.350 to NAC 445A.447. The BMRR's mission is to ensure that Nevada's waters are not degraded by mining operations and that disturbed land is reclaimed to safe and stable conditions for productive post-mining land use. The Regulation Branch is responsible for protecting Nevada waters under federal water pollution control regulations. It issues Water Pollution Control Permits (WPCPs) to operators before construction of any mining, milling, or other activity that uses water from any source or quality that is biologically, chemically, or physically altered because of the use.

ES.4.7.3 Groundwater Discharge Permits

The BWPC issues groundwater discharge permits for activities like surface disposal, commercial septic systems, unlined ponds, and irrigation with reclaimed wastewater. "Zero discharge permits" are also issued in cases where a potential to discharge exists but is not likely, e.g., lined ponds and tanks. The June 11, 2007, NPDES permit holder list contains 98 groundwater discharge permits for municipal and industrial facilities in Clark County, all for discharge of treated effluent into the ground. Each permittee is required to monitor water use and meet the effluent requirements indicated in the permit.

ES.4.7.4 Leaking Underground Storage Tanks and Chemical Spills

Clark County has 143 active cases of leaking underground storage tanks (LUSTs). Although some have only contaminated soil, 99 have contaminated at least the local groundwater. The majority are related to gasoline or diesel storage and documented contaminants include methyl tertiary-butyl ether (MTBE) and benzene. Nearly all of the LUSTs are located in the Las Vegas Valley, although a few were found in Mesquite. NDEP, which regulates underground storage tanks (USTs), has adopted Title 40, Part 280 of the Code of Federal Regulations [40 CFR 280], the federal UST regulations.

All operators of active and temporarily closed USTs that meet the definition specified in 40 CFR 280.12 and unless otherwise specified in 40 CFR 280.10 require an annual operating permit issued by the Southern Nevada Health District's Solid Waste and Compliance Section of the Environmental Health Division. In addition, operators

installing, upgrading and/or permanently closing a UST(s) also must obtain a separate permit.

In Clark County, there are 43 active cases of confirmed chemical spills contacting either surface or groundwater. These spills are typically solvents or related to gasoline spills. The locations range from airports and Air Force bases to dry cleaners, casinos, and shopping centers.

ES.4.8 Section 8 – Nonpoint Sources

Nonpoint sources are defined as diffuse sources of pollution that are distributed throughout the watershed and contribute to receiving waters at multiple locations. In Clark County, the primary nonpoint sources are stormwater runoff, groundwater exfiltration, agricultural return flows, erosion, and contributions from miscellaneous urban activities (e.g., excess irrigation, wash water, illicit discharges to streets and, drainage facilities).

Clark County Regional Flood Control District (CCRFCD), U.S. Geological Survey (USGS) and SNWA conduct water quality monitoring for nonpoint sources. Both dry weather and wet weather monitoring is conducted to characterize various nonpoint sources as well as within channels and culverts to characterize overall runoff.

Dry weather water quality monitoring is conducted in the Las Vegas Valley to define the quality of a combination of all nonpoint sources except stormwater. SNWA conducts quarterly dry weather monitoring, analysis, and data tabulation under a cooperative agreement with CCRFCD. This sampling program satisfies requirements of the Municipal Separate Storm Sewer System (MS4) permit issued to the Las Vegas Valley entities by NDEP. In 2006-2007, sampling was conducted at seven locations.

Wet weather stormwater quality analysis is performed in the Las Vegas Valley to comply with the MS4 permit. In 2006-2007, samples were obtained from Las Vegas Wash at the Desert Rose Golf Course, and Las Vegas Wash below Lake Las Vegas. In previous years, sampling was also conducted at Western Tributary at Civic Center, Las Vegas Creek at Pecos or Lena, Duck Creek at Boulder Highway, Flamingo Wash at Nellis, C-1 Channel at Warm Springs, Sloan Channel (Range Wash) at Charleston), Monson Channel, Meadows Detention Basin, and Las Vegas Wash at Pabco Road.

The 2006-2007 wet weather data were consistent with data collected between 1992 and 2006. It is assumed that the measured quality in the Las Vegas Valley is representative

of all urban areas in Clark County, although areas with less dense development may have lower concentrations of constituents.

Table ES-6 compares the median dry weather concentrations, the median wet weather concentrations, and provides a calculated wet weather versus dry weather factor or ratio.

Table ES-6

Comparison of Wet Weather and Dry Weather Pollutant Concentrations in Las Vegas Valley (1991 – 2007)

Constituent	Median Dry Weather Concentration	Median Wet Weather Concentration	Wet/Dry
Biochemical Oxygen Demand (mg/L)	<6	35	>6
Chemical Oxygen Demand (mg/L)	16	230	14
Total Suspended Solids (mg/L)	13	950	73
Total Dissolved Solids (mg/L)	3,100	580	0.19
Oil and Grease (mg/L)	<3.0	<3.0	1.0
Total Petroleum Hydrocarbons (mg/L)	<1.0	<1.0	1.0
Total Kjeldahl Nitrogen (mg/L)	0.90	4.9	5.4
Nitrate-N (mg/L)	4.10	1.76	0.4
Ammonia-N (mg/L)	<0.08	0.60	>7.5
Total Nitrogen (mg/L)	4.3	7.2	1.7
Orthophosphate - P (mg/L)	<0.020	0.19	>9.5
Total Phosphorus (mg/L)	0.04	0.96	24.0
Cadmium, total (mg/L)	<0.005	<0.005	1.0
Chromium, total (μg/L)	<2.4	18	>7.5
Copper (mg/L)	<0.01	0.044	>4.4
Lead (mg/L)	<0.001	0.076	>76
Nickel, total (mg/L)	0.010	0.026	2.6
Mercury, total (mg/L)	<0.0002	<0.0002	1.0
Silver, total (mg/L)	<0.010	<0.010	1.0
Zinc (mg/L)	<0.02	0.23	>11.5
Arsenic (mg/L)	<0.009	0.014	>1.56
Boron (mg/L)	0.96	0.24	0.25
Cyanide (mg/L)	<0.005	<0.005	>1.0
Turbidity (NTU)	1.90	235	124
pH	8.3	7.6	0.9
Surfactants (mg/L)	<0.06	0.50	>8.3
Phenol (mg/L)	<0.01	0	>0
Total Chlorine (mg/L)	<0.10	<0.10	1.0
Color (ACU)	15	100	6.7
Selenium (mg/L)	0.010	<0.010	<1.0
Fecal Coliform (MPN/100mL)	650	24,000	37
Salmonella (MPN/100mL)	<2.2	<2.0	0.9

Source: CCRFCD (2007)

The following observations were drawn from this analysis:

1. Stormwater runoff in the Las Vegas Wash contributes higher pollutant concentrations than dry weather runoff for most constituents.

2. Bacteria counts are 10 to 100 times greater in stormwater.

3. Total suspended solids (TSS) concentrations are 10 to 100 times higher and turbidity is over 100 times higher in stormwater than dry weather runoff. This is due to sediment transport during storm events.

4. Dry weather concentrations of total dissolved solids (TDS) are substantially higher than wet weather concentrations.

5. Surfactants are an order of magnitude higher in stormwater.

6. Nutrient concentrations (total nitrogen, total phosphorus, and orthophosphate-P) are higher in wet weather runoff than dry weather.

7. Most metals concentrations were below detection limits in dry weather flows. Mercury, cadmium, and silver were below the detection limits in most samples of wet and dry weather flows. Nickel, chromium, copper, arsenic, and zinc concentrations were higher in wet weather than dry weather flows.

8. The median wet weather selenium concentration is less than the median dry weather concentration. This suggests that higher flows during storm events may dilute selenium in surface waters.

9. Biological Oxygen Demand (BOD) and chemical oxygen demand (COD) are about an order of magnitude higher in wet weather flows.

10. Wet weather pH remains within an acceptable range of 7.6 to 8.3. It is slightly higher in dry weather runoff, compared to a typical wet weather measurement of 7.6.

ES.4.9 Section 9 – Best Management Practices and Alternative Treatment Methods and Disposal

ES.4.9.1 Best Management Practices

Because of their diffuse nature, nonpoint sources are best managed through a combination of non-structural and structural best management practices (BMPs). The objective of non-structural BMPs is to reduce the generation of pollutants at their source. Structural BMPs reduce the conveyance of pollutants from their source to receiving waters. BMPs are considered to be more cost-effective than traditional end-of-pipe treatment measures for nonpoint source pollution, due in part to the highly variable flow rates and pollutant load characteristics of nonpoint source flows.

BMP programs have been developed within the county. Alternative treatment methods are considered for (a) smaller, rural type systems that can benefit from emerging technology and in areas of rapid transition from rural to urban and (b) larger urban areas.

The State of Nevada has prepared a *Handbook of Best Management Practices* which provides selection and design criteria for BMPs for a variety of land uses ranging from construction sites, to agriculture, to mining and urban activities (Conservation Commission, 1994). The Handbook was prepared and is distributed by the State Conservation Commission, the Nevada Division of Conservation Districts, and NDEP. Application of the design criteria in the Handbook is not currently mandated by any state or local agency.

The CCRFCD adopted the current *Hydrologic Criteria and Drainage Design Manual* in 1999 and revised it as recently as 2006. The *Hydrologic Criteria and Drainage Design Manual* provides information on the selection and design of BMPs for typical urban situations. The BMPs described are suggested for use in new developments and in retrofit situations, but are not currently required by any of the entities' development codes or design manuals.

The BMP handbooks described above do not contain specific design criteria or standard plans tailored to the Clark County development environment and hydrologic conditions. Research and experience throughout the country have identified a range of BMPs appropriate for use in urban environments, but some may not be applicable to the arid conditions and sparse vegetation that is the natural environment in Clark

County. Potential BMPs for reducing the impact of urban nonpoint source pollution in the Las Vegas Valley were identified by CCDCP.

ES.4.9.2 Alternative Treatment Methods and Disposal

A number of methods for wastewater treatment and disposal in Clark County have been investigated. The investigation was focused on identifying methods that are suitable for smaller and rural systems that may see rapid transitions from rural to urban development, although some of the technologies (e.g., sequencing batch reactors [SBRs] and ozone) are better suited to address treatment issues in larger systems. The discussion of wastewater treatment and disposal methods has been organized into treatment approaches and technologies, and effluent disposal methods, as shown below:

Treatment Approaches

- Satellite water reclamation
- Package plants and interim package plants

Treatment Technologies

- SBRs
- Membrane bioreactors (MBRs)
- Wetlands treatment
- Advanced Ecologically Engineered System (AEES)
- Ozone disinfection

Effluent Disposal

- Groundwater recharge
- Nonpotable reuse
- Return to waterways

Basic treatment approaches can be ranked from small individual septic systems, to large advanced wastewater treatment facilities that provide comprehensive biological, chemical, and physical treatment processes in primary through tertiary treatment stages.

Treatment technologies may be applicable to small but growing systems, either in central treatment plants or in the reduced-scale approaches.

Effluent disposal methods can often provide alternative means to protect water quality than more extensive and expensive treatment.

ES.4.10 Section 10 – Wellhead Protection

Amendments to the national Safe Drinking Water Act in 1986 mandated that each state develop a Wellhead Protection Program for the purpose of protecting groundwater that serves as a source for public drinking water supplies. In Nevada, the program is administered by the NDEP BWPC. The NDEP states that wellhead protection is important because remediation of contaminated groundwater is expensive and sometimes it may be impossible to return the contaminated water to drinking water quality.

Wellhead Protection Programs (WHPPs) in Nevada are developed and managed at the local level, such as the public water system, city, or township; however, guidance and technical assistance on the elements of the program may be provided by the NDEP and the Nevada Rural Water Association. Communities are encouraged to submit WHPPs for NDEP endorsement. Elements of a WHPP include:

- Formation of a WHPP team
- Delineation of wellhead protection areas (WHPAs)
- Inventory of potential contaminant sources within WHPAs
- Selection and implementation of management strategies
- New well planning
- Contingency plan development
- Public participation

As of April 2007, five community water systems and two non-transient non-community water systems in Clark County had prepared WHPPs. According to the EPA's Public Water Systems Facts and Figures, a community water system is a public water system that supplies water to the same population year-round; a non-transient, non-community water system is a public water system that regularly supplies water to at least 25 of the same people at least 6 months per year, but not year-round (e.g., schools, factories, office buildings, and hospitals). **Table ES-7** shows the community water systems and non-transient non-community water system in Clark County, by planning area.

Table ES-7

Clark County Communities
With Completed Wellhead Protection Plans
(April 2007)

Planning Area	Wellhead Protection Community	System Type
1	Indian Springs	Community Water System
	Creech Air Force Base	Non-Transient Non-Community Water System
2	Moapa Valley Water District	Community Water System
3	None	None
4	None	None
5	Blue Diamond Village	Community Water System
	Nellis Air Force Base	Non-Transient Non-Community Water System
6	Sandy Valley	Community Water System
7	None	None
8	Searchlight	Community Water System

ES.4.11 Section 11 – Colorado River and Lake Mead

Las Vegas Wash is integral to water quality planning activities within the Las Vegas Valley since protection of the unique Wash environment involves wastewater treatment, water rights and return flow credits, salinity control for the Colorado River, park planning, and water quality standards. The Wash also provides habitat to approximately 300 fish and wildlife species and more than 200 species of upland, riparian, and wetland plants. As urban development continues in the Valley, the natural resource value of Las Vegas Wash will continue to increase.

A series of activities have influenced the Las Vegas Wash throughout the years. Headcutting, the process of upstream advance of a gully and vertical channel downcutting by erosion, is the primary form of erosion in the lower Wash. Increasing urbanization in the Valley has increased both storm flows and sewage discharges and has accelerated the erosion process in the Wash, deepening and widening the channel and discharging silt into Lake Mead. Since the 1970s, channel erosion in the Wash has steadily reduced the area of wetlands vegetation and decreased travel times of waters

discharged from WWTPs to Lake Mead. Major events to control erosion in the Wash and protect/enhance wetlands include implementation of the Las Vegas Wash Integrated & Comprehensive Management Program, development of the 1995 Wetlands Park Master Plan, and improvements to the water quality of nonpoint source discharges since the joint NPDES stormwater permit was issued in 1990.

As the terminal outlet of the Las Vegas Drainage Basin, the Las Vegas Wash flows from west to east and empties into Las Vegas Bay in Lake Mead on the Colorado River. The Wash provides approximately 2 percent of the total water inflow to Lake Mead.

Lake Mead was formed after the Hoover Dam (also known as Boulder Dam) was completed. The 726-foot-high dam, located approximately 25 miles southeast of Las Vegas on the Colorado River at Black Canyon, between Nevada and Arizona, was constructed between 1931 and 1935 as a national public works project to control flooding and drought and provide hydroelectric power to fast-growing Southern California. Water impounding began in February 1935 and power generation began in 1936. Located in the Mojave Desert, Lake Mead is the largest manmade water body in the United States (more than 110 miles long, with more than 822 miles of shoreline) and has the largest surface area (more than 162,600 acres) of any reservoir in the Northern Hemisphere. The reservoir has four major basins from upstream to downstream:

- Temple Basin
- Gregg Basin
- Virgin Basin
- Boulder Basin

The Colorado River flows through Glen Canyon National Recreation Area and Grand Canyon National Park before reaching Hoover Dam and Lake Mead. The Moapa and Virgin Rivers discharge into the Overton Arm of the Virgin Basin, and Las Vegas Wash discharges into the narrow inlets of Las Vegas Bay, a large arm of the Boulder Basin.

Lake Mead is a deep, warm, monomictic reservoir. Thermal stratification develops in May and June, and a classic thermocline develops in July between a depth of 33 and 48 feet. Turnover begins in October and the reservoir is completely destratified by January.

Lake Mead is managed by the U.S. Bureau of Reclamation (Reclamation) for a variety of beneficial uses including water supply, propagation of wildlife and aquatic life, and recreation. Water from Lake Mead is provided to Arizona, California, Nevada, several Native American tribes, and the country of Mexico.

The coordination activities and projects for Las Vegas Wash include:

- Clark County Wetlands Park Master Plan
- Las Vegas Wash Coordination Committee
- Las Vegas Wash Weed Partnership
- Clean Water Coalition Systems Conveyance and Operations Program
- Las Vegas Valley Watershed Advisory Committee

The water quality and volume coordination activities for Lake Mead include:

- Lake Mead Water Quality Forum
- Colorado River Commission
- Clean Water Coalition Boulder Basin Adaptive Management Plan

ES.4.12 Section 12 – Environmental/Integrated Planning Coordination

Agencies at the federal, state, regional, and local levels have prepared various environmental documents and plans related to water resources in Clark County. **Table ES-8** lists major environmental agencies and organizations and summarizes their relevant responsibilities, planning documents, and projects. A brief summary of the key environmental activities requiring integrated planning coordination is identified in **Table ES-8**.

Table ES-8

Agencies and Organizations Responsible for Environmental Planning in Clark County

Agency/ Organization	Responsibilities, Planning Documents, and Projects
Clark County Department of Air Quality and Environmental Management	• *208 Water Quality Management Plan* Administering Agency • *Multiple Species Habitat Conservation Plan* • State Implementation Plans for PM10 and carbon monoxide • Eco-County Initiative
Clark County Department of Comprehensive Planning	• Land use planning agency (*Clark County Comprehensive Plan*)
Clark County Regional Flood Control District	• Stormwater management lead agency • *Flood Control Master Plan* and *Updates* (latest is the 2007 *Las Vegas Valley Flood Control Master Plan Update Final Project Control Plan*) • *Storm Water Management Plan for MS4 Permittees*
Conservation District of Southern Nevada	• Partners with agencies and private business to implement programs to conserve natural resources
High Desert Resource Conservation & Development Council	• Local volunteer council which promotes conservation • Focused on native vegetation restoration in southern Nevada
U. S. Fish and Wildlife Service	• *Multiple Species Habitat Conservation Plan*; Section 10(a) permitting • *Virgin River Fishes Recovery Plan* • *Muddy River Ecosystem Recovery Plan*
U.S. Army Corps of Engineers	• Administers the permit program related to Section 404 of the CWA - impacts to wetlands; wetlands mitigation bank administration

Table ES-8 (Continued)

Agencies and Organizations Responsible for Environmental Planning in Clark County

Agency/ Organization	Responsibilities, Planning Documents, and Projects
Bureau of Land Management	• Manages substantial land holdings within Clark County • *Las Vegas District Resource Management Plan*
U. S. Bureau of Indian Affairs	• Trustee for the Moapa Indian Reservation
Nevada Division of Environmental Protection	• Administers Section 401 Water Quality Certification Program; issues NPDES discharge permits – Discussed in Section 4 • Established the Lake Mead Water Quality Forum
Southern Nevada Water Authority	• Water Purveyor in the Las Vegas Valley and Boulder City • Treatment and Transmission Facility • Administration and funding for Virgin River, Muddy River, and Las Vegas Wash and Lake Mead scientific investigations focusing on vegetation communities and sensitive species
Muddy River Regional Environmental Impact Alleviation Committee	• Local group dedicated to the enhancement of the riparian area along the Muddy River • On-going tamarisk removal and native vegetation replanting
Lake Mead Water Quality Forum	• Purpose is to protect public health and preserve the water quality of Las Vegas Wash, Las Vegas Bay, and Lake Mead – Discussed in Section 11

Table ES-8 (Continued)

Agencies and Organizations Responsible for Environmental Planning in Clark County

Agency/ Organization	Responsibilities, Planning Documents, and Projects
Clean Water Coalition	• Systems Conveyance and Operations Program – Discussed in Section 5 • *Boulder Basin Adaptive Management Plan* (*BBAMP*) – Discussed in Section 11 • *Selenium Management Plan* – Discussed in Section 11 • Water Quality Modeling in Lake Mead – Discussed in Section 11 • Endocrine Disrupting Chemical Research – Discussed in Section 11
Colorado River Commission	• Administers programs impacting Colorado River and tributary flows in Nevada – Discussed in Section 11
U.S. Bureau of Reclamation	• Manages Hoover Dam, Lake Mead, and Lake Mojave – Discussed in Section 11 • Administers Colorado River Contracts
National Park Service	• Manages public recreation and natural resources within Lake Mead National Recreation Area (NRA) – Discussed in Section 11 • *Lake Mead NRA General Management Plan*

ES.4.13 Section 13 – Planning Recommendations / Implementation

Each section of the *Clark County Area-Wide WQMP* contains recommendations pertaining to the corresponding section topic. Section 13 – Recommendations include the priority recommendations noted in each of the sections' recommendations. The following are the prioritized "Top 14" recommendations from Section 13, for the *Clark County Area-Wide WQMP*:

- The WQMP should be updated and amended every five years. Amendments on a five-year basis will help to ensure that discharge permit revisions and applications are consistent with the WQMP, and that changing environmental

conditions such as air and water quality can be integrated in a timely manner. The five-year update should include a status report on the recommendations contained in the previous WQMP.

- Population projections for Clark County should be reviewed and revised as appropriate in future updates of the WQMP. CBER population forecasts should continue to be considered when making population projections.

- Establish a financial assistance program for existing property owners relatively close to sewer lines to convert from septic systems to municipal wastewater treatment per DAQEM's April 2008 *Clark County Individual Sewage Disposal System Conversion Study*.

- Expand educational programs that encourage conservation and protection of water resources.

- Clark County should work with SNWA to develop a County-wide wellhead protection ordinance. In support of this effort, it is recommended that SNWA provide a comprehensive database and map inventory of groundwater wells currently in use and those not in use, and determine the number and location of all abandoned groundwater wells.

- Agencies should implement a pollution prevention program or participate in a cooperative regional pollution prevention program to address nonpoint source pollution in cooperation with the SQMC.

- CCRFCD currently serves as lead agency and coordinator for the Las Vegas Valley stormwater discharge permit compliance effort. CCRFCD should provide similar assistance to Clark County communities in Planning Areas 2, 3, and 4 in development of BMP programs, if requested.

- CCRFCD and other agencies should proceed with implementation of master plans and other projects to mitigate channel erosion on Muddy River in lower Moapa Valley and Hidden Valley (Planning Area 2), and on major tributaries in Mesquite and Moapa Valley.

- Monitor local groundwater for elevated nitrate concentrations in areas with septic system densities approaching NDEP's allowed densities. When elevated

concentrations are found, identify the source and potentially repair malfunctioning septic systems or connect to a municipal sewer system.

- The CCWRD and the Moapa Valley Water District should work together to provide an effluent management plan for the Overton Ponds (future Moapa Valley Water Resources Center) and evaluate potential opportunities for water reclamation in the Moapa Valley Township (Planning Area 2).

- Boulder City has hired a consultant to complete a wastewater disposal/reuse study. Naturally, reuse alternatives will be far more expensive than the current disposal system. A collaborative effort among stakeholders should be employed to help fund reuse alternatives.

- Coordinate and/or assist with developing wellhead protection plans and public outreach programs about groundwater protection for communities that rely on groundwater supplies for potable water.

- CWC and SNWA are preparing the *Southern Nevada Regional Water Reuse Study*, which will update information provided in the *AWRS (2000)*. Future updates to the Clark County Area-Wide WQMP should include reclaimed water and reuse opportunities from the updated *Southern Nevada Regional Water Reuse Study*. A basic definition of reuse versus reclamation should be included in the *Southern Nevada Regional Water Reuse Study*, and this definition should be incorporated into future WQMPs.

Section 1

Section 1
Background

1.1 INTRODUCTION

The Federal Water Pollution Control Act, or Clean Water Act (CWA), Amendments of 1972 and 1977 require the control of all sources of water pollution. Section 208 of the CWA requires that all activities associated with water pollution problems be planned and managed through an integrated area-wide water quality management program. It also defines the schedule and scope of area-wide wastewater treatment management plans.

After the Nevada State Legislature passed Senate Bill 468 in May 1975, area-wide water quality management planning duties and power were vested in certain counties. The Clark County Board of County Commissioners (BCC) was designated the area-wide water quality management planning organization within Clark County. The BCC originally designated the Clark County Department of Comprehensive Planning (CCDCP) as the agency to manage and administer 208 planning. In 2006, the BCC designated the Clark County Department of Air Quality and Environmental Management (DAQEM) as the agency to manage and administer 208 planning in Clark County. DAQEM's responsibilities include the preparation of this *Clark County Area-Wide Water Quality Management Plan (WQMP)*.

The initial *208 Water Quality Management Plan* (*208 Plan)* presented objectives, policies, and programs for managing water quality in the county. It was adopted by the BCC in 1978 and approved by the U.S. Environmental Protection Agency (EPA) in 1979. The plan addressed municipal wastewater treatment, groundwater management, stormwater issues, Las Vegas Wash, diffuse agriculture sources, water quality standards and revisions, management reorganization and financing necessary to carry out the *208 Plan*, and an implementation schedule. The list below summarizes amendments and revisions to the original *208 Plan*.

- In October 1979, the original *208 Plan* was revised. The revised plan was certified by the State of Nevada in May 1980 and by EPA in October 1981. It was the first update of the original 1978 plan that address revised federal standards and guidelines, population projections, and new water quality control technologies. The update also reflected comments from local governments, special districts, citizens, and interested groups.

- In April 1988, the BCC revised the Las Vegas Wash Chapter of the *Clark County 208 Revised WQMP* and adopted the revision entitled *Amendment to the Revised Clark County 208 WQMP Lake at Las Vegas, April 1988*.

- In November 1988, the BCC adopted the *Revised Water Quality Management 208 Plan for the Rural Areas of Clark County, November 1988*. The document included a revision of Chapter II – *Wastewater Treatment of the Clark County 208 Revised WQMP* by amending the sections on Rural Areas and Package Plants for Sewage Treatment, and including a new section on Native American Indian Reservations.

- In June 1990, the BCC adopted the Laughlin Amendment to the *Clark County 208 Revised WQMP Amendment*. The adopted report entitled *208 WQMP Laughlin Amendment* provides outline recommendations and conclusions for wastewater and sludge treatment and disposal in the Township of Laughlin (Laughlin).

- In June 1990, the BCC adopted a resolution to amend the *208 Plan* to address the increasing population and wastewater flows to Las Vegas Wash.

- On June 18, 1996, the BCC approved an agreement to prepare the *Las Vegas Valley 208 WQMP Amendment*. The purpose was to revise the 1990 Plan Amendment, include effects of sustained regional growth and development, revise stormwater permitting in a more inclusive nonpoint section, and provide water-quality planning to a horizon year of 2020. The result was the *Las Vegas Valley 208 WQMP Amendment, July 1997*.

- In June 2000, the BCC adopted the *Northeast Clark County 208 WQMP Amendment, June 2000*. This Amendment revised the *1988 Rural Areas 208 Plan Amendment*, addressed the effects of recent development, and provided water quality planning to a horizon year of 2020.

- In 2001, the BCC adopted the *Las Vegas Valley Watershed Wastewater Needs Assessment Study* and the *Area Wide Reuse Study for the Las Vegas Valley (AWRS [2000])* as an implementation amendment to the *Las Vegas Valley 208 WQMP Amendment, July 1997*.

- In June 2004, the BCC adopted the *South Clark County 208 WQMP, June 2004*, which addressed the effects of recent and potential future development in the south county area. It also provided water quality planning to a horizon year of 2023.

- The July 1997 *Las Vegas Valley 208 WQMP Amendment* was amended to include the City of North Las Vegas (CNLV) Water Reclamation Facility (WRF) which will treat wastewater generated within CNLV limits. The final report is entitled the *City of North Las Vegas Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 WQMP, October 2005 (CNLV WRF Amendment [2005])*.

- The *Amendment to Northeast Clark County 208 WQMP, February 2007* was created to update information in the *Northeast Clark County WQMP June 2000 Amendment*. It acknowledges the lack of wastewater management options in the northeast area and provides package plant options for future residential subdivisions.

A chronology of 208 planning in Clark County is included in **Appendix A**.

1.2 PURPOSE OF THE CLARK COUNTY AREA-WIDE WATER QUALITY MANAGEMENT PLAN

On September 5, 2006, the BCC approved an agreement to prepare the *Clark County Area-Wide WQMP*. They subsequently issued a notice to proceed with the WQMP on September 18, 2006. The principal purpose of the *Clark County Area-Wide WQMP* is to:

- Be compliant with the regulations for 208 planning in the State of Nevada. **Table 1-1** discusses these requirements and notes the location within this document where the requirements are addressed.

- Combine and update information from the following Clark County plans into one comprehensive document:

    - *Las Vegas Valley 208 WQMP Amendment (1997)*
    - *Northeast Clark County 208 WQMP Amendment (2000)*
    - *South County WQMP Amendment (2004)*
    - *CNLV WRF Amendment (2005)*
    - *Amendment to Northeast Clark County WQMP (2007)*

A map showing the geographical boundaries for these five plans can be found in Appendix A, Figure A-1. The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County.

- Provide an area-wide WQMP report that includes population and wastewater flow projections, planned sewer improvement and expansion projects (including estimated costs), and proposed schedules for implementation.

- Include effects of sustained regional growth and development.
- Revise stormwater permitting discussion in a more inclusive nonpoint source section.
- Provide water quality planning to a horizon year of 2030.

Table 1-1

Legislative Requirements

Required Plan Elements and Legislation	Clark County Area-Wide WQMP Elements
Treatment works anticipated to meet the needs of the area for the treatment of waste over a 20-year period ▪ NRS 244A.571(l)(a) ▪ 40 CFR 130.6(c)(3) ▪ CWA 208(b)(2)(A)&(B)	▪ Section 1 Update Planning Area Boundaries ▪ Section 2 Regional Population Projections - Forecasted population from CCDCP using GILIS - Municipalities' population projections - Historical percentages of population ▪ Section 3 Projected Wastewater Influent Flows ▪ Section 3 Wastewater Production Rate ▪ Section 4 Current Wastewater Treatment and Planned Facility Expansions - For Each Agency - Including: Existing Collection System, Treatment, and Disposal Facilities - Including: Treatment Process, Biosolids Handling, Existing Capacity Assessment - Projected Collection Systems, Treatment, and Disposal Systems - Water Reclamation Facilities, Treatment Capacity Expansions, Costs and Financing, Pretreatment Program ▪ Sections 5 and 6 - Water Availability - Developable Land ▪ Section 9 Alternative Methods
Land acquisition requirements ▪ NRS 244A.571(l)(a)(1) ▪ CWA 208(b (2)(A)	▪ Section 5 Wastewater Collection, Treatment and Disposal ▪ Section 6 Existing and Future Water Reclamation Opportunities
Urban stormwater runoff management ▪ NRS 244A.571(l)(a)(2) ▪ 40 CFR 130.6(c)(4) ▪ CWA 208(b)(2)(A)	▪ Section 8 Nonpoint Sources ▪ Section 8 Nonpoint Source Contributions ▪ Section 8 Municipal Stormwater Permitting Program ▪ Section 8 Construction Site and Industrial Site Stormwater Permitting ▪ Section 12.2.1.3 CCRFCD Master Plan Update for the Las Vegas Valley ▪ Section 9 Best Management Practices and Alternative Treatment Methods

Table 1-1 (Continued)

Legislative Requirements

Required Plan Elements and Legislation	Clark County Area-Wide WQMP Elements
Financial arrangements for treatment works development ▪ NRS 244A.571 (1)(a)(3) ▪ 40 CFR 130.6(c)(3) CWA 208(b)(2)(A)	▪ Section 5 Wastewater Collection, Treatment, and Disposal
Priorities and time schedules of treatment works ▪ NRS 244A.571(l)(b) ▪ 40 CFR 130.6(c)(3) ▪ CWA 208(b)(2)(B)	▪ Section 5 Future Treatment Facilities
Establish a regulatory program ▪ NRS 244A.571(l)(c) ▪ 40 CFR 130.6(c) (4)(ii) ▪ CWA 208(b)(2)(C)	▪ Section 4 Water Quality Standards/Planning
Waste treatment requirements ▪ NRS 244A.571(l)(c)(1) ▪ 40 CFR 130.6(c)(2) ▪ CWA 301 (b) ▪ CWA 303(e)(3)(A)	▪ Section 4 Water Quality Standards/Planning ▪ Section 5.2 Regulations ▪ Section 5.3 Wastewater Treatment Facilities ▪ Section 6.3 Water Reuse Regulations ▪ Section 9 Alternative Methods
Regulate location, modification and construction of Facilities ▪ NRS 244A.571(l)(c)(2)	▪ Section 5 Wastewater Collection, Treatment, and Disposal ▪ Section 6 Existing and Future Water Reclamation Opportunities ▪ Section 12 Environmental/Integrated Planning Coordination
Pretreatment of industrial or commercial waste discharged into treatment works ▪ NRS 244A.571(l)(c)(3)	▪ Section 5 Wastewater Collection, Treatment, and Disposal
Agencies to construct, operate and maintain all facilities ▪ NRS 244A.571(1)(d) ▪ 40 CFR 130.6(c)(5) ▪ CWA 208(b)(2)(D) ▪ CWA 303(e)(3)(E)	▪ Section 5 Wastewater Collection, Treatment, and Disposal ▪ Section 12 Colorado River and Lake Mead ▪ Section 13 Recommendations

Table 1-1 (Continued)

Legislative Requirements

Required Plan Elements and Legislation	Clark County Area-Wide WQMP Elements
Measures to carry out the plan (including financial) ▪ NRS 244A.571 (1)(e) ▪ 40 CFR 130.6(c)(6) ▪ CWA 208(b)(2)(E)	▪ Section 5 Planned Facilities Expansions/Development ▪ Section 6 Existing and Future Water Reclamation Opportunities
The period necessary to carry out the plan ▪ NRS 244A.571(1)(e) ▪ 40 CFR 130.6(c)(6) ▪ CWA 208(b)(2)(E)	▪ Section 1 Background
Costs of carrying out the plan within the stated period ▪ NRS 244A.571(1)(e) ▪ 40 CFR 130.6(c)(6) ▪ CWA 208(b)(2)(E)	▪ Section 5 Planned Facilities Expansions/Development ▪ Section 6 Existing and Future Water Reclamation Opportunities
Economic, social, and environmental effects of carrying out the plan within the stated period ▪ NRS 244A.571(1)(e) ▪ 40 CFR 130.6(c)(6) ▪ CWA 208(b)(2)(E)	▪ Section 12 Environmental/Integrated Planning Coordination
Identify, if appropriate, agriculturally- and silviculturally-related nonpoint sources of pollution including runoff from manure disposal and livestock and crops ▪ NRS 244A.571(l)(f) ▪ 40 CFR 130.6(c)(4)(iii)(C) ▪ CWA 208(b)(2)(F)	▪ Section 8 Agricultural Return Flows ▪ Section 8 Runoff from Livestock Land Uses
Identify mine-related sources of pollution, if appropriate ▪ NRS 244A.571(l)(g) ▪ 40 CFR 130.6(c)(4)(iii)(D) ▪ CWA 208(b)(2)(G)	▪ Section 7 Mining Fluid Management ▪ Section 8 Mining and Industrial Nonpoint Sources

Table 1-1 (Continued)

Legislative Requirements

Required Plan Elements and Legislation	Clark County Area-Wide WQMP Elements
Identify sources of pollution related to construction ▪ NRS 244A.571(l)(h) ▪ 40 CFR 130.6(c)(4)(iii)(E) ▪ CWA 208(b)(2)(H)	▪ Section 8 Nevada's Stormwater Construction Site Permit Program ▪ Section 8 Las Vegas Valley Construction Site Runoff Management Program
Identify salt water intrusions, if appropriate ▪ NRS 244A.571(l)(i) ▪ 40 CFR 130.6(c)(4)(iii)(F) ▪ CWA 208(b)(2)(1)	▪ Salt water intrusion only applies in coastal areas. Clark County's high salinity ground and surface waters are discussed in Section 8 Groundwater Exfiltration
Disposition of all residual waste generated, which could affect water quality ▪ NRS 244A.571(1)0) ▪ 40 CFR 130.6(c)(4)(iii)(A) ▪ CWA 208(b)(2)(J)	▪ Section 5.3 Wastewater Treatment Facilities
A process to control disposal of pollutants on land or in subsurface excavations to protect the quality of ground and surface waters ▪ NRS 244A.571(l)(k) ▪ 40 CFR 130.6(c)(4)(iii)(B) ▪ CWA 208(b)(2)(K)	▪ Section 5.3 Wastewater Treatment Facilities ▪ Section 7 Groundwater Discharge Permits
Provide the most efficient area-wide management system for the area ▪ NRS 244A.571(2)	▪ Section 4 Water Quality Standards/Planning?
Non-required elements	▪ Executive Summary

Federal and State of Nevada Water Quality Legislation are included in **Appendix B**.

The Indian Reservations within Clark County are not subject to the planning authority of the State of Nevada or its designees; thus, planning information for the Indian Reservations is not included in this WQMP.

1.3 STUDY AREA

For the WQMP, Clark County was divided into eight planning areas, which are shown in **Figure 1-1**:

- Planning Area 1: Sand Spring - Tikaboo Valleys
- Planning Area 2: Muddy River - Meadow Valley Wash
- Planning Area 3: Lower Virgin River
- Planning Area 4: Grand Wash - Lake Mead
- Planning Area 5: Las Vegas Wash
- Planning Area 6: Ivanpah - Pahrump Valleys
- Planning Area 7: Havasu - Mohave Lakes
- Planning Area 8: Paiute Wash

Appendix C includes a description of how the planning areas were delineated, including the respective figures.

1.3.1 Planning Area 1: Sand Spring - Tikaboo Valleys

Planning Area 1 covers an area of approximately 1,035 square miles (662,400 acres), and consists of unincorporated county areas; the main unincorporated town is Indian Springs. Planning Area 1 is located within the Sand Spring - Tikaboo Valleys, and includes a portion of the Las Vegas Wash watershed. The Sand Spring - Tikaboo Valleys watershed drains in a northerly direction to Lincoln County.

Indian Springs is bordered to the north by the Spotted Range and to the east by the Pintwater Range. The valley is composed of alluvium, as shown in the *Geologic Map of Clark County*. Per the U.S. Geological Survey (USGS), alluvium is deposited by running water, and is composed of sand, gravel, and silt.

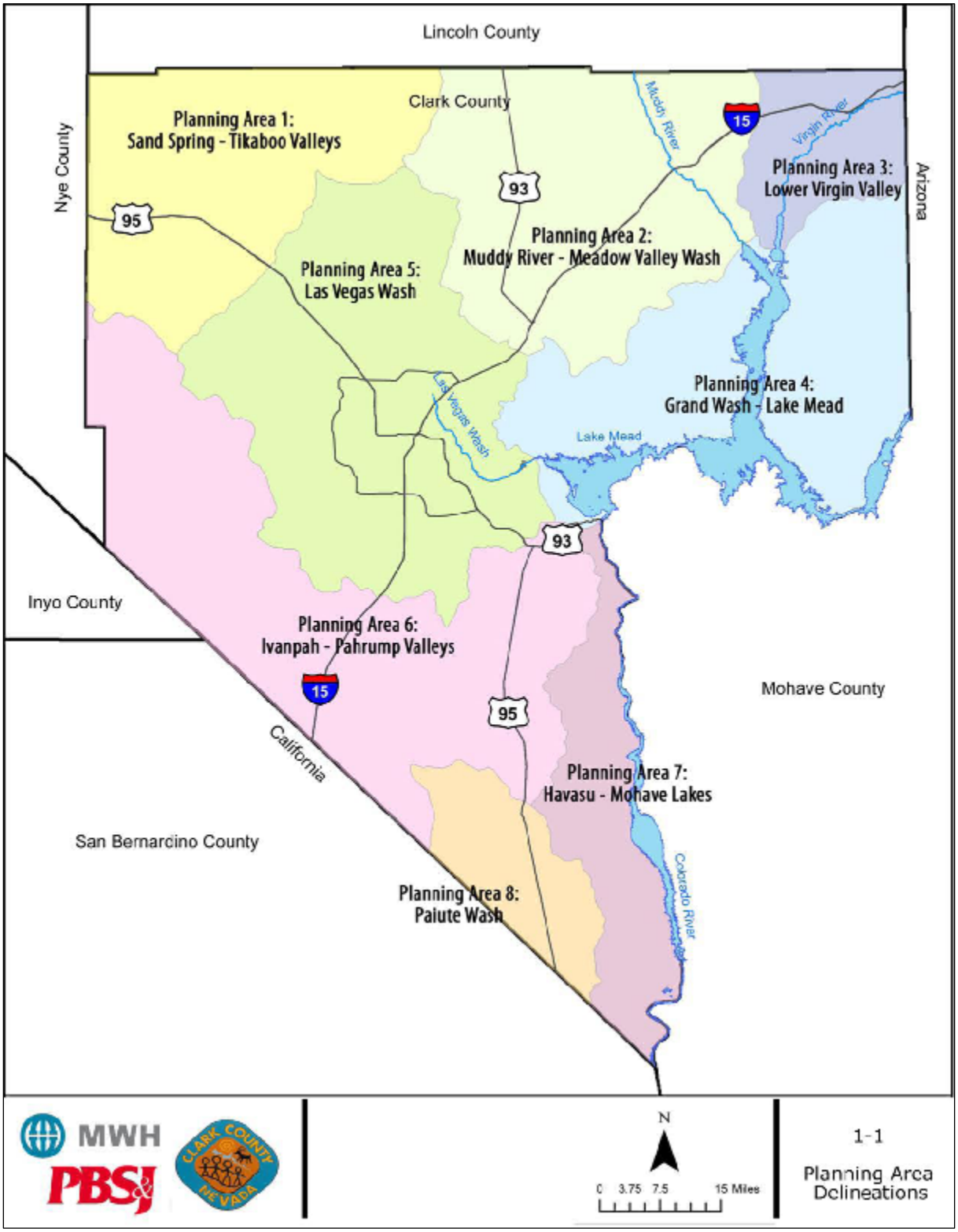
The town of Indian Springs contains some residential dwellings, commercial properties, and Creech Air Force Base, formerly known as the Indian Springs Air Force Auxiliary Field.

There are two prisons in the Three Lakes South Basin, which is included in Planning Area 1.

1.3.2 Planning Area 2: Muddy River - Meadow Valley Wash

Planning Area 2 covers an area of approximately 1,252 square miles (801,280 acres) and contains the following unincorporated communities: Moapa Valley, Logandale, Overton,

Moapa, Glendale, Apex, Moapa Indian Reservation, and Coyote Springs. These communities are located within the Muddy River and Meadow Valley Wash watersheds. The area drains to the Muddy River, which in turn drains to Lake Mead.


Lincoln County
Clark County
Nye County
Arizona
Planning Area 1:
Sand Spring - Tikaboo Valleys
Planning Area 2:
Muddy River - Meadow Valley Wash
Planning Area 3:
Lower Virgin Valley
Planning Area 4:
Grand Wash - Lake Mead
Planning Area 5:
Las Vegas Wash
Planning Area 6:
Ivanpah - Pahrump Valleys
Planning Area 7:
Havasu - Mohave Lakes
Planning Area 8:
Paiute Wash
Muddy River
Virgin River
Las Vegas Wash
Lake Mead
Colorado River
Inyo County
Mohave County
San Bernardino County
California
15
93
95
MWH
PBS&J
N
0 3.75 7.5 15 Miles
1-1
Planning Area Delineations

The Muddy River-Meadow Valley Wash watershed geology consists of alluvial deposits and the Muddy Creek Formation. The Muddy Creek Formation is a series of interbedded sediments of sand, silt, and clay. The topography and soil of the communities are described in the following paragraphs.

1.3.2.1 Moapa Valley, Logandale, and Overton

Moapa Valley lies along the Muddy River drainage, between Interstate 15 and the Lake Mead National Recreation Area. The valley floor is composed of unincorporated county areas and two towns, Overton and Logandale.

The communities of Moapa Valley are spread along a 25-mile-long, 2-mile-wide valley. The valley is bordered to the south by the Muddy Mountains, consisting mainly of sedimentary rock. The soil of the valley contains sand, silt, and clay transported from the upstream areas by the Muddy River.

With the exception of the larger communities of Overton and Logandale, most of the land in this planning area is used for agricultural purposes. The towns have a mix of commercial, residential, and business land uses.

1.3.2.2 Moapa and Glendale

The communities of Moapa and Glendale are located on the west side of Interstate 15 and on the north side of the Muddy River, with the Mormon Mesa and the Mormon Mountains rising from the north side of the river. The communities are bordered to the south and west by the Meadow Valley Mountains. The Mormon and Meadow Valley mountain ranges are sedimentary formations consisting mostly of limestone. The communities of Moapa and Glendale lie on sand, silt, and clay deposited from the Muddy River.

Development is residential, but also supports agricultural uses. Land that is not privately owned in this area is held by the federal government as highway rights-of-way or public lands.

1.3.2.3 Apex

The Apex area is located along Interstate 15, northeast of the Las Vegas Valley. The general topography in the Apex area consists of a large valley surrounded by mountains that drain toward a dry lakebed in the Dry Lake Valley watershed. Apex is bordered on the north and west by the Sheep Mountains and on the south by the Las Vegas Range Mountains. The mountain ranges are primarily sedimentary rock, with limestone as the predominant feature.

Apex is a zoned industrial use park intended to accommodate heavy industrial uses, the Apex Landfill, a gypsum mine, and a chemical lime plant. There is currently no permanent resident population and land that is not privately owned is held by the federal government as highway rights-of-way or public lands.

1.3.2.4 Moapa Indian Reservation

The Moapa Indian Reservation is located along Interstate 15 near Valley of Fire State Park. The community of Moapa is near the northern border of the Reservation. Reservation land consists of Basin and Range topography, with dry lake valleys bordered on the east by the Muddy Mountains, on the south by the Las Vegas Range Mountains, and on the west by the Arrow Canyon Range Mountains.

The Moapa Indian Reservation, encompassing roughly 72,000 acres, is owned by the Southern Paiute. Inhabited by a small population, the Reservation land use is rural with small residential developments. Reservation land is also used for agricultural purposes. There is very little commercial development; only one tribal store is located at the Valley of Fire exit. There are no zoning guidelines that govern land use on the Reservation.

1.3.2.5 Coyote Springs

According to the Clark County website, Coyote Springs Major Projects Description, the ongoing Coyote Springs development encompasses an area of approximately 42,800 acres, with an estimated 13,100 acres of land within Clark County. The community is located along State Highways 93 and 168.

Due to the proximity of Coyote Springs to the Moapa and Glendale communities, the topography and geology previously described for these communities also applies to the portion of Coyote Springs within Clark County.

Coyote Springs mixed use plans include retirement villages, residential homes, business and commercial parks, golf courses, and a recreational area. Therefore, Coyote Springs will contain various zoning requirements for residential and commercial uses.

1.3.3 Planning Area 3: Lower Virgin River

Planning Area 3 covers approximately 357 square miles (228,480 acres), and contains the City of Mesquite (Mesquite) and unincorporated county areas. The two largest unincorporated communities are Bunkerville and Riverside. Planning Area 3 is within the lower Virgin River watershed and the Virgin River empties to Lake Mead. The soils in Planning Area 3 consist of alluvium and the Muddy Creek Formation.

1.3.3.1 Mesquite, Bunkerville, and Riverside

Mesquite is located along Interstate 15 in the lower Virgin River valley, near the Arizona and Utah state lines. Two smaller communities, Bunkerville and Riverside, are south of Mesquite. The cities are bounded to the south by the Virgin Mountains and to the north by the Mormon Mountains. Both mountain ranges consist of blocks of sedimentary rock, with the primary rock made up of limestone. The presence of basalt, rhyolite, and latite flows shows the area had volcanic activity in the past. Mesquite, Bunkerville, and Riverside lie on soils composed of alluvium and the Muddy Creek Formation. The areas drain to the Virgin River, which empties to Lake Mead.

The majority of developments along Mesquite's primary traffic arteries are commercial and residential. Recent planning efforts have established commercial, business, and residential zones, with the long-range master plan indicating a broad range of land uses. The smaller unincorporated towns of Bunkerville and Riverside have some residential and commercial developments.

1.3.4 Planning Area 4: Grand Wash - Lake Mead

Planning Area 4 covers an area of approximately 1,253 square miles (801,920 acres) in Nevada and Arizona. In Clark County, it includes unincorporated county areas and Lake Mead.

Planning Area 4 contains varied topography and soil conditions. The South Virgin Mountains border it to the east, the Muddy Mountains to the west, and Lake Mead to the south. The soil conditions include, but are not limited to, alluvium deposits and the Muddy Creek Formation. Planning Area 4 has very little residential and commercial use; it supports recreational uses such as camping and sport fishing.

1.3.5 Planning Area 5: Las Vegas Wash

Planning Area 5 covers an area of approximately 1,565 square miles (1,001,600 acres). It includes the City of Las Vegas (CLV), City of Henderson (COH), CNLV, and other unincorporated county areas including the township of Sloan. Runoff from Planning Area 5 drains to the Las Vegas Wash watershed. Las Vegas Wash receives surface runoff and groundwater discharges, as well as effluent discharges from the COH, CLV, and the Clark County Water Reclamation District (CCWRD) wastewater treatment facilities (WWTFs).

The Las Vegas Valley is approximately 55 miles long and 25 to 30 miles wide and is surrounded by federal, sovereign, recreational, and undevelopable land. Protected areas include the Desert National Wildlife Refuge, Nellis Air Force Base/Range, Las Vegas Paiute

Indian Reservation, Desert View Natural Environment Area, Toiyabe National Forest (Spring Mountains), Red Rock Canyon National Conservation Area, and Sunrise Mountain Natural Area. The valley is bordered on the west by Mount Charleston in the Spring Mountain Range; to the north by the Las Vegas Desert, Pintwater and Sheep Mountains; to the east by Frenchman and Sunrise Mountains; and to the south by the McCullough Range. The Las Vegas Valley floor is primarily composed of boulders, gravel, and alluvial sand, silt, and clay.

Planning Area 5 contains the most extensive commercial and residential developments in the county, with some industrial and agricultural uses. Industrial uses include abandoned tailing ponds and two gravel quarries. Land is owned privately or by federal entities such as the National Park Service (NPS) and Bureau of Land Management (BLM).

1.3.6 Planning Area 6: Ivanpah - Pahrump Valleys

Planning Area 6 covers an area of approximately 1,690 square miles (1,081,600 acres) within the major Ivanpah-Pahrump Valleys watershed. The basin contains the City of Boulder City (Boulder City), small communities such as Jean and Primm, and townships such as Sandy Valley, and Goodsprings. According to the Boulder City Master Plan, it is on a divide that separates drainage by the Hemenway Wash and the Eldorado Valley. Laughlin runoff traverses the Eldorado Valley and flows to a dry lake southwest of the city, and runoff in the Henenway Wash ends up in Lake Mead. Goodsprings, Jean, and Primm drain to the Ivanpah Valley. Contour data for Sandy Valley shows that drainage runs in a southwest direction to the Mesquite Valley on the California border.

Located within the planning area are the Spring Mountain, Bird Springs, McCullough and Highland Ranges. The geological features are diverse and unique due to the complex and cumulative effects of volcanic and tectonic activity, as well as periods of sedimentation and erosion. The planning area also contains broad expanses of alluvial aprons surrounding the mountains.

Planning Area 6 contains residential and commercial developments. The proposed Ivanpah Airport is being planned about 2 miles north of Primm. The airport development would consist of 6,000 acres for airport facilities and 17,000 acres of Compatibility Management Area (CMA). Currently (2009), only transportation and utility infrastructure is planned within the CMA; any future development would have to be a compatible airport use. Boulder City contains various land uses and is zoned for residential, commercial, hotel and motel developments, and it supports a variety of recreational activities.

1.3.7 Planning Area 7: Havasu - Mohave Lakes

Planning Area 7, the Havasu-Mohave Lakes watershed, covers an area of approximately 539 square miles (344,900 acres) and consists of unincorporated county areas such as Laughlin and the Lake Mead National Recreation Area. The wilderness areas contain little commercial and residential development, but support a variety of recreational activities.

The Lake Mead National Recreation Area is located in the eastern section of south Clark County, along the Colorado River. It contains a wilderness area located in the Lake Mead National Recreation Area and BLM, which includes the Ireteba Peaks Wilderness Area (approximately 32,750 acres), Nellis Wash Wilderness Area (approximately 16,420 acres), Spirit Mountain Wilderness Area (approximately 33,512 acres), and Bridge Canyon Wilderness Area (approximately 7,760 acres). Planning Area 7 is bordered to the west by the Newberry and El Dorado Mountains, and to the east by Lake Mohave. Laughlin and the eastern portions of the Newberry and Eldorado Mountains drain east to the Colorado River, Laughlin Lagoon, and Lake Mojave, while the western portions of the mountains drain west to the Eldorado and Paiute Valleys. The soil of Planning Area 7 is mainly alluvium and Precambrian rock made up of granite, schist, or gneiss.

1.3.7.1 Laughlin

Laughlin is a resort destination with 11 hotels, motels, and/or casinos, and commercial and residential developments. The Clark County website contains the document *Laughlin Land Use Plan (2007)*, which discusses development for Laughlin.

1.3.7.1.1 Topography and Geology

Laughlin, the southernmost city in the State of Nevada, is approximately 90 miles southeast of the CLV. The Laughlin area is located in the Sonoran Desert section of the Basin and Range Province, within the Colorado River Basin, in an area known as the Mohave Valley. The area is bounded by alluvial fans from the Newberry and Dead Mountains on the west, by the Lake Mead National Recreation Area to the north, and by the channelized Colorado River and flood plain to the south and east. Davis Dam is located upstream from Laughlin on the Colorado River.

Geologic features in the Laughlin area can be divided into two classifications: consolidated rocks and alluvium. The consolidated rocks are made of gneiss, schist, and granite. The remainder (the majority of the planning area) consists of unconsolidated and semiconsolidated alluvial deposits. Lenticular beds of sand, gravel, and clay eroded from the adjacent mountains underlie the alluvial fans.

1.3.7.1.2 Watershed

A series of dams along the Colorado River regulate the flow and have eliminated the extensive flooding historically caused by the river. Immediately upstream from Laughlin, the Bureau of Reclamation operates Davis Dam. Water is released from the dam on an hourly basis to coincide with peak electrical demands in the area. During peak electrical demand months, the river below Davis Dam may fluctuate as much as 9 feet during a single 24-hour period.

1.3.7.1.3 Land Use and Zoning

Land ownership in the planning area has largely determined its pattern of development. Major land owners are the BLM, the Bureau of Reclamation, the State of Nevada, and Southern California Edison.

Due to the rapid growth of the local casino resort industry, much of the supply of private land is held for speculation and is not available for residential development.

In June 2007, Clark County was given 9,000+ acres of mostly undeveloped land in the town of Laughlin lying between the Fort Mohave Indian Reservation, the residential area of the town and the western banks of the Colorado River. The Colorado River Commission, a state agency, previously held this land. The Legislature amended the Fort Mohave Valley Development Law so that Clark County would receive the land and oversee its sale and/or lease for development. It is what remains of 15,000 acres sold by the federal government decades ago that formed the original Laughlin town site. The County will first master plan the land and then proceed toward selling and leasing it in an orderly manner with the goal being economic development. The master plans will include mixed development—residential, commercial, recreational and industrial—with emphasis on different types of employment to diversify the local economy.

1.3.8 Planning Area 8: Paiute Wash

Planning Area 8 covers an area of approximately 344 square miles (220,160 acres) and consists of unincorporated county areas. The planning area contains small townships such as Searchlight and Cal-Nev-Ari and is located within the major Paiute Wash watershed. From contour data obtained from the USGS, Davis Dam Quadrangle Map, the two communities drain in a southern direction to the Paiute Wash.

The planning area is bordered by the Castle Mountains to the southwest, the Newberry Mountains to the southeast, and the Eldorado Valley to the north. The geology of the area is simple, containing alluvium deposits.

Planning Area 8 contains small commercial and residential developments within the small townships of Searchlight and Cal-Nev-Ari.

1.4 REFERENCES

City of Boulder City, *Boulder City Master Plan*, 2003. Accessed September 14, 2007, at: http://bcnv.org/communityinfo/comprehensiveplan.html#chapter

City of Henderson, City of Las Vegas, City of North Las Vegas, Clark County Water Reclamation District, and the Las Vegas Valley Water District, *2000 Area Wide Reuse Study, Las Vegas Valley Study Area.* Prepared by Black & Veatch, 2000.

City of North Las Vegas, *City of North Las Vegas Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 Water Quality Management Plan.* Prepared by MWH, October 2005.

Clark County, *Amendment to the Revised Clark County 208 WQMP Lake at Las Vegas.* Prepared by MWH, April 1988.

----- Comprehensive Planning Website, *Laughlin Land Use Plan*, September 5, 2007. Accessed June 16, 2008 (The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County), at: http://www.accessclarkcounty.com/depts/comprehensive_planning/landuse/Documents/LaughlinAmendedPlan0907.pdf

Clark County Department of Air Quality and Environmental Management, *Amendment to Northeast Clark County 208 Water Quality Management Plan*. February 2007. (The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County.)

Clark County Department of Comprehensive Planning, *South County Water Quality Management Plan Amendment*. Prepared by CH2MHill, June 2004. (The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County.)

----- Environmental Planning Division, *Clark County 208 Revised Water Quality Management Plan*. 1979. (The Clark County Area-Wide Water Quality Master Plan replaces and

supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County.)

----- *Clark County 208 Revised Water Quality Management Plan for Rural Areas Amendment*. November 1988. (The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County.)

----- *Las Vegas Valley 208 WQMP Amendment*. Prepared by MWH, July 1997. (The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County.)

----- *Northeast Clark County 208 Water Quality Management Plan Amendment*. Prepared by MWH, June 2000, (the Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County).

Clark County, Development Services, *Coyote Springs Major Projects Description*. Accessed at: http://www.co.clark.nv.us/Development_Services/majproj_desc.htm

Nevada Bureau of Mines and Geology, Geologic Map of Clark Co. Nevada Website, Document Titled Plate 1.pdf. Accessed March 31, 2008, at: http://www.nbmg.unr.edu/dox/b62/index.pdf

----- Quad Maps of Southern Nevada available or obtained from Website. Accessed March 31, 2008, at: http://www.nbmg.unr.edu/drg.html

U.S. Geological Survey, Boundary Descriptions and Names of Regions, Subregions, Accounting Units and Cataloging Units Website. Accessed October 26, 2006, at: http://water.usgs.gov/GIS/huc_name.txt

----- Geopubs Website, Document Titled *Hydrology and Ground-Water Conditions of the Tertiary Muddy Creek Formation in the Lower Virgin River Basin of Southern Nevada and Adjacent Arizona and Utah*. Accessed March 31, 2008, at: http://geopubs.wr.usgs.gov/open-file/of02-172/chapters/chap8.pdf

----- Geologic Glossary Website. Accessed March 31, 2008, at: http://wrgis.wr.usgs.gov/parks/misc/glossarya.html

----- Hydrologic Unit Maps Website. Accessed October 26, 2006, at: http://water.usgs.gov/GIS/huc.html

Section 2

Section 2
Population Projections

2.1 INTRODUCTION

Population projections are used to estimate future wastewater flows and determine collection system and WWTF needs. This section presents the population estimates for 2006 and population projections for the 20-year planning period (2010 through 2030) within Clark County. The 2006 estimates are used because, according to the CCDCP, the data in the Geographically Integrated Land Use Information System (GILIS) tracks well with Clark County's past and current average share of the overall population.

2.2 CURRENT POPULATION IN CLARK COUNTY

Population estimates for 2006 were developed using of GILIS and information provided by the following cities within Clark County:

- Boulder City
- Mesquite
- COH
- CLV
- CNLV

Information from GILIS, provided by the CCDCP, was used to determine population estimates for 2006 for the unincorporated county areas. The unincorporated county areas include the areas within Clark County and are not included in a city jurisdiction, for example, towns, reservations, and tribal lands. GILIS consists of a database and geospatial referencing that provide total population for 2006 per parcel of land within Clark County. This information was overlain on the planning area delineation using ArcGIS software, and then the population estimates for the unincorporated county areas were calculated by summing the total population within each planning area. Population estimates for 2006 were also obtained from each of the cities within Clark County listed above. Population estimates were not requested from unincorporated towns within Clark County, as that information was provided in GILIS; however, 2006 population estimates for the unincorporated towns/townships in Clark County were provided in the *Nevada 2006 Resident Population Estimates*. The total population for each planning area was determined by adding the population estimates for unincorporated county areas to the population estimates for the city/cities within the planning area.

The populations for certain unincorporated county areas were included because they contain a WWTF, which will be discussed in detail in Section 6. The populations for the following unincorporated county areas are included in this section:

- Indian Springs
- Moapa Valley Township
- Coyote Springs
- Blue Diamond
- Searchlight

As discussed in Section 2, the estimates are delineated by planning area. The following subsections discuss the 2006 population estimates for each of the eight planning areas within Clark County; **Figure 1-1** shows the planning areas in Clark County.

2.2.1 Planning Area 1: Sand Spring - Tikaboo Valleys

Planning Area 1, which covers an area of approximately 1,035 square miles, consists of the township of Indian Springs and other unincorporated county areas. The 2006 GILIS population estimate was 6,264. The *Nevada 2006 Resident Population Estimates* shows a 2006 population estimate for Indian Springs of 1,946.

2.2.2 Planning Area 2: Muddy River - Meadow Valley Wash

Planning Area 2 includes the Moapa Valley Township and the future Coyote Springs development. The 2006 GILIS population estimate was 8,260. The *Nevada 2006 Resident Population Estimates* shows a 2006 population estimate for the Moapa Valley Township of 6,984.

2.2.3 Planning Area 3: Lower Virgin River

Planning Area 3 consists of unincorporated county areas and City of Mesquite. The population estimates for 2006 were 1,203 for the unincorporated county areas and 17,656 for Mesquite. Therefore, the combined 2006 population estimate for Planning Area 3 was 18,859.

2.2.4 Planning Area 4: Grand Wash - Lake Mead

Planning Area 4 consists of unincorporated county areas; the 2006 GILIS population estimate was 932.

2.2.5 Planning Area 5: Las Vegas Wash

Planning Area 5 consists of unincorporated county areas, CNLV, CLV, and COH. The 2006 GILIS population estimates for Planning Area 5 are shown in **Table 2-1**.

Table 2-1

Population Estimate for Planning Area 5 (2006)

Description	Population Estimate
CNLV	202,520
CLV	591,536
COH	262,112
Total Unincorporated Clark County • Blue Diamond • Other Unincorporated County Areas	798,941 439 798,502
Combined Total	**1,855,109**

Table 2-1 shows the 2006 total population estimate for Planning Area 5 was 1,855,109. The *Nevada 2006 Resident Population Estimates* shows the population estimate for the unincorporated town of Blue Diamond in 2006 was 439.

2.2.6 Planning Area 6: Ivanpah - Pahrump Valleys

Planning Area 6 consists of unincorporated county areas and Boulder City. The 2006 population estimates were 2,970 for the unincorporated county areas and 15,748 for Boulder City. Thus, the combined 2006 population estimate for Planning Area 6 was 18,718.

2.2.7 Planning Area 7: Havasu - Mohave Lakes

Planning Area 7 consists of unincorporated county areas; the GILIS population estimate for 2006 was 8,757.

2.2.8 Planning Area 8: Paiute Wash

Planning Area 8 consists of unincorporated county areas, including Searchlight; the 2006 GILIS population estimate was 1,056. The *Nevada 2006 Resident Population Estimates* shows a 2006 population estimate for Searchlight of 780.

2.2.9 Summary

The 2006 population estimates for the eight planning areas within Clark County are shown in **Table 2-2**.

Table 2-2

Population Estimate for 2006 in Clark County

Planning Area	Area (square miles)	Population Estimate
1	1,035	6,264
2	1,252	8,260
3	357	18,859
4	1,253	932
5	1,565	1,855,109
6	1,690	18,718
7	539	8,757
8	344	1,056
Combined Total	**8,035**	**1,917,955**

2.3 POPULATION PROJECTIONS FOR CLARK COUNTY

The WQMP has a 20-year planning period with 5-year plan increments beginning in 2010. Using GILIS and information provided by the cities within Clark County, population projections were developed for 2010, 2015, 2020, 2025, and 2030.

The population projections developed for the *Clark County Area-Wide WQMP* used a historical estimate for the 2006 population within Clark County. Although GILIS data from the land-use forecasting process do not match the smooth curve of the Center for Business and Economic Research's (CBER's) Regional Economic Models, Inc. (REMI), 2006 population projections, the CCDCP and the planning departments involved believe GILIS represents a more accurate model for future land-use development. Although the mid-term

populations may differ from the REMI population projections, the REMI population projections were used to help constrain the ultimate population. Population projections will be reviewed in subsequent WQMPs.

The data in GILIS provided land-use forecasts per parcel of land for the unincorporated county areas in 5-year increments up to 2030. There are two types of residential land uses included in GILIS for the unincorporated county areas – single-family residential and multi-family residential. This information was overlain on the planning area delineation using ArcGIS software. The number of units of each residential land-use type were determined for the unincorporated county areas within each planning area, for each of the 5-year increments. The population projections were calculated by multiplying the total number of residential units for each dwelling type by the CCDCP average number of people per residential type: 2.72 people per single-family dwelling and 2.24 people per multi-family dwelling unit.

Population projections for the unincorporated county areas (with the exception of Coyote Springs and Blue Diamond) were developed using GILIS and town boundaries. The town boundaries, which were downloaded from the Clark County Geographic Information System Management Office (GISMO), were overlain on GILIS to determine the population projections for these unincorporated county areas.

CCDCP developed 20-year projections for the Coyote Springs development (located in Planning Area 2) using information supplied by the developer. A 95 percent occupancy rate was assumed as a reasonable average for residential development.

Population projections for Blue Diamond were not developed using GILIS. Instead, they were developed using 8 percent growth every 5 years or 1.6 percent per year, as provided by CCDCP for the *CCWRD Facilities Master Plan (2004)*.

Population projections for the cities in Clark County were not included in GILIS information. Population projections for the planning period were provided by each of the cities within Clark County.

Total projections for each of the planning areas were calculated by adding the population projection for unincorporated county areas to the population projection for the city/cities within the planning area for the 5-year increments of the 20-year planning period. The following subsections summarize the population projections for the planning areas within Clark County.

2.3.1 Planning Area 1: Sand Spring - Tikaboo Valleys

Population projections for 2006 through 2030, including the 20-year planning period (2010 through 2030) for Planning Area 1 are displayed in **Table 2-3** and **Figure 2-1**.

The population is projected to increase 45 percent from 2006 to 2010. From 2010 to 2030, anticipated growth slows to approximately a 20 percent increase. The total population is projected to increase from 6,264 to 10,857 during the planning period, an increase of 73 percent.

2.3.2 Planning Area 2: Muddy River - Meadow Valley Wash

Population projections for 2006 through 2030, including the 20-year planning period (2010 through 2030) for Planning Area 2 are displayed in **Table 2-4** and **Figure 2-2**.

The population is projected to increase steadily and be approximately increased by a factor of five by 2030. The significant increase in population will be in the Coyote Springs development. The total population is projected to increase from 8,260 to 64,860 during the planning period.

2.3.3 Planning Area 3: Lower Virgin River

Population projections for 2006 through 2030, including the 20-year planning period (2010 through 2030) for Planning Area 3 are displayed in **Table 2-5** and **Figure 2-3**.

Table 2-3

Population Projections for Planning Area 1

Year	Population Projection		
	Unincorporated County Areas		Planning Area 1 Total
	Indian Springs	Other Areas	
2006	1,946	4,318	6,264
2010	4,262	4,806	9,068
2015	4,653	4,934	9,587
2020	4,870	4,971	9,841
2025	5,350	5,016	10,366
2030	5,841	5,016	10,857

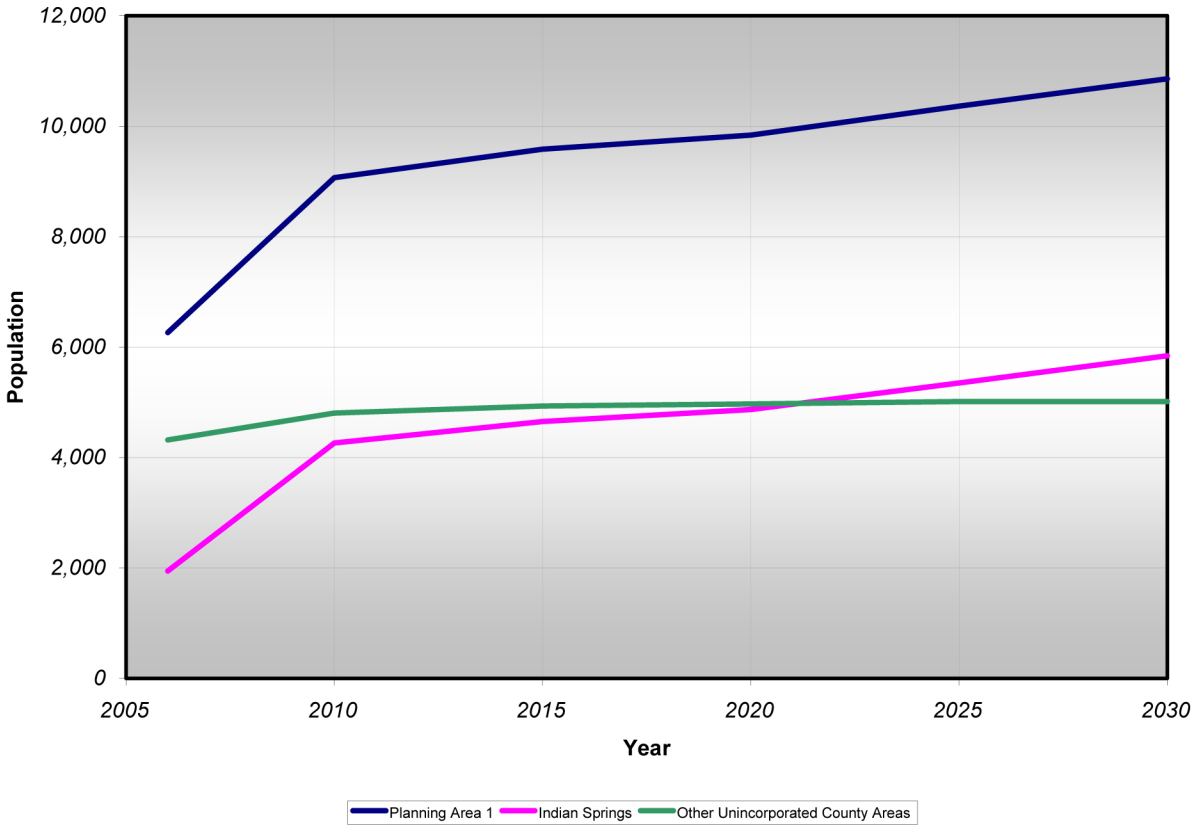


Figure 2-1
Planning Area 1 - Population Projections

This page intentionally left blank

Table 2-4

Population Projections for Planning Area 2

Year	Population Projection			
	Unincorporated County Areas			Planning Area 2 Total
	Moapa Valley	Coyote Springs	Other Areas	
2006	6,984	0	1,276	8,260
2010	9,541	2,375	1,355	13,271
2015	11,043	8,313	1,177	20,533
2020	14,749	17,219	2,304	34,272
2025	16,962	29,094	3,602	49,658
2030	18,408	40,969	5,483	64,860

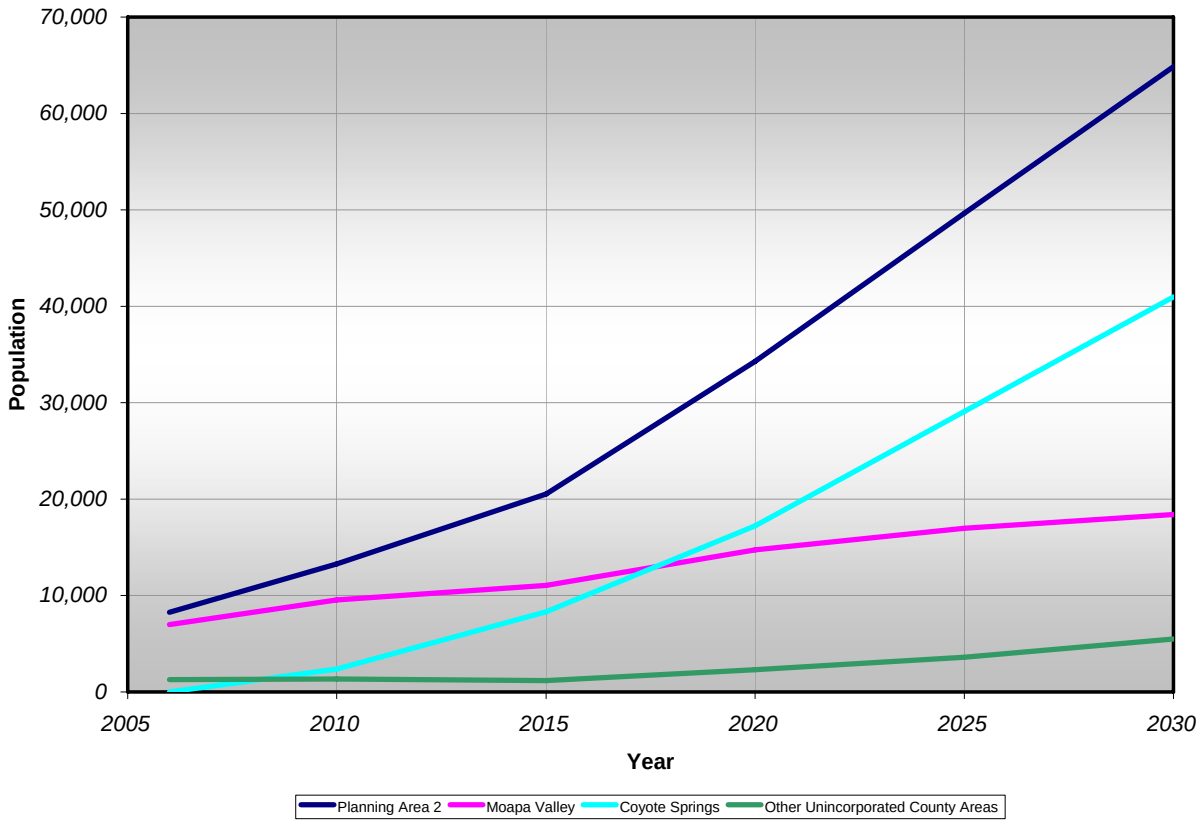


Figure 2-2
Planning Area 2 - Population Projections

Table 2-5

Population Projections for Planning Area 3

Year	Population Projection		
	Mesquite	Unincorporated County Areas	Planning Area 3 Total
2006	17,656	1,203	18,859
2010	23,000	1,203	24,203
2015	32,000	1,203	33,203
2020	43,000	2,197	45,197
2025	55,000	4,024	59,024
2030	70,000	4,754	74,754

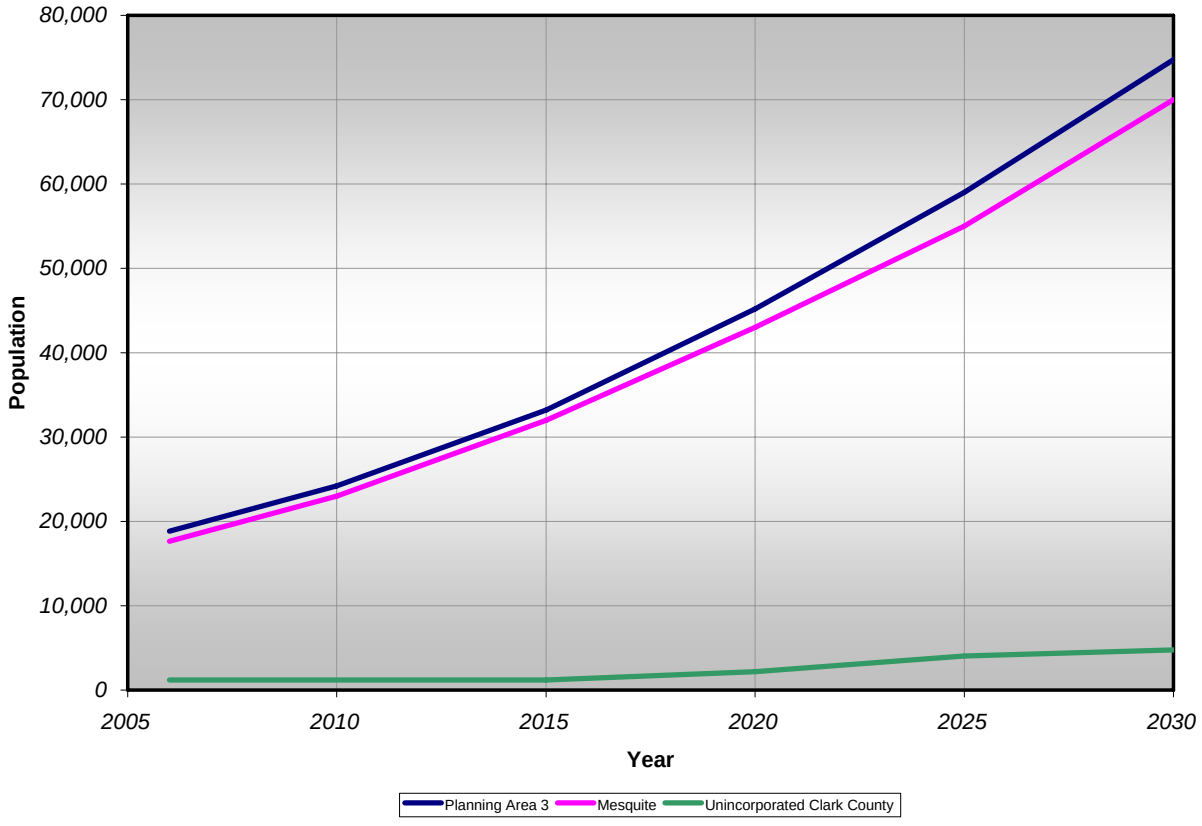


Figure 2-3
Planning Area 3 - Population Projections

The population of Planning Area 3 is projected to increase by a factor of four by 2030, primarily within Mesquite.

2.3.4 Planning Area 4: Grand Wash - Lake Mead

The population of Planning Area 4 is not projected to increase during the 20-year planning period. For the WQMP, the population projection for each incremental year will remain the same as the 2006 population estimate — 932 people.

2.3.5 Planning Area 5: Las Vegas Wash

Population projections for 2006 through 2030, including the 20-year planning period (2010 through 2030) for Planning Area 5 are displayed in **Table 2-6** and **Figure 2-4**.

The population is projected to increase approximately 80 percent from 2006 to 2030.

2.3.6 Planning Area 6: Ivanpah - Pahrump Valleys

Population projections for 2006 through 2030, including the 20-year planning period (2010 through 2030) for Planning Area 6 are displayed in **Table 2-7** and **Figure 2-5**.

Table 2-6

Population Projections for Planning Area 5

Year	Population Projection					
				Unincorporated County Areas		
	COH	CLV	CNLV	Blue Diamond	Other Areas	Planning Area 5 Total
2006	262,112	591,536	202,520	439	798,502	1,855,109
2010	332,633	687,751	276,494	467	932,624	2,229,969
2015	436,482	788,221	338,307	504	1,121,229	2,684,743
2020	524,560	867,245	396,862	544	1,228,729	3,017,940
2025	586,972	934,265	443,349	588	1,247,606	3,212,780
2030	614,461	989,723	499,335	635	1,252,779	3,356,933

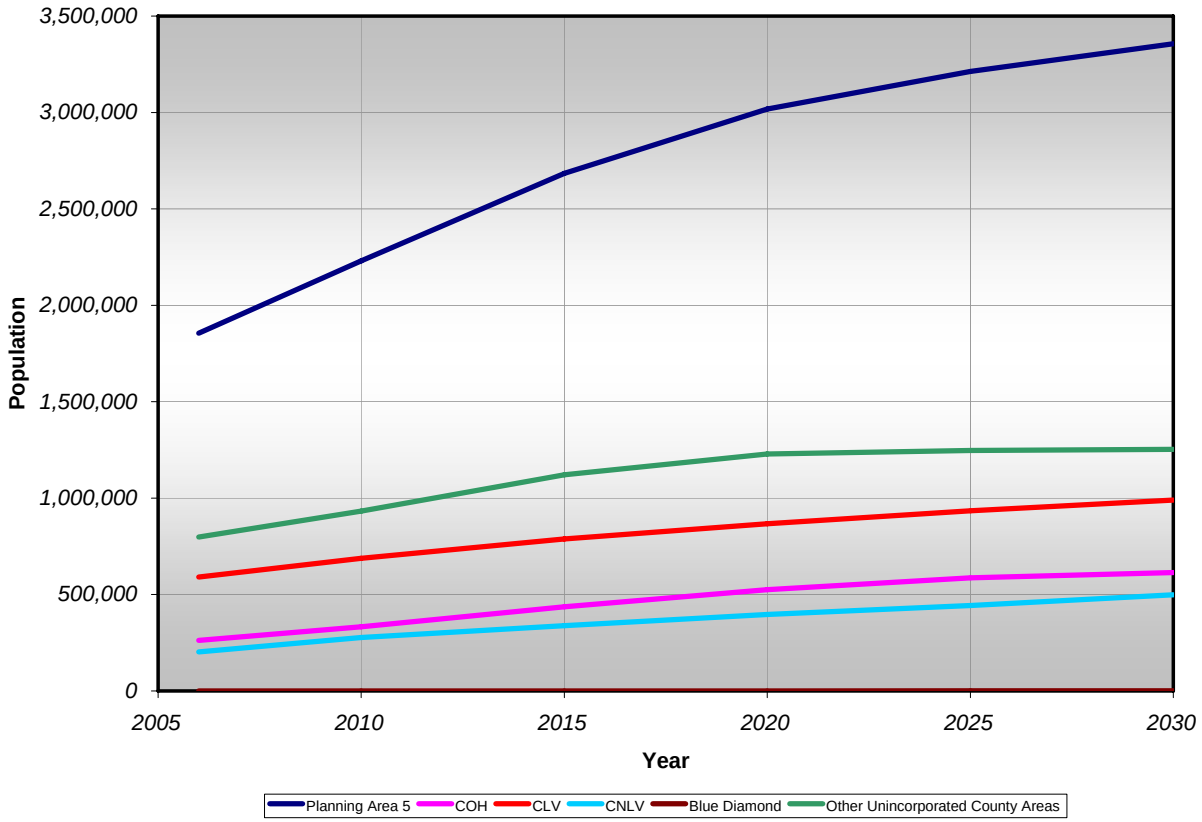


Figure 2-4
Planning Area 5 - Population Projections

Table 2-7

Population Projections for Planning Area 6

Year	Population Projection		
	Boulder City	Unincorporated County Areas	Planning Area 6 Total
2006	15,748	2,970	18,718
2010	16,000	3,485	19,485
2015	17,000	3,781	20,781
2020	18,000	4,041	22,041
2025	19,000	4,611	23,611
2030	20,000	5,128	25,128

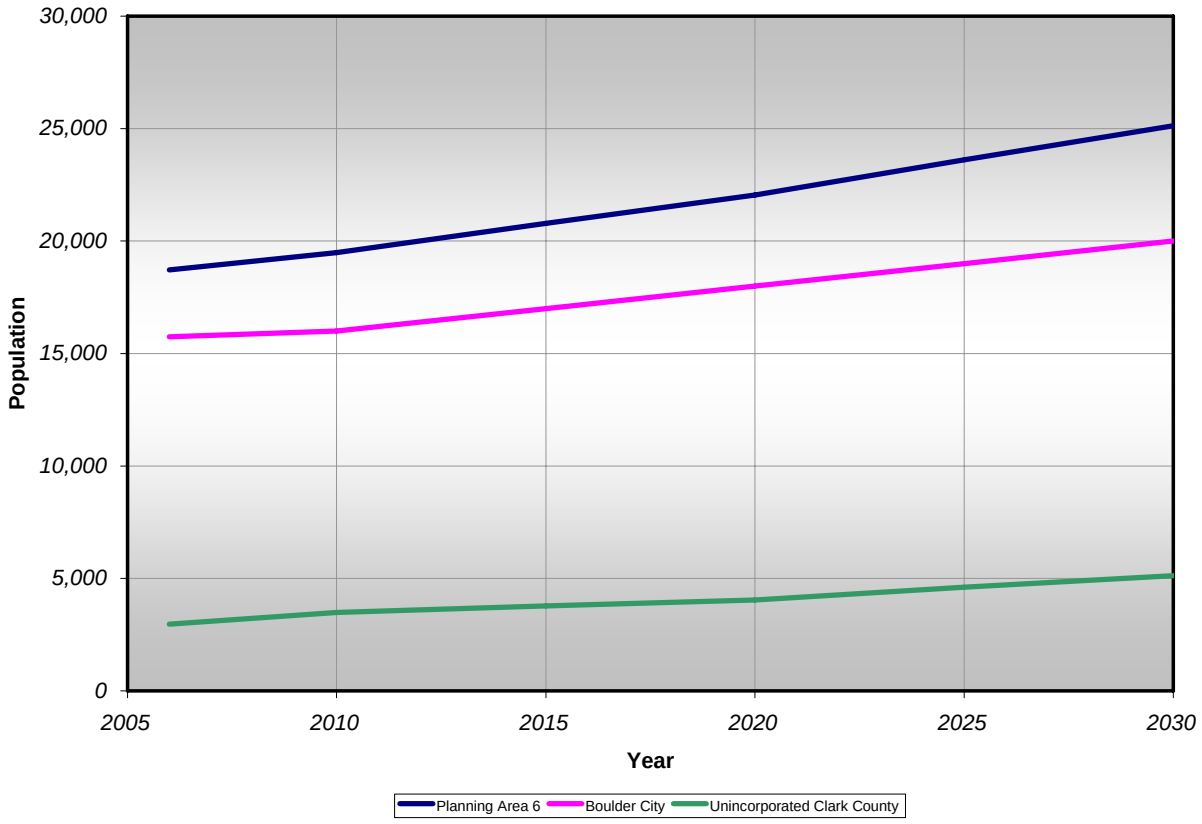


Figure 2-5
Planning Area 6 - Population Projections

The population is projected to increase approximately 35 percent by 2030. Boulder City is projected to grow by approximately 27 percent and the unincorporated areas' population is projected to increase by more than 70 percent.

2.3.7 Planning Area 7: Havasu - Mohave Lakes

Population projections for 2006 through 2030, including the 20-year planning period (2010 through 2030) for Planning Area 7 are displayed in **Table 2-8** and **Figure 2-6**.

The population is projected to grow steadily from 2006 to 2030, with a six-fold increase in population from 2006 to 2030.

2.3.8 Planning Area 8: Paiute Wash

Population projections for 2006 through 2030, including the 20-year planning period (2010 through 2030) for Planning Area 8 are displayed in **Table 2-9** and **Figure 2-7**.

The Planning Area 8 population is projected to more than double from 2006 to 2010, but the subsequent growth rate is projected to be slower - only 30 percent between 2010 and 2030. The population will still be small, with an overall projected increase from 1,056 to 3,183.

2.4 COMPARISON OF CLARK COUNTY POPULATION PROJECTIONS

The population projections developed for the *Clark County Area-Wide WQMP* were compared to population projections developed by other sources to show consistency with other Clark County planning projects. **Table 2-10** and **Figure 2-8** summarize the projections developed for the *Clark County Area-Wide WQMP* and the CBER population projections included in the Southern Nevada Water Authority (SNWA) *Water Resource Plan* (2008). Near-term projections (out to 2010) agree within one percent of each other. The 2015-2030 projected populations developed for the *Clark County Area-wide WQMP* and the CBER SNWA Water Resource Plan 2008 are within approximately 3 percent of each other. Therefore, the *Clark County Area-wide WQMP* projections are similar to the CBER projections.

Table 2-8

Population Projections for Planning Area 7

Year	Population Projection
2006	8,757
2010	14,567
2015	25,109
2020	33,996
2025	48,995
2030	53,690

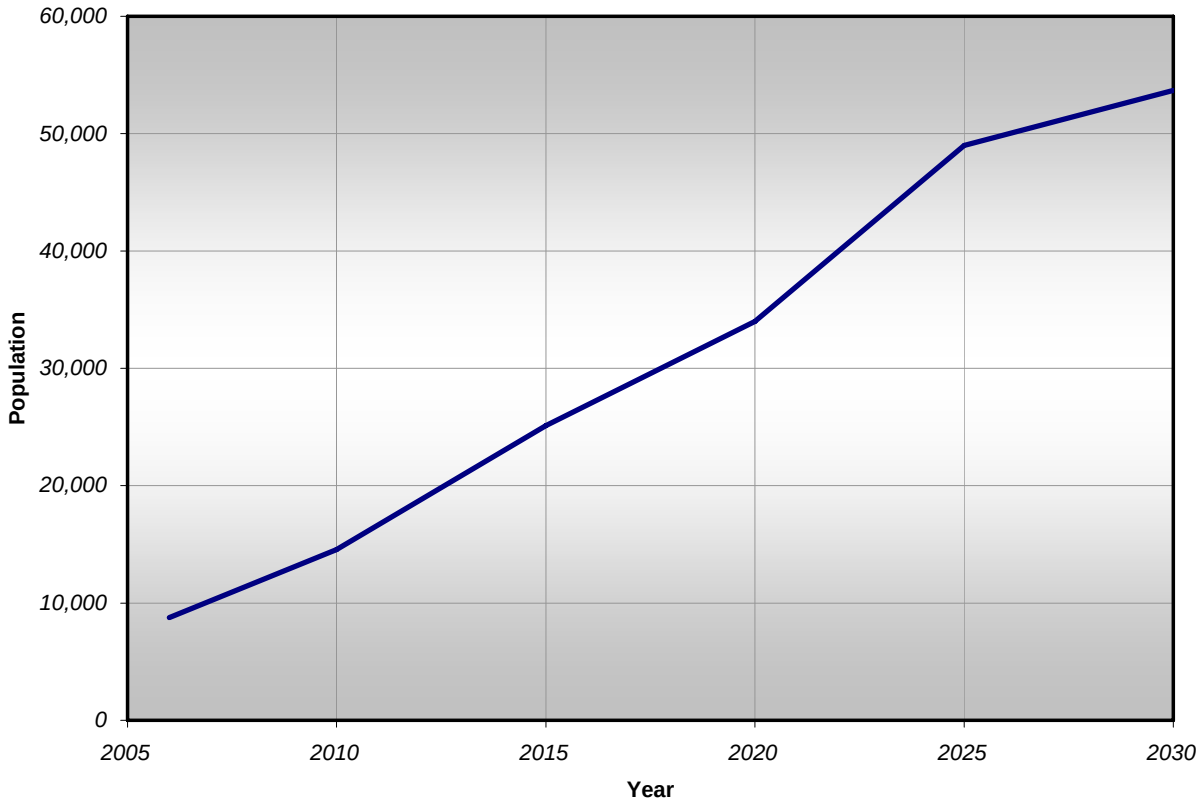


Figure 2-6
Planning Area 7 - Population Projections

Table 2-9

Population Projections for Planning Area 8

Year	Population Projection		
	Unincorporated County Areas		Planning Area 8 Total
	Searchlight	Other Areas	
2006	780	276	1,056
2010	1,539	920	2,459
2015	1,817	920	2,737
2020	2,130	1,053	3,183
2025	2,130	1,053	3,183
2030	2,130	1,053	3,183

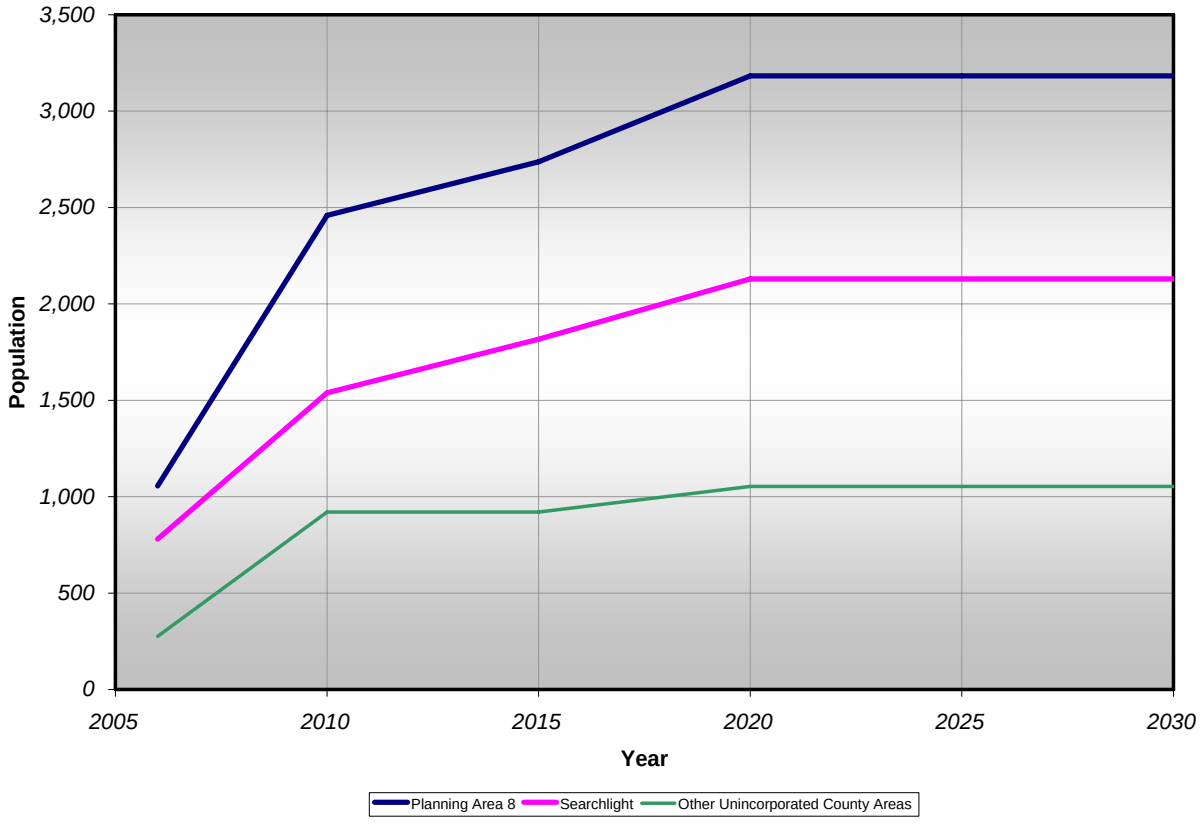


Figure 2-7
Planning Area 8 - Population Projections

Table 2-10

Comparison of Clark County Population Projections

Year	Population Projections	
	Clark County Area-Wide WQMP	CBER - SNWA Water Resource Plan 2008
2006	1,917,955	1,912,654
2010	2,313,954	2,288,942
2015	2,797,625	2,735,996
2020	3,167,402	3,059,584
2025	3,408,549	3,306,947
2030	3,590,337	3,516,688

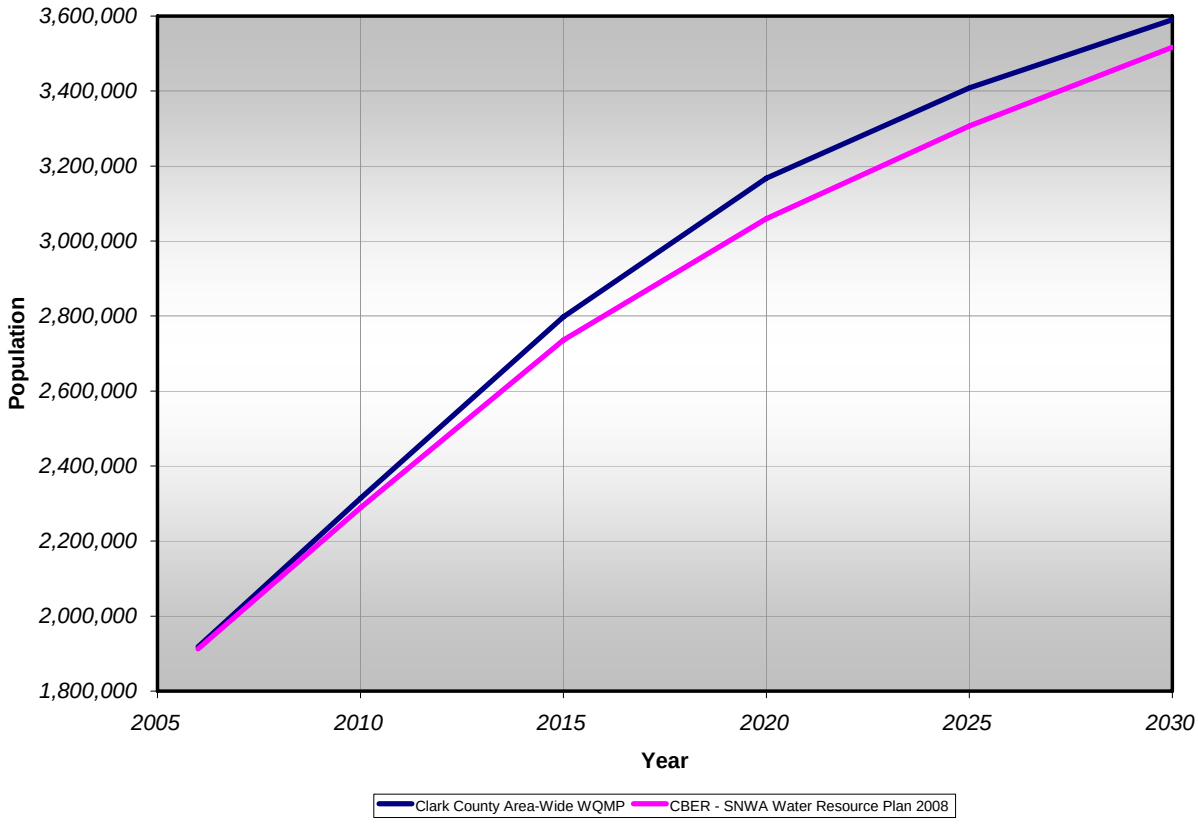


Figure 2-8
Comparison of Clark County Population Projections

2.5 CLARK COUNTY POPULATION PROJECTIONS BY PLANNING AREA

The WQMP baseline population estimates for 2006 and population projections are provided for each planning area within Clark County, as summarized in **Table 2-11**. **Table 2-12** shows a summary of the baseline population estimates for 2006 and population projections for the unincorporated county areas and the incorporated population for each planning area within Clark County.

Table 2-11

Population Projections by Planning Area

Planning Area	2006	2010	2015	2020	2025	2030
1	6,264	9,068	9,587	9,841	10,366	10,857
2	8,260	13,271	20,533	34,272	49,658	64,860
3	18,859	24,203	33,203	45,197	59,024	74,754
4	932	932	932	932	932	932
5	1,855,109	2,229,969	2,684,743	3,017,940	3,212,780	3,356,933
6	18,718	19,485	20,781	22,041	23,611	25,128
7	8,757	14,567	25,109	33,996	48,995	53,690
8	1,056	2,459	2,737	3,183	3,183	3,183
Total	**1,917,955**	**2,313,954**	**2,797,625**	**3,167,402**	**3,408,549**	**3,590,337**

Planning Area 5 will continue to have by far the largest population in Clark County, with 96.7 percent of the 2006 population and 93.5 percent of the 2030 population. The largest percent population increases are projected in Planning Areas 2, 3, and 7 during the planning period. These three planning areas represent 1.9 percent of the 2006 population and are projected to represent 5.4 percent of the 2030 population.

Table 2-12

Unincorporated County Areas and Incorporated Population Projections by Planning Area

Planning Area	2006		2010		2015		2020		2025		2030	
	Unincorporated County Areas	Incorporated	Unincorporated County Areas	Incorporated	Unincorporated County Areas	Incorporated	Unincorporated County Areas	Incorporated	Unincorporated County Areas	Incorporated	Unincorporated County Areas	Incorporated
1	6,264	-	9,068	-	9,587	-	9,841	-	10,366	-	10,857	-
2	8,260	-	13,271	-	20,533	-	34,272	-	49,658	-	64,860	-
3	1,203	17,656	1,203	23,000	1,203	32,000	2,197	43,000	4,024	55,000	4,754	70,000
4	932	-	932	-	932	-	932	-	932	-	932	-
5	798,941	1,056,168	933,091	1,296,878	1,121,733	1,563,010	1,229,273	1,788,667	1,248,194	1,964,586	1,253,414	2,103,519
6	2,970	15,748	3,485	16,000	3,781	17,000	4,041	18,000	4,611	19,000	5,128	20,000
7	8,757	-	14,567	-	25,109	-	33,996	-	48,995	-	53,690	-
8	1,056	-	2,459	-	2,737	-	3,183	-	3,183	-	3,183	-
Subtotal	828,383	1,089,572	978,076	1,335,878	1,185,615	1,612,010	1,317,735	1,849,667	1,369,963	2,038,586	1,396,818	2,193,519
Total	**1,917,955**		**2,313,954**		**2,797,625**		**3,167,402**		**3,408,549**		**3,590,337**	

2.6 RECOMMENDATIONS

The recommendations for population projections were compiled from existing 208 WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* Project Oversight Committee (POC). The following are the recommendations pertaining to population projections for the *Clark County Area-Wide WQMP*:

- Population projections for Clark County should be reviewed and revised as appropriate in future updates of the WQMP. CBER population forecasts should continue to be considered when making population projections.

- Population estimates should be compared annually to projected population figures to better determine future potential population and wastewater flows.

2.7 REFERENCES

Center for Business and Economic Research at the University of Nevada, Las Vegas. *Clark County Nevada Population Forecast 2007*. August 2007.

City of Boulder City, Director of Public Works, *Personal Communications*, June 6, 2007.

City of Henderson, *Demographic Profile*, April 11, 2007. Accessed at: http://cityofhenderson.com/planning/php/planningbody7.php

City of Las Vegas, *Water Pollution Control Facility 2006 Plan Update - Final Draft*. Prepared by HDR, August 29, 2006.

City of Mesquite, Planning Department, *Personal Communications* , June 12, 2007.

City of North Las Vegas, *2006 Community Report*

Clark County, Geographic Information System Management Office (GISMO), April 2007.

Clark County Department of Comprehensive Planning, *Geographically Integrated Land Use Information System (GILIS)*, April 2007.

Clark County Water Reclamation District, *Facilities Master Plan, Functional Area 5, Outlying Facilities*, Prepared by Stanley Consultants, February 2004.

Southern Nevada Water Authority, *Hydrographic Areas* GIS file, November 17, 2006.

----- *Water Resource Plan 2008, Appendices*. Accessed June 9, 2008, at: http://www.snwa.com/html/wr_resource_plan.html

State of Nevada, Division of Water Resources, *Hydrographic Areas*, September 1968.

U.S. Geological Survey, *Hydrologic Unit Maps*.. Accessed October 26, 2006 at: http://water.usgs.gov/GIS/huc.html.

University of Nevada Las Vegas, Center for Business and Economic Research (CBER). Clark County Nevada Population Forecast 2007, August 2007.

Section 3

Section 3
Wastewater Flow Projections

3.1 INTRODUCTION

The population projections developed in Section 2 were used to estimate future wastewater flows throughout Clark County. This section presents the wastewater flow estimates for 2006 and projections for the 20-year planning period (2010 through 2030).

3.2 WASTEWATER FLOW CONTRIBUTIONS

The population figures were multiplied by the per capita wastewater flow contribution factor in gallons per capita per day (gpcd) to determine the wastewater flows.

3.2.1 Unincorporated County Areas

Information for the unincorporated county areas within Clark County was provided by the CCWRD. An Equivalent Residential Unit (ERU) is the average amount of wastewater that a single-family residence discharges into the wastewater system. According to the *Design and Construction Standards for Wastewater Collection Systems 1997*, an ERU in Clark County is equivalent to the discharge of 90,000 gallons per year or approximately 250 gallons per day (gpd).

CCWRD has historically used 100 gpcd for wastewater flow projections for unincorporated county areas, except for the wastewater flows generated by the hotels and casinos in Laughlin. The flows contributed by the Laughlin hotels/casinos compared to the Laughlin residential flows is disproportionately higher than a similar comparison in the Las Vegas Valley due to the smaller Laughlin population.

Laughlin is located in the southern portion of Planning Areas 7 and 8. According to the GILIS files, the 2006 population of 8,621 for Laughlin is fully contained within Planning Area 7 (CCDCP, 2007). In the GILIS land-use forecast and population projections, Laughlin is anticipated to expand into Planning Area 8 — from 55 people projected in 2010 to a total of 151 people projected in the period from 2020 to 2030. Because these numbers are small compared to the total population for Laughlin, the average dry weather flow for Laughlin will not be greatly impacted by this population being accounted for in Planning Area 8.

Laughlin currently (2008) contains 11 hotels, motels, and/or casinos, with an availability of more than 11,000 rooms. This is projected to reach approximately 18,000 rooms by 2030. To address the high transient population related to these hotel/casino rooms, a contribution

rate of 350 gpd/room at an 85 percent occupancy rate is used to calculate flows from the hotels/casinos. This approach is consistent with the *CCWRD Facilities Master Plan (2004)*.

The draft CCWRD *Integrated Facility Master Plan 2007 – Technical Memoranda Volume 2* included population-based wastewater flow projections that used average daily per-person wastewater contributions of 123 and 129 gpcd within unincorporated county areas in the Las Vegas Valley. The upper value of 129 gpcd was selected to calculate wastewater flow projections for the *Clark County Area-Wide WQMP*.

3.2.2 Cities

Historical data and current per capita wastewater flow contributions were provided for the unincorporated county areas and the cities within Clark County (as mentioned in Section 2).

Boulder City recommended a value of 115 gpcd to project wastewater flows for Boulder City.

The *Southwest Water Reclamation Facility Predesign Report 2005* indicated that the average daily per-person wastewater contribution for COH is about 95 gpcd. COH determined that this value was acceptable for planning purposes, since it includes residential wastewater contributions and provides allowances for additional wastewater flows generated by commercial and industrial properties.

CLV has been tracking per capita wastewater flow contributions at the Water Pollution Control Facility (WPCF) since the 1990s. For CLV, per capita wastewater flow contributions are approaching 90 gpcd, and CLV is using that value to predict future flows (CLV, 2006). Thus, a value of 90 gpcd will be used to estimate per capita wastewater flow projections for CLV for the 20-year planning period.

As stated in the *CNLV WRF Amendment (2005)*, CNLV has experienced annual average daily wastewater flows of about 90 gpcd. CNLV determined that this value was acceptable; thus, CNLV per capita wastewater flow contributions for the WQMP are 90 gpcd.

Mesquite is currently experiencing wastewater flow contributions of 115 gpcd and recommended this value as the projected wastewater flow for Mesquite (Mesquite, 2007).

Table 3-1 summarizes the wastewater flow contributions used for the *Clark County Area-Wide WQMP*.

Table 3-1

Per Capita Wastewater Flow Contributions

County/City	Wastewater Flow Contributions (gpcd)
Unincorporated County Areas Outside Las Vegas Valley	100
Unincorporated County Areas Within Las Vegas Valley	129
Laughlin Hotels/Casinos	350 (gpd/room)
City of Boulder City	115
City of Henderson	95
City of Las Vegas	90
City of North Las Vegas	90
City of Mesquite	115

These data, combined with the population projections summarized in Section 2, were used to project wastewater flows in Clark County for 2006 through 2030, including the 20-year planning period (2010 through 2030).

3.3 WASTEWATER FLOW PROJECTIONS

Wastewater flow projections for unincorporated county areas and for the incorporated cities were computed using the population data described in Section 2 and the per capita wastewater flow contributions presented in **Table 3-1**. These calculations result in the average dry weather flow, which is the flow that occurs on a daily basis with no contribution from rainfall. Wastewater flow projections for each planning area were calculated by adding the wastewater flow projection for unincorporated county areas to the wastewater flow projections for the cities within the planning area for the 5-year increments of the 20-year planning period. The following subsections discuss the wastewater flow projections for the planning areas within Clark County.

3.3.1 Planning Area 1: Sand Spring - Tikaboo Valleys

Projected wastewater flows for Planning Area 1 are based on the population estimates included in Section 2. Planning Area 1 consists of unincorporated county areas; total wastewater flow projections were determined using the CCWRD per capita wastewater flow contributions. **Table 3-2** and **Figure 3-1** display average dry weather flow projections for the planning period from 2006 through 2030.

3.3.2 Planning Area 2: Muddy River – Meadow Valley Wash

Projected wastewater flows for Planning Area 2 are based on the population estimates included in Section 2. Planning Area 2 consists of unincorporated county areas; wastewater flow projections were determined using the CCWRD per capita wastewater flow contributions. **Table 3-3** and **Figure 3-2** display average dry weather flow projections for the planning period from 2006 through 2030.

3.3.3 Planning Area 3: Lower Virgin River

Projected wastewater flows for Planning Area 3 are based on the population estimates included in Section 2. Planning Area 3 consists of unincorporated county areas and Mesquite. Wastewater flow projections were determined using the CCWRD per capita wastewater flow contributions for the unincorporated county areas and the value provided by Mesquite for the city. **Table 3-4** and **Figure 3-3** display average dry weather flow projections for the planning period from 2006 through 2030.

3.3.4 Planning Area 4: Grand Wash – Lake Mead

Planning Area 4 consists of unincorporated county areas; wastewater flow projections were developed using the CCWRD per capita wastewater flow contributions. As discussed in Section 2, the population for Planning Area 4 is not projected to increase during the 20-year planning period. Average dry weather flows are 0.1 million gallons per day (mgd) for the 20-year planning period.

Table 3-2
Wastewater Flow Projections for Planning Area 1

Year	Wastewater Flow (mgd) [a]		
	Unincorporated County Areas		
	Indian Springs	Other Areas	Planning Area 1 Total
2006	0.12 [b]	0.43	0.55
2010	0.43	0.48	0.91
2015	0.47	0.49	0.96
2020	0.49	0.50	0.99
2025	0.54	0.50	1.04
2030	0.58	0.50	1.08

Notes:

[a] mgd = million gallons per day, average dry weather flow
[b] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

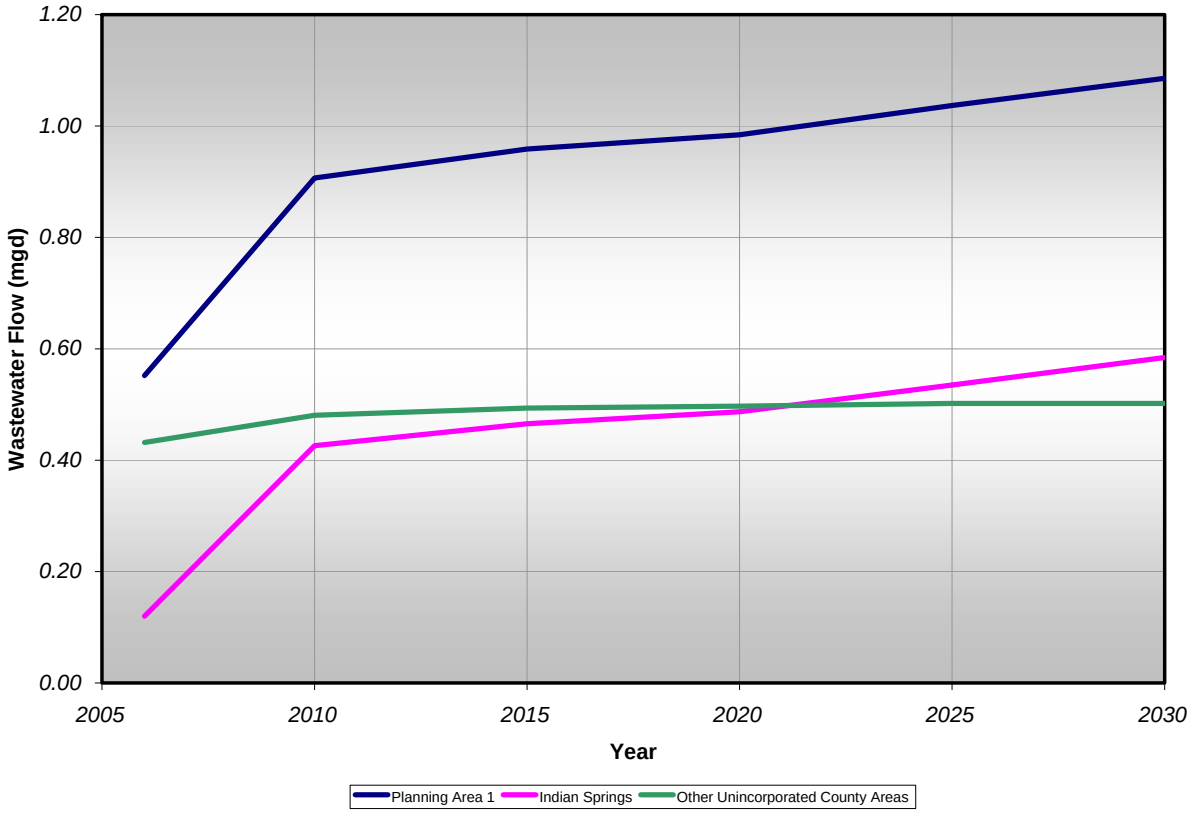


Figure 3-1
Planning Area 1 – Wastewater Flow Projections

Table 3-3
Wastewater Flow Projections for Planning Area 2

Year	Wastewater Flow (mgd) [a]			
	Unincorporated County Areas			Planning Area 2 Total
	Moapa Valley	Coyote Springs	Other Areas	
2006	0.7	0.0	0.1	0.8
2010	1.0	0.2	0.1	1.3
2015	1.1	0.8	0.1	2.0
2020	1.5	1.7	0.2	3.4
2025	1.7	2.9	0.4	5.0
2030	1.8	4.1	0.5	6.4

Note:

[a] mgd = million gallons per day, average dry weather flow

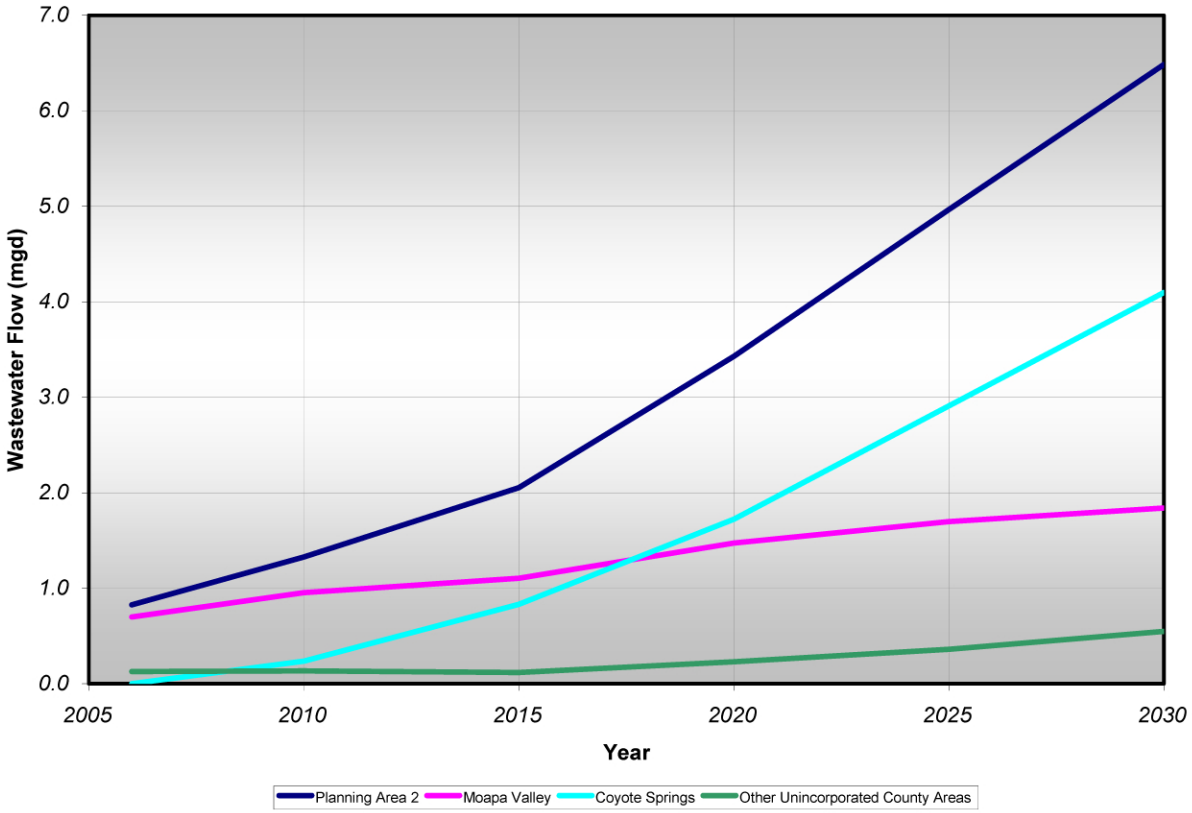


Figure 3-2
Planning Area 2 – Wastewater Flow Projections

Table 3-4
Wastewater Flow Projections for Planning Area 3

Year	Wastewater Flow (mgd) [a]		
	Mesquite	Other Areas	Planning Area 3 Total
2006	1.8 [b]	0.1	1.9
2010	2.6	0.1	2.7
2015	3.7	0.1	3.8
2020	4.9	0.2	5.1
2025	6.3	0.4	6.7
2030	8.1	0.5	8.6

Notes:

[a] mgd = million gallons per day, average dry weather flow
[b] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

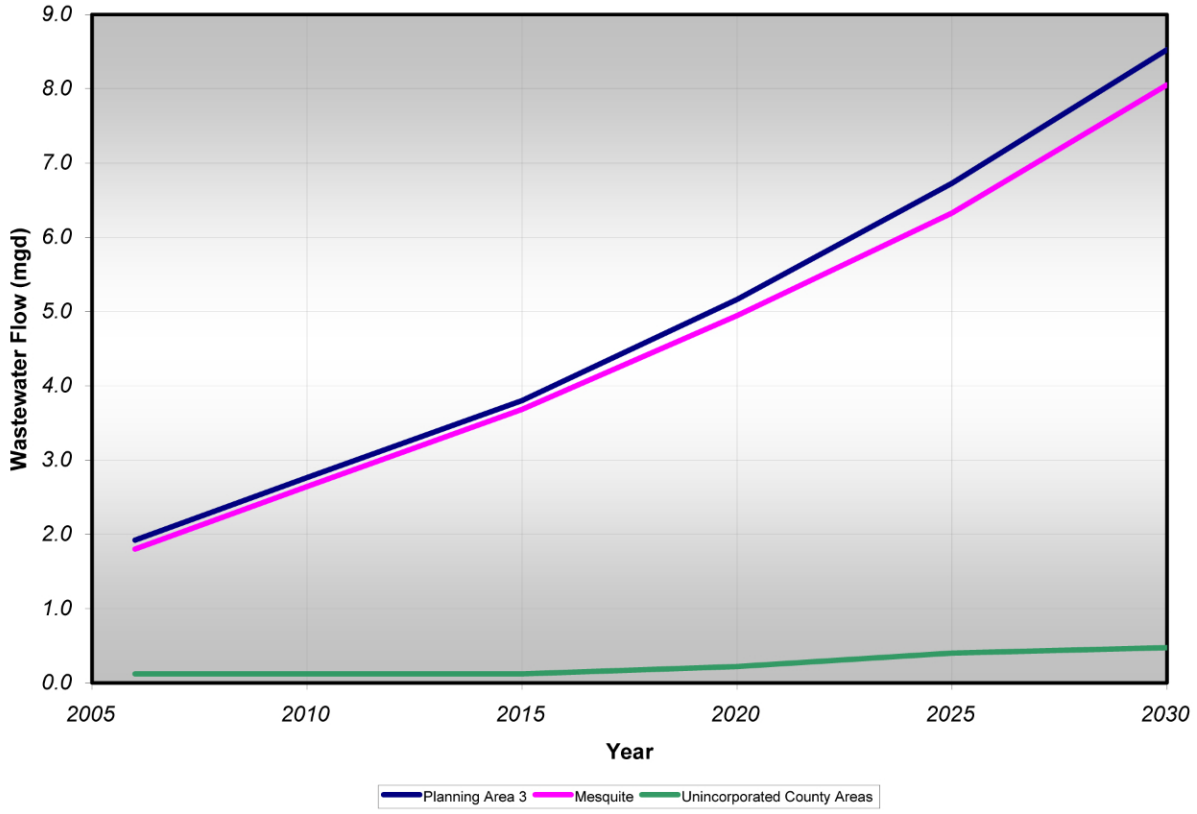


Figure 3-3
Planning Area 3 – Wastewater Flow Projections

3.3.5 Planning Area 5: Las Vegas Wash

Projected wastewater flows for Planning Area 5 are based on the population estimates included in Section 2. Planning Area 5 consists of unincorporated county areas, COH, CLV, CNLV, and the proposed Southern Nevada Regional Heliport (Heliport). Wastewater flow projections were determined using the CCWRD per capita wastewater flow contributions for the unincorporated county areas within the Las Vegas Valley and the values provided by the Las Vegas Valley cities. **Table 3-5** and **Figure 3-4** display average dry weather flow projections for the planning period from 2006 through 2030.

3.3.5.1 Proposed Southern Nevada Regional Heliport

The majority of helicopter tour operators in Las Vegas are currently (2008) based at McCarran International Airport, requiring Grand Canyon tour operators to routinely fly over commercial and residential areas. As the number of helicopter flights from the airport has steadily increased, the community has voiced an interest in identifying a nonurban site that would be dedicated to helicopter activity. In 2004, the BCC designated a preferred site to accommodate commercial helicopter operations approximately 2.5 miles south of the Interstate 15 and Sloan Interchange (referred to as the South of Sloan site).

In 2005, Congress passed legislation providing for the transfer of the South of Sloan site from the BLM to Clark County for construction and operation of the Heliport (Public Law 109-115). If the Heliport is approved by the Federal Aviation Administration (FAA), construction could begin in 2008 with operations beginning in 2010.

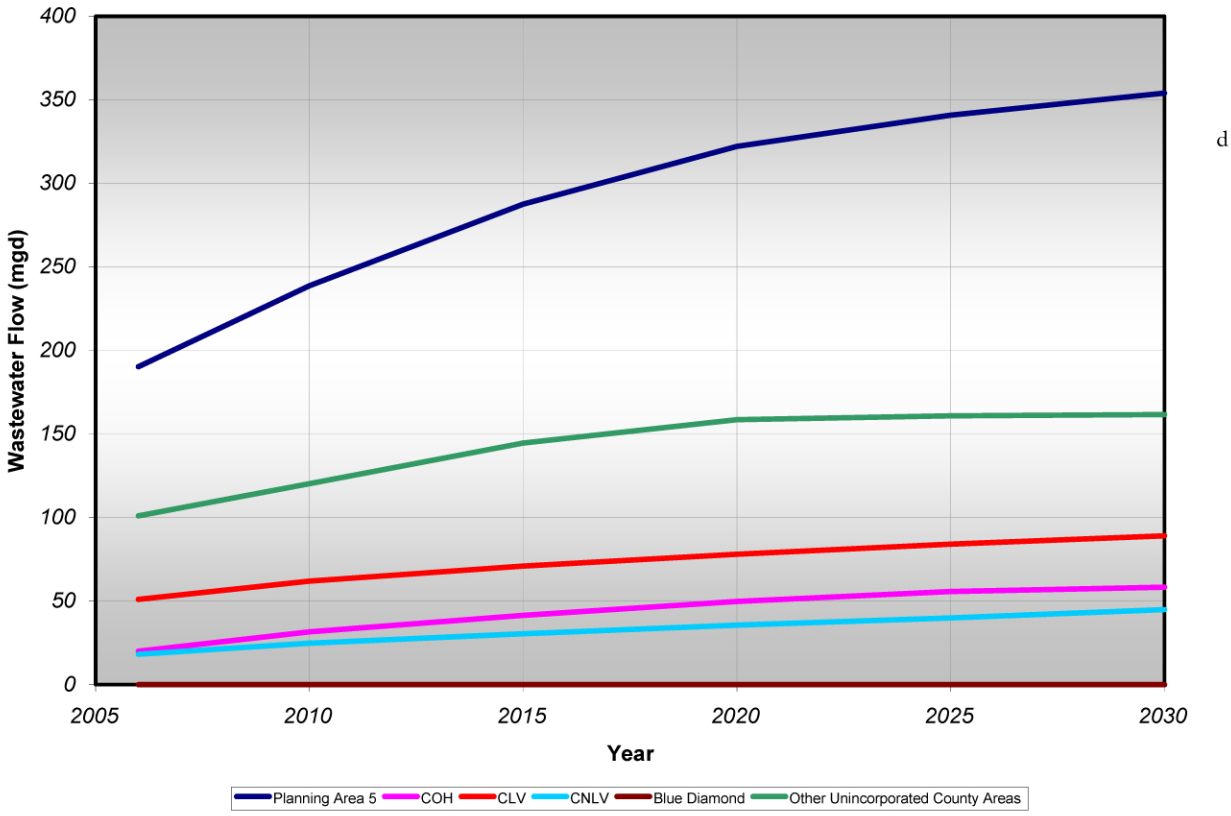
Daily wastewater flows for the Heliport were estimated based on forecasted passenger volumes, contractor employees, and CCDOA personnel, using airport-specific flow data obtained from local, state, and federal wastewater treatment design manuals; wastewater flows were provided by CCDOA for inclusion in the *Clark County Area-Wide WQMP*. Per capita flow estimates were cross-checked using wastewater data from McCarran International Airport and found to be consistent. **Table 3-6** shows the project passenger demand and wastewater generation rate for the proposed Heliport for the planning period from 2006 through 2030.

Table 3-5
Wastewater Flow Projections for Planning Area 5

Year	Wastewater Flow (mgd) [a]					
				Unincorporated County Areas		Planning Area 5 Total
	COH	CLV	CNLV	Blue Diamond	Other Areas	
2006	20 [b]	51 [c]	18	0.04	101 [b]	190
2010	32	62	25	0.05	120	239
2015	41	71	30	0.05	145.01	288.01
2020	50	78	36	0.05	159.01	322.01
2025	56	84	40	0.06	161.01	341.01
2030	58	89	45	0.06	162.02	354.02

Notes:

[a] mgd = million gallons per day, average dry weather flow
[b] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*
[c] CLV wastewater flow calculated by the difference between *SWAC 2006 Year End Summary* CLV total flow of 69 mgd and calculate 2006 CNLV flow of 18 mgd.



[d]

Figure 3-4
Planning Area 5 - Wastewater Flow Projections

Table 3-6

Proposed Southern Nevada Regional Heliport
Forecasted Number of Passengers Per Year and Projected Wastewater Flows

Year	Passenger Per Year Projection	Wastewater Flow (mgd)
2006	0	0.0
2010	0	0.0
2015	380,000	0.01
2020	462,000	0.01
2025	562,000	0.01
2030	684,000	0.02

3.3.6 Planning Area 6: Ivanpah - Pahrump Valleys

Projected wastewater flows for Planning Area 6 are based on the population estimates included in Section 2. Planning Area 6 encompasses unincorporated county areas, including Jean, Primm, and the proposed Ivanpah Airport; Boulder City is also within this planning area. Wastewater flow projections were determined using the CCWRD per capita wastewater flow projections, flows from the Jean and Primm WWTFs, and values provided by Boulder City.

According to the *CCWRD Facilities Master Plan (2004)*, wastewater flows to the Jean WWTF were 0.34 mgd in 2002 and are projected to remain constant unless the proposed Ivanpah Airport is developed. According to the *Enco Southwest Discharge Monitoring Reports (2006-07)*, the average wastewater flow for Primm was 0.48 mgd in 2006. The *CCWRD Facilities Master Plan (2004)* indicated a projected flow of 0.49 mgd for the Primm WWTF.

Airports represent a significant wastewater flow contribution in Clark County. McCarran International Airport is the primary commercial service airport for all of southern Nevada, accommodating 47 million passengers in 2007. The Clark County Department of Aviation (CCDOA) has determined that McCarran International Airport could accommodate approximately 60 million passengers per year before delays become severe, causing passengers and airlines to curtail planned activities. This passenger demand is projected to be reached in 2016. Consequently, the CCDOA has proposed to construct and operate a supplemental airport at the Ivanpah site.

CCDOA projects that the aviation demand for the proposed Ivanpah Airport at opening would be approximately 11.7 million passengers annually (proposed Ivanpah Airport projected to be operational sometime in 2018) and by 2025 would be approximately 25 million passengers per year. The ultimate capacity of the Ivanpah Airport is approximately 48 million passengers per year.

The wastewater generated from the proposed passenger terminal, concourses, and ancillary buildings at Ivanpah Airport was estimated by multiplying each building area by a wastewater generation factor specific to the building's primary function (e.g., passenger terminal, flight kitchen); wastewater flows were provided from CCDOA for inclusion in the *Clark County*

Area-Wide WQMP. **Table 3-7** shows the projected passenger demand and wastewater generation rate for the proposed Ivanpah Airport for the planning period from 2006 through 2030.

Table 3-7

Proposed Ivanpah Airport
Forecasted Number of Passengers Per Year and Estimated Wastewater Flows

Year	Passenger Per Year Projection (millions)	Wastewater Flow (mgd)
2006	0	0.0
2010	0	0.0
2015	0	0.0
2020	15.4	0.30
2025	24.5	0.48
2030	33.7	0.65

Table 3-8 shows the Planning Area 6 wastewater flow projections.

Table 3-8

Planning Area 6
Unincorporated County Areas
Population Projections and Wastewater Flows

Year	Wastewater Flow (mgd)				
	Residential	Jean	Primm	Proposed Ivanpah Airport	Unincorporated County Areas Total
2006	0.30	0.34	0.48	0	1.1
2010	0.35	0.34	0.49	0	1.2
2015	0.38	0.34	0.49	0	1.2
2020	0.40	0.34	0.49	0.36	1.6
2025	0.46	0.34	0.49	0.47	1.8
2030	0.51	0.34	0.49	0.58	1.9

Table 3-9 and **Figure 3-5** display average dry weather flow projections for 2006 through 2030, including the 20-year planning period (2010 through 2030).

Table 3-9

Wastewater Flow Projections for Planning Area 6

Year	Wastewater Flow (mgd)[a]		
	Total Unincorporated County Areas	Boulder City	Planning Area 6 Total
2006	1.1	1.1 [b]	2.2
2010	1.2	1.8	3.0
2015	1.19	2.0	3.19
2020	1.59	2.1	3.69
2025	1.79	2.2	3.99
2030	1.88	2.3	4.18

Notes:

[a] mgd = million gallons per day, average dry weather flow
[b] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

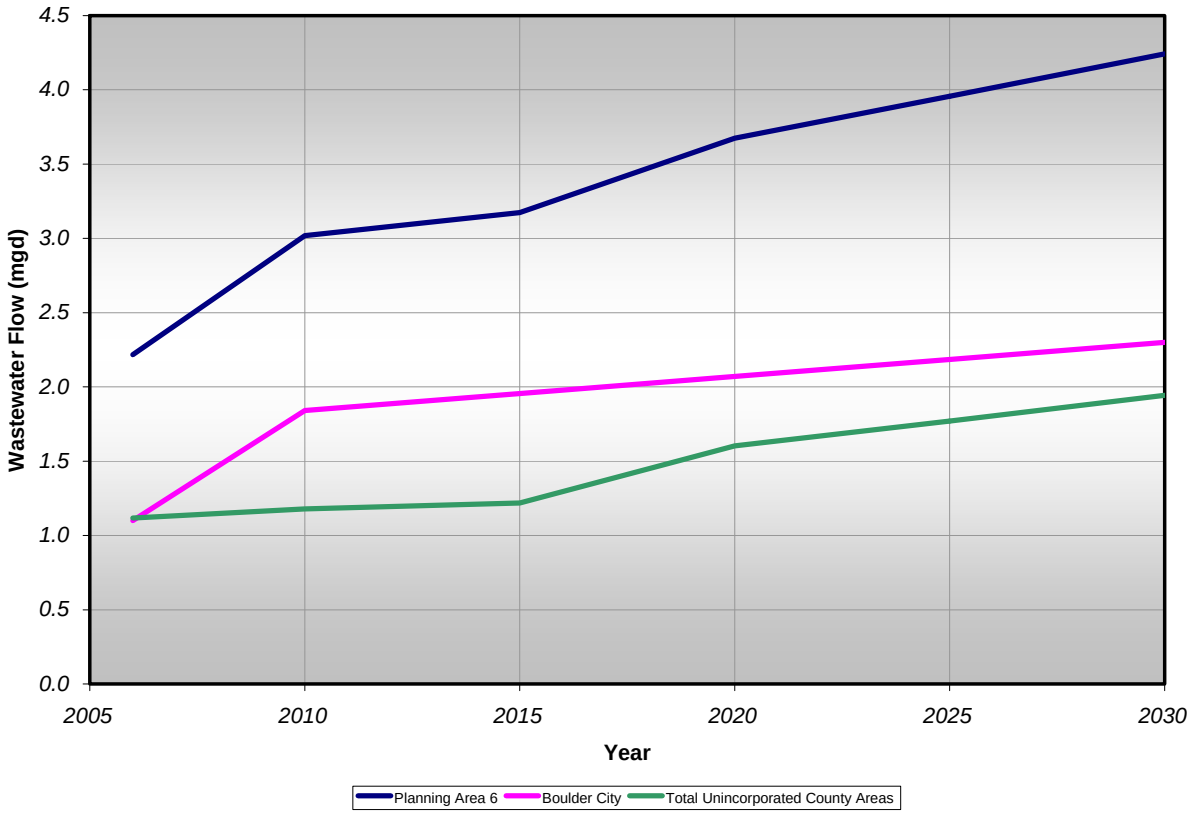


Figure 3-5
Planning Area 6 - Wastewater Flow Projections

3.3.7 Planning Area 7: Havasu - Mohave Lakes

Projected wastewater flows for Planning Area 7 are based on the population estimates included in Section 2. Planning Area 7 consists of unincorporated county areas, with the majority of the population in Laughlin. Wastewater flow projections were determined using the CCWRD per capita wastewater flow contributions of 100 gpcd for the residential flows, and 350 gpd/room for the hotels/casinos. **Table 3-10** and **Figure 3-6** display the resultant average dry weather flow projections for the planning period from 2006 through 2030.

Table 3-10
Wastewater Flow Projections for Planning Area 7

Year	Wastewater Flow (mgd)[a]		
	Residential	Laughlin Hotel/Casino	Planning Area 7 Total
2006	N/A	N/A	2.4 [b]
2010	1.5	4.0	5.5
2015	2.5	4.4	6.9
2020	3.4	4.7	8.1
2025	4.9	5.0	9.9
2030	5.4	5.3	10.7

Notes:

[a] mgd = million gallons per day, average dry weather flow
[b] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*
N/A – Not Available

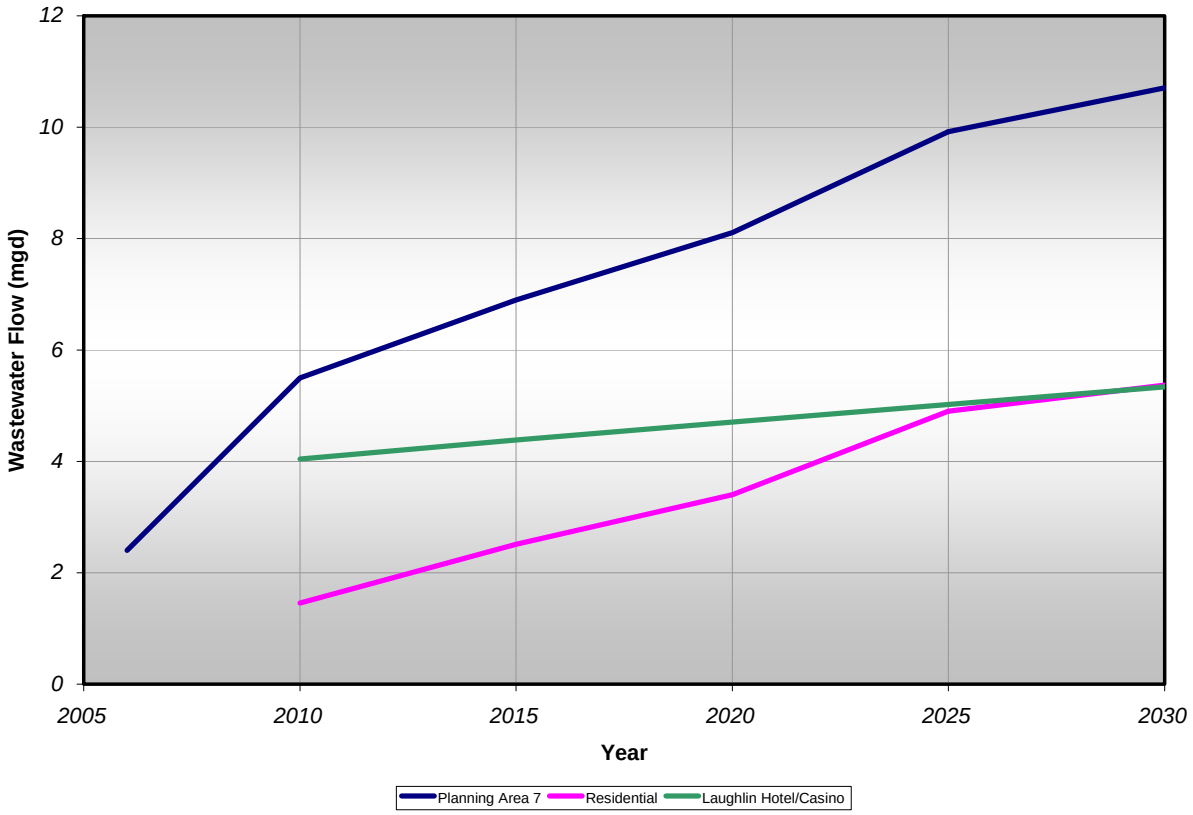


Figure 3-6
Planning Area 7 - Wastewater Flow Projections

3.3.8 Planning Area 8: Paiute Wash

Projected wastewater flows for Planning Area 8 are based on the population estimates included in Section 2. Planning Area 8 consists of unincorporated county areas; wastewater flow projections were determined using the CCWRD per capita wastewater flow contributions. **Table 3-11** and **Figure 3-7** display average dry weather flow projections for the planning period from 2006 through 2030.

Table 3-11

Wastewater Flow Projections for Planning Area 8

Year	Wastewater Flow (mgd)[a]		
	Unincorporated County Areas		Planning Area 8 Total
	Searchlight	Other Areas	
2006	0.10 [b]	0.03	0.13
2010	0.15	0.09	0.24
2015	0.18	0.09	0.27
2020	0.21	0.11	0.32
2025	0.21	0.11	0.32
2030	0.21	0.11	0.32

Notes:

[a] mgd = million gallons per day, average dry weather flow
[b] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

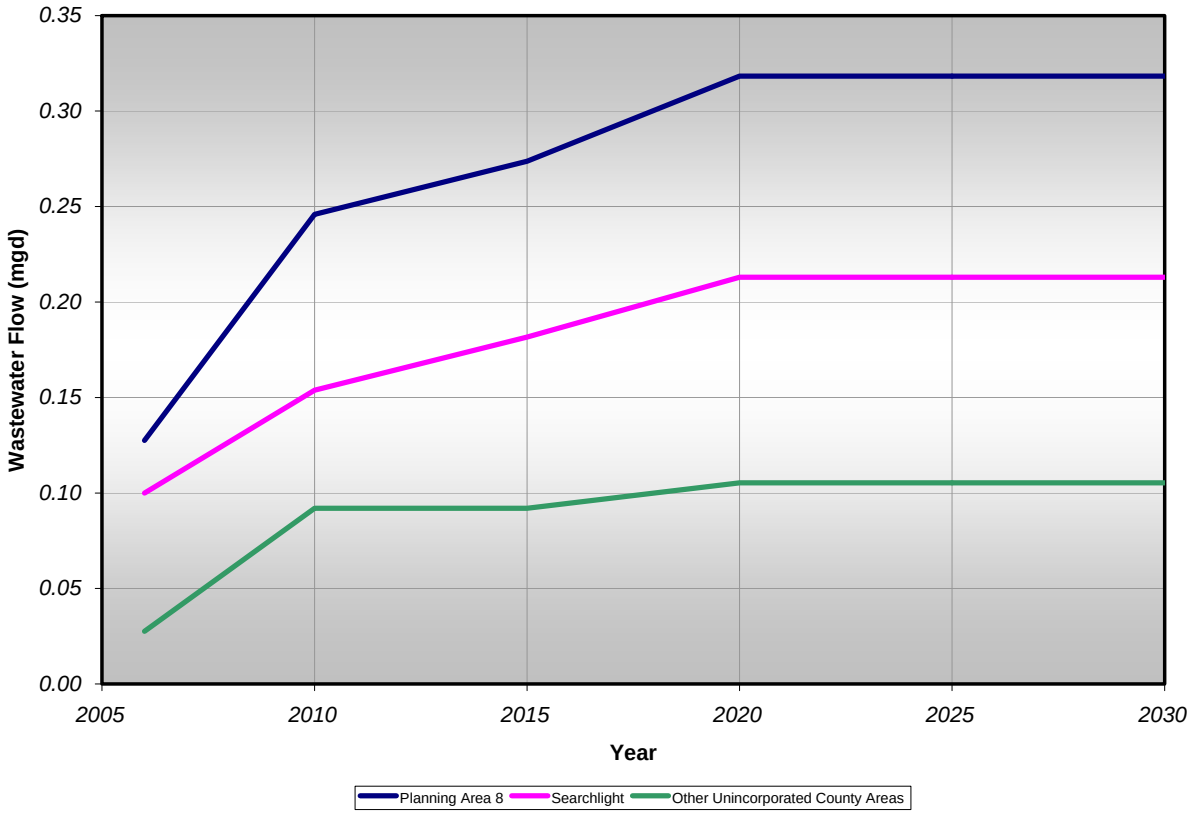


Figure 3-7
Planning Area 8 - Wastewater Flow Projections

3.4 RECOMMENDATIONS

The recommendations for wastewater flow projections were compiled from existing 208 WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to wastewater flow projections for the *Clark County Area-Wide WQMP*:

- Wastewater flow projections in Planning Area 2 should be consistent with and coordinated with projected water supply and demand identified by the Moapa Valley and Virgin Valley Water Districts, and with groundwater apportionment available for water supply.

- Coordination should continue among the Moapa Valley and Virgin Valley Water Districts and the wastewater dischargers, including Mesquite and the CCWRD, to ensure a proactive approach to identify future needs.

- Land and water availability should be periodically analyzed and continually coordinated to address environmental issues.

- Coordination should continue between the SNWA, the Clean Water Coalition (CWC), the wastewater dischargers to assure a proactive approach to identify future needs.

- Continue to coordinate wastewater flow projections with relevant agencies.

- Assessments of opportunities for reclamation of wastewater flows through available options should include an assessment of wastewater flow projection involving relevant water and wastewater agencies to ensure effective coordination while seeking to optimize water resources in consideration of relevant laws and regulations.

3.5 REFERENCES

City of Boulder City, Director of Public Works, *Personal Communications*, June 6, 2007.

City of Henderson, *Southwest Water Reclamation Facility Predesign Report - Volume 1*. Prepared by Black & Veatch, December 2005.

City of Las Vegas, *Water Pollution Control Facility 2006 Plan Update - Final Draft*. Prepared by HDR, August 29, 2006.

City of Mesquite, Public Works, *Personal Communications*, June 5, 2007.

City of North Las Vegas, *Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 Water Quality Management Plan*, Prepared by MWH, October 2005, (The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County).

Clark County Department of Comprehensive Planning, *Geographically Integrated Land Use Information System* (GILIS), April 2007.

Clark County Water Reclamation District, *Facilities Master Plan*. Prepared by Stanley Consultants, 2004.

----- *Integrated Facility Master Plan 2007 – Technical Memoranda Volume 2*, Draft Report, June 2007.

Enco, *Southwest Discharge Monitoring Reports,* 2006-2007.

Section 4

Section 4
Water Quality Standards / Planning

4.1 INTRODUCTION

In Nevada, the State Environmental Commission (SEC) is responsible for rules and standards to control human health and the environment, including pollution of waters of the state.

"Waters of the State" are:

> "all waters situated wholly or partly within or bordering upon this State, including but not limited to: (1) all streams, lakes, ponds, impounding reservoirs, marshes, water courses, waterways, wells, springs, irrigation systems and drainage systems; and (2) all bodies or accumulations of water, surface and underground, natural or artificial" (NRS § 445A.415)."

Rule enforcement is through the Nevada Division of Environmental Protection (NDEP). NDEP monitors, assesses, reports under CWA 303(d) and 305(b), and develops total maximum daily loads (TMDLs) for the State of Nevada. The Bureau of Water Quality Planning oversees the Nonpoint Source Pollution Management Program, performs water quality monitoring, petitions the SEC to set water quality standards, issues water quality certifications as mandated by CWA Section 401, and develops TMDLs. The Bureau of Water Pollution Control (BWPC) administers the National Pollutant Discharge Elimination System (NPDES) program and enforces compliance of permit conditions. Nevada has been delegated permit authority for the NPDES permit program, including stormwater permits, for all areas of the state except Indian lands. Discharge permits define the quality of the discharge necessary to protect the quality of the waters of the state, enforcing the state's water pollution control laws and regulations. The BWPC also performs engineering reviews of the designs of permitted facilities, inspects permitted facilities, investigates violations of water pollution statutes and regulations, and provides technical and financial assistance to dischargers. The Bureau of Mining Regulation and Reclamation (BMRR) oversees the design, construction, operation, and closure of mining facilities.

The seven-member BCC is designated as the Area-Wide Water Quality Management Planning Organization (Nevada Revised Statute [NRS] 244A). The BCC serves "ex-officio" as the governing body of the Las Vegas Valley Water District (LVVWD), the CCWRD, the University Medical Center of Southern Nevada, the Big Bend and Kyle Canyon Water Districts, and the Clark County Liquor and Gaming Board. The BCC hires a County Manager who is responsible for the administrative operations of County government. The BCC has delegated the water quality management to the DAQEM, which administers the Water Quality Program with the intent "to protect, preserve and enhance the quality of Clark County's water resources for the benefit of present and future generations through proactive

long-term planning, real-time monitoring, community education, regulations, compliance assurance, and working together with the public, federal, state and local agencies." The DAQEM Water Quality Planning Team works with the municipalities, wastewater dischargers, affected industry, and concerned citizens to ensure compliance with water quality plans and policies.

Las Vegas Valley Watershed Advisory Committee (LVVWAC)'s mission is to protect, preserve and enhance the quality and quantify of water resources in the Las Vegas Valley watershed to sustain economic wellbeing and protect the environment for present and future generations. The organization's goals and strategies are as follows:

1. Protect Lake Mead as a source of water for Southern Nevada and downstream users.

- Monitor and respond to upstream inflows to Lake Mead.
- Manage non-point sources from the Las Vegas Valley.
- Manage the operations and facilities of the System Conveyance and Operations Program (SCOP).
- Manage, coordinate and optimize water reclamation facilities.

2. Meet or surpass federal, state and local standards and regulations.

- Endeavor to protect Lake Mead, Las Vegas Wash and tributaries to meet or surpass environmental water quality standards.
- Continue to ensure drinking water standards are met or surpassed.

3. Preserve and enhance the natural, cultural, historic and recreational values of the watershed and Lake Mead.

- Manage wildlife and habitats.
- Minimize impacts to cultural and historic values.
- Endeavor to prevent and control invasive species.
- Support recreational uses and the health of fisheries and other water dependant wildlife.

4. Coordinate water resource management.

- Balance ecosystem, flows and other functions of the Las Vegas Wash and Lake Mead.
- Optimize the use of reclaimed water.
- Ensure the development of and compliance with the Clark County 208 Water Quality Management Plan for the Las Vegas Valley watershed.

5. Manage flood risks.

- Minimize the loss of life and property from the impacts of flooding.

6. Sustain water and energy resources for future generations.

- Optimize use of renewable energy.
- Consider the net environmental benefit.
- Enhance energy and water conservation programs.

7. Build community awareness and support for regional watershed management.

- Develop communication and education programs.
- Integrate existing stakeholder programs to specifically address watershed issues.

4.2 MAJOR SURFACE WATERS

The major surface waters in Clark County are:

- **Virgin River** – The Virgin River drains the northeast portion of Clark County. Its headwaters are located in southwestern Utah and the river flows through Utah and Arizona before entering Nevada near Mesquite. The river flow is intermittent within Nevada, flowing southwesterly for about 25 miles through the unincorporated towns of Bunkerville and Riverside before emptying into the Overton Arm of Lake Mead. Located just south of Interstate 15, the Virgin River Area of Critical Environmental Concern (ACEC) includes the river, its floodplain, and adjacent riverbanks.

- **Lake Mead and the Colorado River** – The Colorado River flows through the Glen Canyon National Recreation Area (NRA) and Grand Canyon National Park before reaching Lake Mead, which was formed after the Hoover Dam was completed in 1935 at Black Canyon, between Nevada and Arizona. Lake Mead is a deep, warm, monomictic reservoir. The 1.5-million-acre Lake Mead NRA encompasses both Lake Mead and Lake Mohave (south of Las Vegas along the Arizona/Nevada border). The reservoir has four major basins: Temple, Gregg, Virgin, and Boulder. The Muddy and Virgin Rivers discharge into the Overton Arm of the Virgin Basin.

- **Las Vegas Wash** – As the terminal outlet of the Las Vegas drainage basin, Las Vegas Wash flows from west to east and empties into Las Vegas Bay in Lake Mead on the Colorado River. A 7-mile reach of Las Vegas Wash flows through the Clark County Wetlands Park, an 8-square-mile desert wetlands park that provides recreation and wildlife habitat. The Wash is the receiving water for discharges from the COH, CLV, and the CCWRD WWTFs.

- **Meadow Valley Wash** – The long, narrow Meadow Valley Wash is formed by the confluence of Patterson Wash and Spring Valley Creek. Another tributary, Clover Creek, joins Meadow Valley Wash near Caliente, Nevada. Within Clark County, the wash parallels the Union Pacific Railroad south to the Moapa/Glendale area, where it empties into the Muddy River.

- **Muddy River** – Formally known as the Moapa River (a Paiute word meaning "muddy"), the Muddy River begins as a series of thermal springs in the Moapa Valley southeast of Arrow Canyon, then flows through the unincorporated towns of Logandale and Overton before discharging to the Overton Arm of Lake Mead. Before construction of the Hoover Dam in 1935, the Muddy River flowed 30 miles to the Virgin River, a Colorado River tributary. A portion of the Muddy River upstream of Moapa is within the boundaries of the Moapa Indian Reservation.

4.3 BENEFICIAL USES AND WATER QUALITY CRITERIA

The Nevada Administrative Code (NAC) Sections 445A.119 – 445A.225 contain the water quality standards for the state, including designation of beneficial uses of the waters and water quality criteria necessary to protect those beneficial uses. Water quality standards are defined for a water body, or a portion of a water body, and used to assess the health of the waters of the state, to set limits in surface water discharge permits, and to set goals for nonpoint source pollution control. In many cases, two or more reaches of a river system are defined, possibly with different beneficial uses and water quality standards.

4.3.1 Beneficial Uses

Existing uses of a specific water body are termed "beneficial uses," see **Table 4-1**. Other uses can be designated, whether or not they have been attained on a water body, to implement federal or state mandates and goals. Once beneficial uses are designated, water quality objectives are established to protect these beneficial uses. In general, the quality of any waters receiving waste discharges must be such that no impairment of the beneficial usage of water occurs as a result of the discharge. For some water bodies, beneficial uses and water quality standards are described by reach at a control point. A control point is a location where water quality criteria are specified. The criteria specified apply to all surface waters upstream in the watershed from the control point, or to the next upstream control point. The beneficial uses of major surface waters in Clark County are summarized in **Table 4-2**. Surface waters may have one or more designations. The most stringent requirement governs the in-stream water quality.

Table 4-1

Beneficial Uses of Nevada Surface Waters

Use Code	Beneficial Use	Standards to Protect Existing and Designated Beneficial Uses
AESTHETIC	Waters of Extraordinary Ecological or Aesthetic Value	The unique ecological or aesthetic value of the water must be maintained.
IRR	Irrigation	The water must be suitable for irrigation without treatment.
STOCK	Watering of Livestock	The water must be suitable for the watering of livestock without treatment.
ENHANCE	Enhancement of Water Quality	The water must support natural enhancement or improvement of water quality in any water which is downstream.
AQUATIC	Propagation of Aquatic Life	The water must be suitable as a habitat for fish and other aquatic life existing in a body of water. This does not preclude the reestablishment of other fish or aquatic life.
MARSH	Freshwater Marsh	The water must support the maintenance of freshwater marshes.
WILD	Propagation of Wildlife	The water must be suitable for the propagation of wildlife and waterfowl without treatment.
IND	Industrial Supply	The water must be treatable to provide a quality of water which is suitable for the intended use.
MUN	Municipal or Domestic Supply	The water must be capable of being treated by conventional methods of water treatment to comply with Nevada's drinking water standards.
REC-1	Recreation Involving Contact with the Water	There must be no evidence of manmade pollution, floating debris, sludge accumulation, or similar pollutants.
REC-2	Recreation Not Involving Contact with the Water	The water must be free from: (1) visible floating, suspended, or settled solids arising from man's activities; (2) sludge banks; (3) slime infestation; (4) heavy growth of attached plants, blooms, or high concentrations of plankton, discoloration or excessive acidity or alkalinity that leads to corrosion of boats and docks; (5) surfactants that foam when the water is agitated or aerated; and (6) excessive water temperatures.

Source: NAC 445A.122

Table 4-2

Beneficial Uses of Major Surface Waters in Clark County

Beneficial Use	Virgin River (NAC 445A.174)	Colorado River (NAC 445A.170)	Lake Mead (NAC 445A.194)	Lake Mead LV Bay to LV Wash Confluence (NAC 445A.196)	Las Vegas Wash (NAC 445A.198/ 200)	Meadow Valley Wash (NAC 445A.174)	Muddy River Source to Glendale (NAC 445A.209)	Muddy River Glendale to Lake Mead (NAC 445A.174)
AESTHETIC								
IRR	X	X	X	X	X	X	X	X
STOCK	X	X	X	X	X	X	X	X
ENHANCE								
AQUATIC	X	X	X	X	X	X	X	X
MARSH					X			
WILD	X	X	X	X	X	X	X	X
IND	X	X	X	X		X	X	X
MUN		X	X				X	
REC-1		X	X					
REC-2	X	X	X	X	X	X	X	X

4.3.2 Narrative Water Quality Criteria

Nevada's water quality standards include narrative standards applicable to all surface waters of the state and site-specific numeric criteria for major "designated" water bodies. NAC Chapter 445 describes water quality standards that apply to all natural streams and lakes and reservoirs or impoundments on natural streams and other specified waterways, unless excepted on the basis of existing irreparable conditions that preclude such use. The following standards are applicable to all surface waters within Nevada (NAC Section 445A.121):

1. **Settleable Solids**. Waters must be free from substances attributable to domestic or industrial waste or other controllable sources that will settle to form sludge or bottom deposits in amounts sufficient to be unsightly, putrescent or odorous, or in amounts sufficient to interfere with any beneficial use of the water.

2. **Floating Materials**. Waters must be free from floating debris, oil, grease, scum, and other floating materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to be unsightly or in amounts sufficient to interfere with any beneficial use of the water.

3. **Taste, Odor, and Color**. Waters must be free from materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to produce taste and odor in the water or detectable off-flavor in the flesh of fish or in amounts sufficient to change the existing color, turbidity, or other conditions in the receiving stream to such a degree as to create public nuisance or in amounts sufficient to interfere with any beneficial use of the water.

4. **Temperature and Toxins**. Waters must be free from high temperature, biocides, organisms pathogenic to human beings, toxic, corrosive, or other deleterious substances attributable to domestic or industrial waste or other controllable sources at levels or combinations sufficient to be toxic to human, animal, plant, or aquatic life or in amounts sufficient to interfere with any beneficial use of the water.

5. **Toxic Materials.** If toxic materials are known or suspected by the department to be present in a water, testing for toxicity may be required to determine compliance with the provisions of this section and effluent limitations. The department may specify the method of testing to be used. The failure to determine the presence of toxic materials by testing does not

preclude a determination by the department, on the basis of other criteria or methods, that excessive levels of toxic materials are present.

6. Radioactive Materials. Radioactive materials attributable to municipal, industrial, or other controllable sources must be the minimum concentrations that are physically and economically feasible to achieve. In no case must materials exceed the limits established in the 1962 Public Health Service Drinking Water Standards (or later amendments) or 1/30th of the maximum permissible concentrations (MPC) values given for continuous occupational exposure in the "National Bureau of Standards Handbook No. 69." The concentrations in water must not result in accumulation of radioactivity in plants or animals that result in a hazard to humans or harm to aquatic life.

7. Metals. Wastes from municipal, industrial, or other controllable sources containing arsenic, barium, boron, cadmium, chromium, cyanide, fluoride, lead, selenium, silver, copper, and zinc that are reasonably amenable to treatment or control must not be discharged untreated or uncontrolled into the waters of Nevada. In addition, the limits for concentrations of the chemical constituents must provide water quality consistent with the mandatory requirements of the 1962 Public Health Service Drinking Water Standards.

8. Natural Conditions of the Receiving Water. The specified standards are not considered violated when the natural conditions of the receiving water are outside the established limits, including periods of extreme high or low flow. Where effluents are discharged to such waters, the discharges are not considered a contributor to substandard conditions provided maximum treatment in compliance with permit requirements is maintained.

4.3.3 Water Quality Requirements to Maintain Existing Higher Quality

There are standards to protect beneficial uses as well as antidegradation requirements of designated waters – the requirements to maintain existing higher quality (RMHQs). RMHQs become effective when the existing water quality for individual parameters is higher than the water quality standard to protect beneficial uses. The RMHQs are then linked to permits and other programs to prevent degradation of existing superior water quality. **Table 4-3** summarizes the RMHQs for designated waters in Clark County, as presented in NAC 445A.

Table 4-3

Summary of Water Quality Requirements to Maintain Existing Higher Quality for Surface Waters in Clark County

Parameter	Virgin River at Mesquite (NAC 445A.175)	Virgin River at State Line (NAC 445A.176)	Virgin River at Riverside (NAC 445A.177)	Colorado River Below Davis Dam (NAC 445A.192)	Colorado River Below Hoover Dam (NAC 445A.193)	Lake Mead (NAC 445A.195)	Lake Mead LV Bay to LV Wash Confluence (NAC 445A.197)	Las Vegas Wash at Telephone Line Road (NAC 445A.199)	Las Vegas Wash at Lake Mead (NAC 445A.201)	Meadow Valley Wash (NAC 445A.212)	Muddy River at Glendale Bridge (NAC 445A.210)	Muddy River Glendale to Lake Mead (NAC 445A.211)
Temperature change	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C	ΔT = 0°C
pH	--	--	--	--	--	95% of samples not to exceed 8.8 S.U.	95% of samples not to exceed 8.9 S.U.	--	--	--	--	--
Total Phosphates (as P) (mg/L)	--	A-Avg ≤0.06 S.V. ≤0.1	--	A-Avg ≤0.02 S.V. ≤0.03	A-Avg ≤0.02 S.V. ≤0.033	--	--	--	--	--	--	--
Nitrogen Species (N) (mg/L)	Total Nitrogen A-Avg ≤0.9 S.V. ≤1.6	Total Nitrogen A-Avg ≤2.4 S.V. ≤3.2	Total Nitrogen A-Avg ≤2.9 S.V. ≤6.1	Nitrate A-Avg ≤1.1 S.V. ≤1.6	Total Nitrogen A-Avg ≤1.0 S.V. ≤1.5	TIN 95% of samples ≤4.5	TIN 95% of samples ≤5.3	TIN 95% of samples ≤20	TIN 95% of samples ≤17	Total Nitrogen A-Avg ≤2.0 S.V. ≤3.3	Total Nitrogen A-Avg ≤1.3 S.V. ≤1.4	Total Nitrogen A-Avg ≤1.3 S.V. ≤1.8
Turbidity (NTU)	--	--	--	--	--	<10 NTU over natural conditions		--	--	--	--	--
Color (PCU)	--	--	--	--	--	<10 PCU over natural conditions	--	--	--	--	--	--
Total Dissolved Solids (mg/L)	--	--	--	--	--	F.W.A.A. mg/L below Hoover Dam	See NAC 445A.143	95% of samples[1]	95% of samples	--	--	--
Fecal coliform (No./100ml)	A.G.M. ≤300 S.V. ≤550	A.G.M. ≤450 S.V. ≤1800	A.G.M. ≤625 S.V. ≤1250	A.G.M. ≤50 S.V. ≤100	A.G.M. ≤50 S.V. ≤100	--	--	--	--	--	--	A.G.M. ≤500 S.V. ≤1300

Notes:

Additional standards apply for Lake Mead for chlorophyll *a*. See: NAC 445A.195

A.G.M. = annual geometric mean
F.W.A.A. = flow-weighted annual average
NAC = Nevada Administrative Code
PCU = platinum-cobalt units
S.U. = standard pH units
S.V. = single value
TIN = total inorganic nitrogen

4.3.4 Water Quality Requirements to Maintain Beneficial Uses

The NAC contains numeric water quality criteria necessary to protect the beneficial uses designated for major surface waters. **Table 4-4** summarizes these criteria for designated waters in Clark County. The regulations also account for periods of drought or flood (extreme events). NAC 445A.121(8) states, "The specified standards are not considered violated when the natural conditions of the receiving water are outside the established limits, including periods of extreme high or low flow…." Low- and high-flow thresholds are generally defined using the 7Q10 statistic – the lowest or highest streamflow for 7 consecutive days that occurs on average once every 10 years.

4.4 PERMITS

Based on the established water quality objectives, the BWPC issues individual NPDES permits for discharge to surface waters, groundwater permits for discharges that may impact subsurface waters, Underground Injection Control (UIC) permits for injection through wells, and stormwater permits. Temporary or general permits are also developed, depending upon the type of discharge, the duration, and the waters that may be potentially impacted. Permitting for wastewater effluent reuse is discussed in Section 6 of this WQMP, while nonpoint source permitting and the Clark County municipal separate storm sewer system (MS4) permit are discussed in Section 8.

NDEP has developed a network of surface water quality monitoring stations to monitor conditions on each of the river systems. For the Colorado River System in Clark County, stations are located on the Colorado River, Las Vegas Wash, Virgin River, and Muddy River. A range of parameters is monitored, including physical conditions, metals, nutrients, minerals, and bacteria. Data collected from the monitoring stations are used to assess compliance with water quality standards, conduct trend analysis, validate water quality models, and set TMDLs (NDEP, 2005).

Table 4-4

Summary of Water Quality Criteria to Protect Beneficial Uses of Designated Surface Waters in Clark County

Parameter	Virgin River at Mesquite (NAC 445A.175)	Virgin River at State Line (NAC 445A.176)	Virgin River at Riverside (NAC 445A.177)	Colorado River Below Davis Dam (NAC 445A.192)	Colorado River Below Hoover Dam (NAC 445A.193)	Lake Mead (NAC 445A.195)	Lake Mead LV Bay to LV Wash Confluence (NAC 445A.197)	Las Vegas Wash at Telephone Line Road (NAC 445A.199)	Las Vegas Wash at Lake Mead (NAC 445A.201)	Meadow Valley Wash (NAC 445A.212)	Muddy River at Glendale Bridge (NAC 445A.210)	Muddy River at Overton (NAC 445A.211)
Temperature °C-Maximum	Nov-Jun ≤21°C Jul-Oct ≤32°C	Nov-Jun ≤21°C Jul-Oct ≤32°C	Nov-Jun ≤21°C Jul-Oct ≤32°C	Nov-Apr ≤13°C May-Jun ≤17°C Jul-Oct ≤23°C	Nov-Apr ≤13°C May-Jun ≤17°C Jul-Oct ≤23°C	--	--	--	--	Nov-Jun ≤21°C Jul-Oct ≤32°C	Nov-Jun ≤21°C Jul-Oct ≤32°C	Nov-Jun ≤21°C Jul-Oct ≤32°C
Temperature change	ΔT = ≤2°C	ΔT = ≤2°C	ΔT = ≤2°C	ΔT = ≤2°C	ΔT = ≤2°C	ΔT = ≤2°C	ΔT = ≤2°C	--	--	ΔT = ≤2°C	ΔT = ≤2°C	ΔT = ≤2°C
pH	S.V. ≤6.5–9.0 ΔpH ±0.5 max	S.V. ≤6.5–9.0 ΔpH ±0.5 max	S.V. ≤6.5–9.0 ΔpH ±0.5 max	S.V. ≤6.5–9.0 ΔpH ±0.5 max	S.V. ≤6.5–9.0 ΔpH ±0.5 max	Within range 6.5–9.0	Within range 6.5–9.0	Within range 6.5–9.0	Within range 6.5–9.0	S.V. ≤6.5–9.0 ΔpH ±0.5 max	S.V. ≤6.5–9.0 ΔpH ±0.5 max	S.V. ≤6.5–9.0 ΔpH ±0.5 max
Total Phosphates (as P) (mg/L)	A-Avg ≤0.1	A-Avg ≤0.1	A-Avg ≤0.1	A-Avg ≤0.05	A-Avg ≤0.05	--	--	--	--	A-Avg ≤0.1	A-Avg ≤0.1	A-Avg ≤0.3
Nitrogen Species (N) (mg/L)	Nitrate S.V. ≤90 Nitrite S.V. ≤5.0	Nitrate S.V. ≤90 Nitrite S.V. ≤5.0	Nitrate S.V. ≤90 Nitrite S.V. ≤5.0	Nitrate S.V. ≤10 Nitrite S.V. ≤0.06	Nitrate S.V. ≤10 Nitrite S.V. ≤0.06	Nitrate ≤10 Nitrite ≤1	Nitrate ≤90 Nitrite ≤5	Nitrate ≤100 Nitrite ≤10	Nitrate ≤100 Nitrite ≤10	Nitrate S.V. ≤90 Nitrite S.V. ≤5.0	Nitrate S.V. ≤10 Nitrite S.V. ≤1.0	Nitrate S.V. ≤90 Nitrite S.V. ≤5.0
Total Ammonia (as N) (mg/L)	See NAC 445A.118											
Dissolved Oxygen (mg/L)	S.V. ≥5.0	S.V. ≥5.0	S.V. ≥5.0	Nov-May S.V. ≥6.0 June-Oct S.V. ≥5.0	Nov-May S.V. ≥6.0 June-Oct S.V. ≥5.0	≥5.0	≥5.0	Aerobic conditions (goal)	Aerobic conditions (goal)	S.V. ≥5.0	S.V. ≥5.0	S.V. ≥5.0
Suspended Solids (mg/L)	--	--	--	S.V. ≤25	S.V. ≤25	--	--	≤135	≤135	--	--	--

Table 4-4 (Continued)

Summary of Water Quality Criteria to Protect Beneficial Uses of Designated Surface Waters in Clark County

Parameter	Virgin River at Mesquite (NAC 445A.175)	Virgin River at State Line (NAC 445A.176)	Virgin River at Riverside (NAC 445A.177)	Colorado River Below Davis Dam (NAC 445A.192)	Colorado River Below Hoover Dam (NAC 445A.193)	Lake Mead (NAC 445A.195)	Lake Mead LV Bay to LV Wash Confluence (NAC 445A.197)	Las Vegas Wash at Telephone Line Road (NAC 445A.199)	Las Vegas Wash at Lake Mead (NAC 445A.201)	Meadow Valley Wash (NAC 445A.212)	Muddy River at Glendale Bridge (NAC 445A.210)	Muddy River at Overton (NAC 445A.211)
Turbidity (NTU)	Not to exceed natural conditions by more than 10 NTU			S.V. ≤10	S.V. ≤10	≤25	≤25	--	--	Not to exceed natural conditions by more than 10 NTU		
Color (PCU)	Not to exceed natural conditions by more than 10 PCU						--	--	--	Not to exceed natural conditions by more than 10 PCU		
Total Dissolved Solids (mg/L)	See NAC 445A.143					S.V. ≤1000	S.V. ≤3000	S.V. ≤3000	S.V. ≤3000	See NAC 445A.143		
Alkalinity (as CaCO3) (mg/L)	<25% change from natural conditions					--	--	--	--	<25% change from natural conditions		
Fecal coliform (No./100ml)	A.G.M. ≤1000 S.V. ≤2000	A.G.M. ≤1000 S.V. ≤2000	A.G.M. ≤1000 S.V. ≤2000	G.M. ≤200 No more than 10% of samples >400	G.M. ≤200 No more than 10% of samples >400	G.M. ≤200 No more than 10% of samples >400	G.M. ≤200 No more than 10% of samples >400	G.M. ≤200 No more than 10% of samples >400	G.M. ≤200 No more than 10% of samples >400	A.G.M. ≤1000 S.V. ≤2000	A.G.M. ≤1000 S.V. ≤2000	A.G.M. ≤1000 S.V. ≤2000
E.coli (No./100 ml) A.G.M.	≤630	≤630	≤630	A.G.M. ≤126 S.V. ≤235	A.G.M. ≤126 S.V. ≤235	30-day log mean ≤126 S.V. ≤235	--	--	--	≤630	≤630	≤630

Notes:

Additional standards apply for Lake Mead for chlorophyll *a*. See: NAC 445A.195

A.G.M. = annual geometric mean
G.M. = geometric mean (30-day period)
F.W.A.A. = flow-weighted annual average
mg/L = milligrams per liter;
NAC = Nevada Administrative Code
PCU = platinum-cobalt units
S.U. = standard pH units
S.V. = single value
TIN = total inorganic nitrogen

4.5 WATER QUALITY LIMITED SEGMENTS AND TOTAL MAXIMUM DAILY LOADS

In compliance with Section 303(d) of the CWA, Nevada has developed a list of water bodies needing additional work beyond existing controls to achieve or maintain water quality standards (NDEP, 2005). The 2004 303(d) list is the most recent list approved by EPA. The 2006 list is in draft form and being reviewed (NDEP, 2008). As required by the CWA, NDEP considered "all existing and readily available water quality-related data and information" in identifying listed waters, including chemical and physical water column properties, sediment and fish tissue, biological information, toxicity testing results, and qualitative information. In general, a water body is included on the Nevada 303(d) list if any of its numeric beneficial use standards were exceeded more than 10 percent of the time during the listing period (October 1, 2000, through September 30, 2005, for the draft 2006 list). Once listed, the TMDL process provides a framework for watershed-based solutions for water bodies impaired by point sources, nonpoint sources, or both. NDEP (2005) defines a TMDL as:

> "a written, quantitative plan and analysis for attaining and maintaining water quality standards in all seasons for a specific waterbody and pollutant. Total maximum daily loads or TMDLs are an assessment of the maximum amount of pollutant a waterbody can receive without violating water quality standards. TMDLs take into account pollution from all sources, including discharges from sewage treatment facilities and industry; runoff from farms, forests and urban areas; and natural sources. TMDLs provide a way to integrate the management of both point and nonpoint sources of pollution through the establishment of wasteload allocations (WLA) for point source discharges and load allocations (LA) for nonpoint sources of pollution. The TMDL Program is designed to help bring waterbodies into compliance with the water quality standards as needed to support their designated uses such as irrigation, aquatic life, municipal or domestic supply, and water contact recreation."

The TMDL Program is being implemented according to the Bureau of Water Quality Planning's (BWQP) 5-year plan, also known as the Long-Range Plan (LRP) (NDEP, 2006). The current version of the LRP covers the period from July 2006 to June 2011 and outlines the monitoring, assessment, standards development, TMDLs, nonpoint source pollution management, and public education that will be conducted to meet BWQP goals.

Table 4-5 summarizes 303(d) list status for Clark County surface waters per the draft 2006 303(d) listing (NDEP, 2008).

Table 4-5

Nevada's Draft 2006 303(d)
Impaired Waters List – Clark County Surface Waters

Surface Water	Reach (length in miles)	Pollutants of Concern	Notes
Colorado River	Lake Mojave inlet to California Stateline (18.5)	temperature	Low priority for TMDL development
Colorado River	Hoover Dam to Lake Mojave inlet (31.27)	dissolved oxygen temperature	Low priority for TMDL development
Las Vegas Wash	Confluence of Las Vegas Wash with Lake Mead to Telephone Line Road (5.12)	iron molybdenum selenium	TMDLs for total phosphorus (TP) and total ammonia (NH_4) established in 1989, became fully effective in 1994, 1995, respectively (NDEP, 2003b), TP and NH_4 delisted on the 2006 303(d) List Low priority for TMDL development for iron, molybdenum, and selenium Delisted for total suspended solids (TSS) in 2002 based on observed improved water quality after construction of erosion control structures
Las Vegas Wash	Above treatment plants (11.1)	total dissolved solids (TDS) iron selenium	Low priority for TMDL development
Virgin River	Arizona stateline to Mesquite (4.5)	TP temperature iron boron	Low priority for TMDL development for all pollutants except boron Boron TMDL developed 2003 (NDEP, 2003a)

Table 4-5 (Continued)

Nevada's Draft 2006 303(d)
Impaired Waters List – Clark County Surface Waters

Surface Water	Reach (length in miles)	Pollutants of Concern	Notes
Virgin River	Mesquite to river mouth at Lake Mead (25.75)	iron manganese TP temperature boron	Low priority for TMDL development for all pollutants except boron Boron TMDL developed 2002
Muddy River	From river source to Glendale (13.63)	temperature TP iron dissolved oxygen	Low priority for TMDL development
Muddy River	Glendale to Wells Siding Diversion (5.6)	iron	Low priority for TMDL development
Muddy River	Wells Siding Diversion to river mouth at Lake Mead (10.8)	boron temperature molybdenum manganese iron	Low priority for TMDL development
Flamingo Wash	Above Las Vegas Wash (18.8)	TDS selenium	Low priority for TMDL development
Sloan Channel	Origin to Las Vegas Wash (7.8)	pH selenium	Low priority for TMDL development
Monson Channel	Origin to Las Vegas Wash (2.7)	selenium TDS	Low priority for TMDL development
Duck Creek	Origin to Las Vegas Wash (21.2)	selenium TDS	Low priority for TMDL development
Las Vegas Creek	Origin to Las Vegas Wash (7.4)	pH selenium	Low priority for TMDL development

Source: NDEP, 2008.

4.5.1 Existing Total Maximum Daily Loads

The NDEP established TMDLs for two of the impaired surface waters, the Las Vegas Wash and the Virgin River. Each of those TMDLs is described in the following paragraphs.

4.5.1.1 Las Vegas Wash / Lake Mead

In 1987, NDEP established RMHQs for chlorophyll *a* and beneficial use criteria for un-ionized ammonia for Las Vegas Bay. Data showed nonachievement of these standards and TMDLs became effective for Las Vegas Wash in 1994 (total phosphorus) and 1995 (total ammonia). WLAs for these pollutants are summarized in **Table 4-6**. To increase flexibility, WLA trading is allowed among CLV, CCWRD, and COH (the WLA applies to the combined loading from all outfalls).

Table 4-6

Las Vegas Wash Wasteload and Load Allocations

Discharger	Total Phosphorus, March 1 - October 31 (lbs/day)	Total Ammonia, April 1 - September 30 (lbs/day)
Clark County	176	511
City of Las Vegas	122	354
City of Henderson	36	105
Total WLA	**334**	**970**
LA (Nonpoint Source Load)	100	0
TMDL	**434**	**970**

4.5.1.2 Virgin River

Streamflow in the Virgin River is primarily from snowmelt in Utah, with lesser inputs from springs (Littlefield Springs, Petrified Springs, and springs in Beaver Dam Wash), groundwater, treated wastewater discharge by the City of St. George in Utah, and ephemeral tributaries in the lower basin. Boron, an essential element for plant growth, is found in the Virgin River in concentrations that occasionally exceed the level considered to protect sensitive crops during long-term irrigation (750 micrograms per liter [µg/L] total recoverable boron per the Gold Book [EPA, 1986]). According to available data, boron concentrations increase with decreases in streamflow. Boron loadings in the Nevada portion of the Virgin River are considered to come from natural sources (e.g., springs, tributary inflows, and groundwater inflows) and nonpoint sources (e.g., irrigation return flows). Because boron loading in Nevada is minimal, the boron standard cannot be met in Nevada's portion of the Virgin River without load reductions in Utah and Arizona. To better characterize the

problem, additional analysis of boron sources (natural and anthropogenic) in Utah and Arizona was recommended (NDEP, 2003a).

4.6 RECOMMENDATIONS

The recommendations for water quality standards/planning were compiled from existing 208 WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to water quality standards/planning for the *Clark County Area-Wide WQMP*:

- Area-wide planning should continue through the WQMP process, with the Clark County Department of Air Quality and Environmental Management responsible for coordination of air and water quality conformance.

- Clark County should designate staff members for membership and continued participation with the Virgin River Tamarisk Work Group, Muddy River Regional Environmental Impact Alleviation Committee, the Lake Mead Water Quality Forum and Citizens Advisory Committee, and the Las Vegas Valley Watershed Advisory Committee. It is recommended that local agencies affected by water quality planning participate in and coordinate with these same groups. Specifically, it is recommended that the City of Mesquite join the Lake Mead Water Quality Forum by entering into its Memorandum of Agreement.

- Water quality coordination should continue among relevant agencies as described in Section 12, Environmental/Integrated Planning Coordination.

- Air Quality State Implementation Plans should continue to be coordinated with the overall WQMP process. Coordination of population projections for air and water quality planning is crucial in assuring consistency with local, state and federal regulators.

- Clark County wastewater agencies should continue to coordinate among themselves and with the Nevada Bureau of Water Quality Planning on implementation of WLAs for TMDLs to satisfy the requirements of the Long-Range Plan.

- DAQEM, Mesquite, the unincorporated communities of northeast Clark County, and the CCWRD should consider forming a regional wastewater agency for northeast Clark County.

- The WQMP should be updated and amended every five years. Amendments on a five-year basis will help to ensure that discharge permit revisions and applications are consistent with the WQMP, and that changing environmental conditions such as air and water quality can be integrated in a timely manner. The five-year update should include a status report on the recommendations contained in the previous WQMP.

4.7 REFERENCES

Environmental Protection Agency, *Quality Criteria for Water 1986 (The Gold Book)*, EPA 440/5-86-001, Prepared by the Office of Water Regulations and Standards. Washington D.C., 1986

Nevada Administrative Code, *Section 445*, as currently amended.

Nevada Division of Environmental Protection (*NDEP, Lower Virgin River- Boron Total Maximum Daily Loads*, Submitted to EPA Region IX, October 15, 2002, Approved by EPA Region IX, January 14, 2003, Prepared by the Bureau of Water Quality Planning), 2003a.

----- *Evaluation of Total Maximum Daily Loads and Associated Water Quality Standards Attainment for the Las Vegas Wash, Las Vegas Bay and Lake Mead*, Prepared by the Bureau of Water Quality Planning, 2003b.

----- *EPA Approved Final Nevada's 2004 303(d) Impaired Waters List*, Prepared by the Bureau of Water Quality Planning, November 2005.

----- *Bureau of Water Quality Planning's 5-Year Plan*: July 2006 – June 2011, June 2006.

----- *Draft Nevada's 2006 303(d) Impaired Waters List*, Prepared by the Bureau of Water Quality Planning, January 2008.

Section 5

Section 5
Wastewater Collection, Treatment, and Disposal

5.1 INTRODUCTION

This section discusses the current wastewater collection, treatment, and disposal systems used by the wastewater purveyors in Clark County, as well as the projected conditions anticipated by the purveyors. It begins with a summary of regulations, lists the current and proposed WWTFs by planning area, and is followed by a discussion of the individual treatment facilities for the unincorporated county areas and incorporated cities.

5.2 REGULATIONS

Regulations for wastewater treatment works are defined in NAC Sections 445A.283 through 445A.292. In addition, the regulations for individual sewage disposal system (commonly termed or termed herein as septic system) construction, sewage disposal, and densities within Nevada are located in NAC Sections 278.420 through 278.530 and NAC Sections 444.750 through 444.839. NDEP requires that planning for a wastewater treatment facility capacity expansion is initiated when wastewater influent flows reach 85 percent of plant capacity.

Package plants and interim package plants are wastewater treatment management options in certain areas of Clark County. A package plant for sewage treatment is defined in NRS Section 445A.380 and is copied verbatim below:

> "1. "Package plant for sewage treatment" means any plant which:
> (a) Consists of units or modules designed for construction, assembly, connection and installation at the site for treatment of sewage; and
> (b) Is privately owned and will be operated to treat wastewater and sewage for a limited area.
> 2. The term does not include:
> (a) A plant for the treatment of domestic sewage whose capacity is less than 5,000 gallons per day;
> (b) Septic systems composed of single or multiple septic tanks and leach fields; or
> (c) Systems operated for the pretreatment of industrial wastewater before disposal to a publicly owned treatment plant."

An interim package plant is defined in Clark County Code Section 24.28.010(h) and is copied verbatim below:

> "(h) "Interim package plant" means a facility or structure for wastewater treatment, that:
> (1) Consists of units or modules designed for construction, assembly, connection and installation at the site for treatment of sewage;
> (2) Is privately constructed and then dedicated to the district before commencement of operation;
> (3) Will be operated to treat wastewater and sewage for a limited area where a public wastewater facility is planned to become operational on an undetermined date or within 5 years from the date the applicant submits an application for an interim package plant; and
> (4) Requires a discharge permit, obtained by the district pursuant to NRS Chapter 445A."

5.3 WASTEWATER TREATMENT FACILITIES

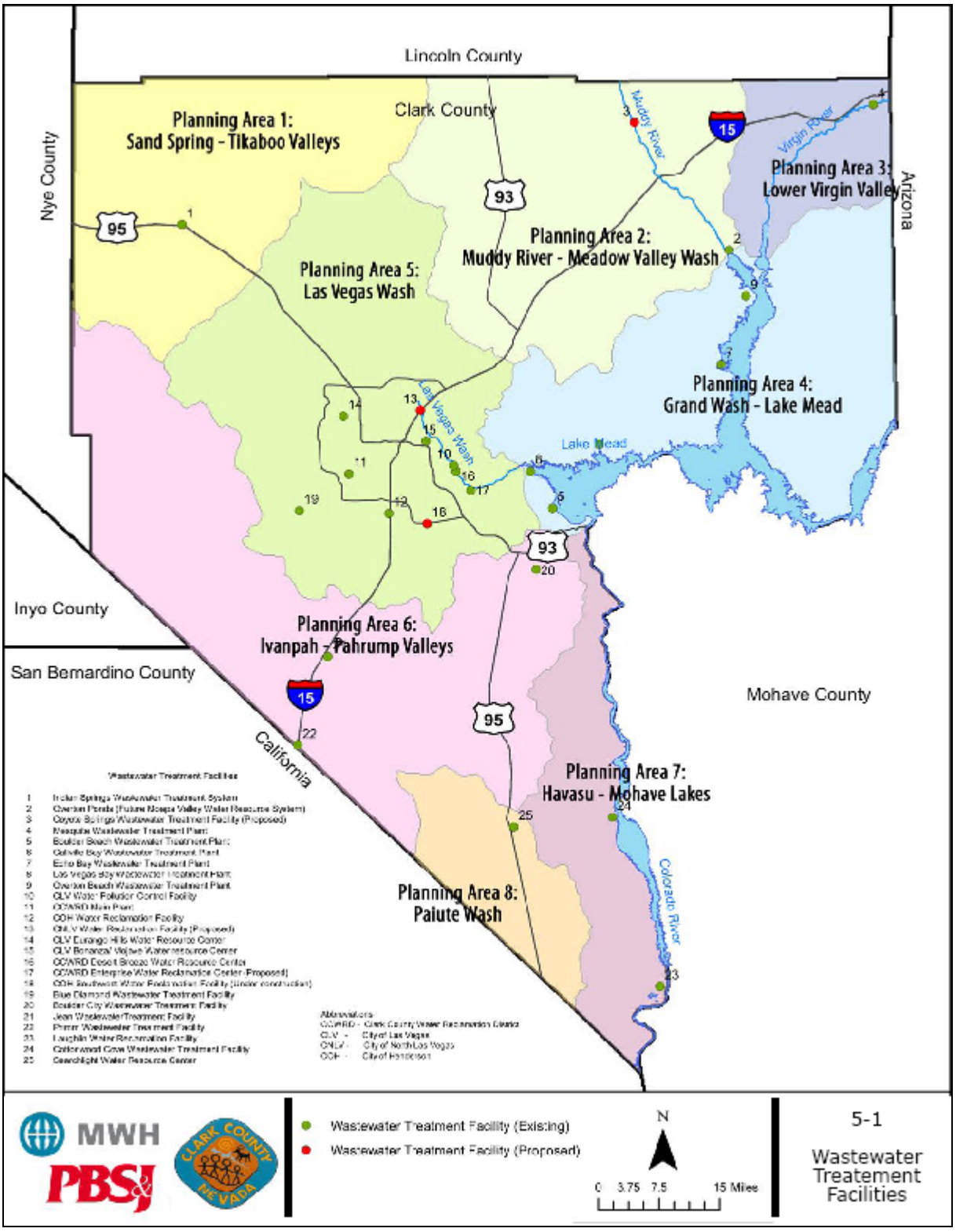
Table 5-1 includes a list of the existing and proposed WWTFs in Clark County. The table includes the planning area number, facility number as referenced on **Figure 5-1**, the managing entity, and the name of the treatment facility.

Current and proposed wastewater collection, treatment, and disposal systems are discussed for each planning area. The individual treatment facilities contain the following subsections:

- Existing or Proposed Collection System
- Existing or Proposed Treatment Facilities
- Septic Systems
- Future Collection Systems
- Future Treatment Facilities
- Solids Handling and Effluent Disposal

Table 5-1
Wastewater Treatment Facilities in Clark County

Planning Area	Facility No.	Managing Entity	Treatment Facility
1	1	CCWRD	Indian Springs Wastewater Treatment System
2	2	CCWRD	Overton Ponds (Future Moapa Valley Water Resource Center [WRC])
	3	CCWRD	Coyote Springs WWTF (Proposed)
3	4	City of Mesquite	Mesquite WWTP
4	5	NPS	Boulder Beach WWTP
	6	NPS	Callville Bay WWTP
	7	NPS	Echo Bay WWTP
	8	NPS	Las Vegas Bay WWTP
	9	NPS	Overton Beach WWTP
5	10	CLV	CLV Water Pollution Control Facility
	11	CCWRD	CCWRD Main Plant (Includes the Central Plant and Advanced WWTP)
	12	COH	COH Water Reclamation Facility
	13	CNLV	CNLV Water Reclamation Facility (Proposed)
	14	CLV	Durango Hills WRC
	15	CLV	Bonanza/Mojave WRC
	16	CCWRD	Desert Breeze WRC
	17	CCWRD	Enterprise WRC (Proposed)
	18	COH	COH Southwest Water Reclamation Facility (Under Construction)
	19	CCWRD	Blue Diamond WWTF
6	20	Boulder City	Boulder City WWTF
	21	Privately Owned	Jean WWTF
	22	Privately Owned	Primm WWTP
7	23	CCWRD	Laughlin Water Reclamation Facility
	24	NPS	Cottonwood Cove WWTF
8	25	CCWRD	Searchlight WRC


Lincoln County
Nye County
Clark County
Arizona
Inyo County
San Bernardino County
Mohave County
California
Planning Area 1:
Sand Spring - Tikaboo Valleys
Planning Area 2:
Muddy River - Meadow Valley Wash
Planning Area 3:
Lower Virgin Valley
Planning Area 4:
Grand Wash - Lake Mead
Planning Area 5:
Las Vegas Wash
Planning Area 6:
Ivanpah - Pahrump Valleys
Planning Area 7:
Havasu - Mohave Lakes
Planning Area 8:
Paiute Wash
Muddy River
Virgin River
Las Vegas Wash
Lake Mead
Colorado River
95
93
15
Wastewater Treatment Facilities
1 Indian Springs Wastewater Treatment System
2 Overton Ponds (Future Moapa Valley Water Resource System)
3 Coyote Springs Wastewater Treatment Facility (Proposed)
4 Mesquite Wastewater Treatment Plant
5 Boulder Beach Wastewater Treatment Plant
6 Callville Bay Wastewater Treatment Plant
7 Echo Bay Wastewater Treatment Plant
8 Las Vegas Valley Wastewater Treatment Plant
9 Overton Beach Wastewater Treatment Plant
10 CLV Water Pollution Control Facility
11 CCWRD Main Plant
12 COH Water Reclamation Facility
13 CLV Water Reclamation Facility (Proposed)
14 CLV Durango Hills Water Resource Center
15 CLV Bonanza/ Alpine Water resource Center
16 CCWRD Desert Breeze Water Resource Center
17 CCWRD Enterprise Water Reclamation Center (Proposed)
18 COH Southwest Water Reclamation Facility (Under construction)
19 Blue Diamond Wastewater Treatment Facility
20 Boulder City Wastewater Treatment Facility
21 Jean Wastewater Treatment Facility
22 Primm Wastewater Treatment Facility
23 Laughlin Water Reclamation Facility
24 Colorado Cove Wastewater Treatment Facility
25 Searchlight Water Resource Center
Abbreviations
CCWRD - Clark County Water Reclamation District
CLV - City of Las Vegas
CNLV - City of North Las Vegas
COH - City of Henderson
MWH
PBS&J
Wastewater Treatment Facility (Existing)
Wastewater Treatment Facility (Proposed)
N
0 3.75 7.5 15 Miles
5-1
Wastewater Treatement Facilities

5.3.1 Planning Area 1 – Sand Spring - Tikaboo Valleys

Wastewater treatment in Planning Area 1 includes the WWTF in Indian Springs and individual sewage disposal systems (septic systems) throughout the planning area.

5.3.1.1 Indian Springs

Indian Springs is located 45 miles north of Las Vegas along U.S. Route 95. The Indian Springs Wastewater Treatment System is owned and operated by the CCWRD.

5.3.1.1.1 Existing Collection System

According to the *CCWRD Facilities Master Plan (2004)*, the collection system for Indian Springs is composed of approximately 6 miles of pipe, 76 manholes, and one lift station.

5.3.1.1.2 Existing Treatment Facilities

The Indian Springs Wastewater Treatment System consists of four single-stage stabilization ponds: a primary pond, a secondary pond, and two overflow ponds; the average daily design capacity of the facility is 0.114 mgd. The primary pond, Pond No. 1, and the secondary pond, Pond No. 2, are both approximately 3.9 acres in size and have an average operating depth of 4 feet. The ponds were originally constructed with a soil cement liner to prevent percolation. Pond No. 3 and Pond No. 4 are used as overflow basins and are roughly 1 acre and 3 acres in area, respectively. The Indian Springs Wastewater Treatment System site plan is shown in **Figure 5-2**. According to the *2006 Year End Summary for the Clark County Sewage and Wastewater Advisory Committee* (*SWAC 2006 Year End Summary*), in 2006 the average wastewater flows for the Indian Springs Wastewater Treatment System were 0.120 mgd.

5.3.1.1.3 Indian Springs Septic Systems

Geographic information system (GIS) files containing septic system permits within Clark County (with a modification date of July 14, 2007) have been downloaded from the Clark County GISMO website, as discussed in Section 8. The GIS file contains 26 permitted septic systems located in or near Indian Springs; however, in the CCWRD handout provided at the CCWRD Coordination Meeting held on December 6, 2007, there are 36 permitted septic systems in Indian Springs. Using the assumptions that each septic system is connected, at minimum, to one single-family dwelling and using 2.5 persons per single-family dwelling, the number of people using septic systems is 90 (the product of 2.5 persons per dwelling and 36 permitted septic systems). This number of people will be subtracted from the population projections, since they are not connected to the sewer system.

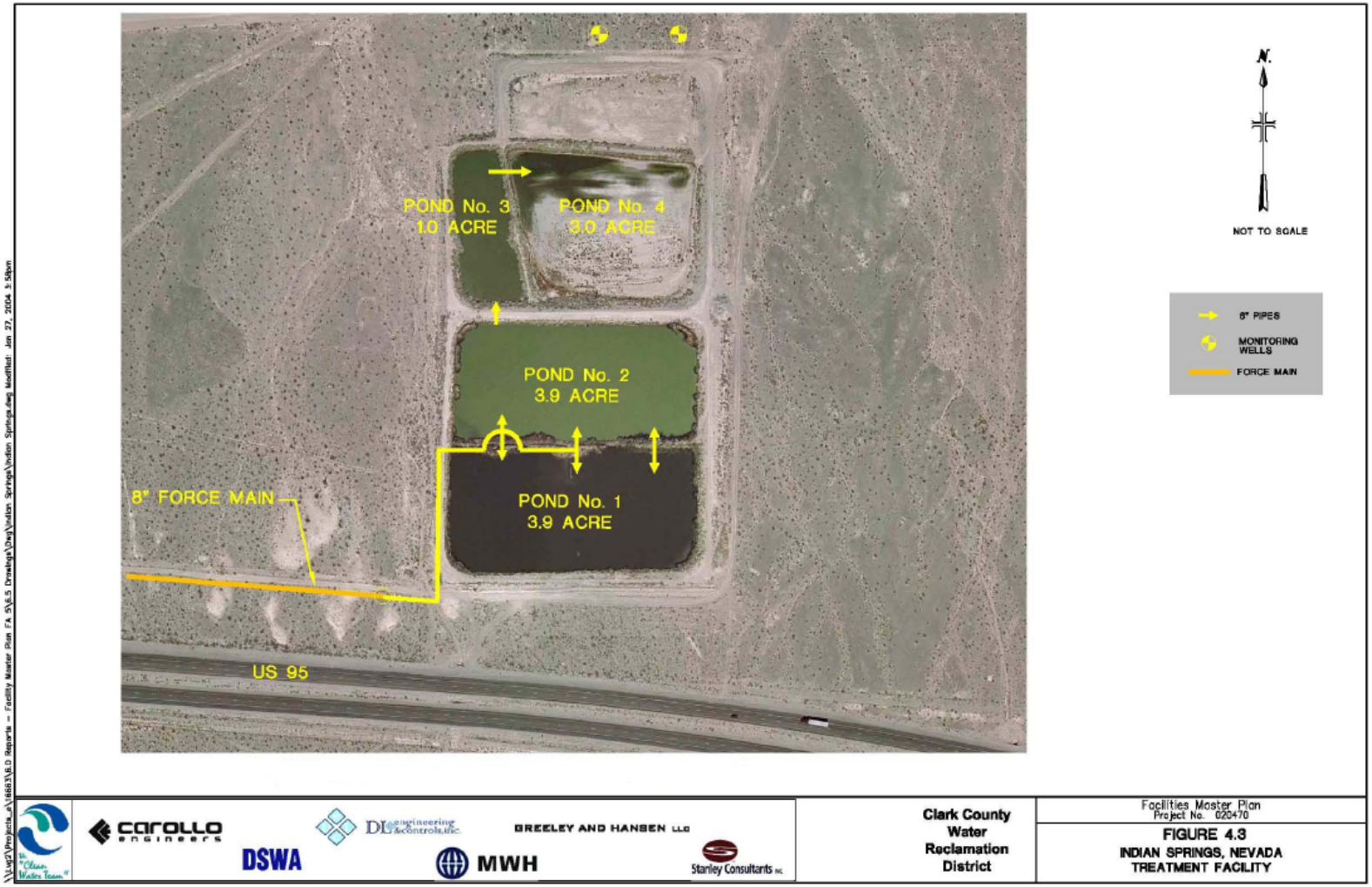


Figure 5-2
Indian Springs Wastewater Treatment System Site Plan

In addition, according to the *CCWRD Facilities Master Plan (2004)*, for a conservative estimate of future wastewater flows for Indian Springs, units using septic systems were assumed to connect to the wastewater collection network at a rate of one unit per year. The *CCWRD Facilities Master Plan (2004)* also assumed that new residents of Indian Springs would connect into the future sewer collection system. The number of people connected to the sewer system will include the number of people whose septic systems are converted to the wastewater system each year (one septic system conversion per year equals 2.5 people per year).

5.3.1.1.4 Future Collection System

The Indian Springs wastewater collection system may need to expand during the 20-year planning horizon to meet the service needs of the current and future residents.

5.3.1.1.5 Future Treatment Facilities

The current design capacity of the Indian Springs Wastewater Treatment System is 0.114 mgd. The *Indian Springs Wastewater Treatment System Upgrades – Drawings 2006* shows expansion of the facility to 0.7-mgd design capacity for annual dry weather flow. The proposed layout of the Indian Springs Wastewater Treatment System expansion, as included in the *Indian Springs Wastewater Treatment System Upgrades – Drawings 2006*, is shown in **Figure 5-3**.

Population projections were developed in Section 3; however, to determine the wastewater flows to WWTFs, projected population connected to the sewer system (total population minus permitted sewer systems) has been calculated in this section. It is recommended that these population projections for Indian Springs be revisited in future updates of the WQMP.

Table 5-2 and **Figure-5-4** show the Indian Springs population connected to the sewer system, wastewater flow projections, and the treatment facility phased capacity expansions.

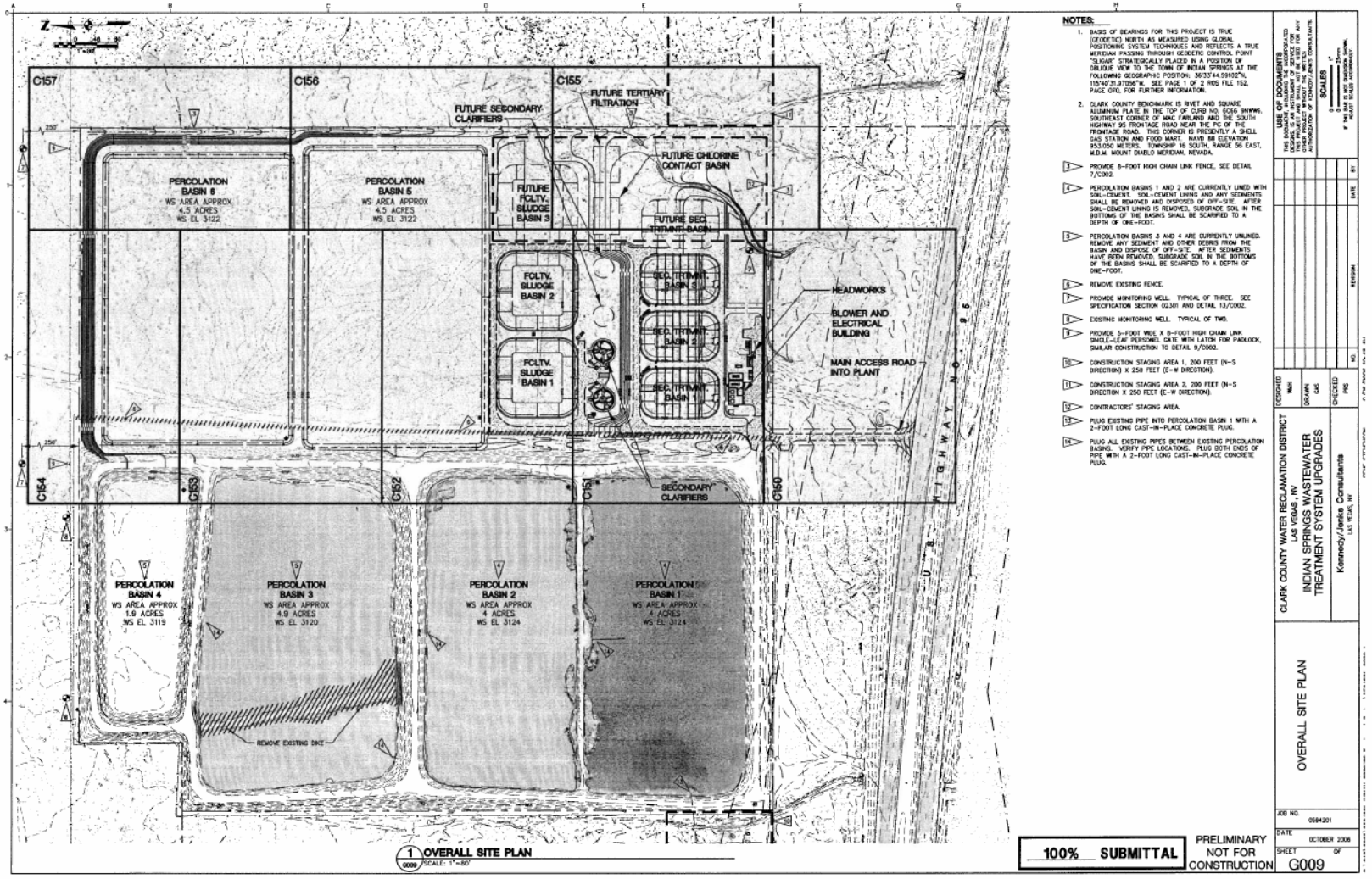


Figure 5-3
Indian Springs Wastewater Treatment System Upgrade Site Plan

Table 5-2

**Indian Springs Population Projections,
Wastewater Flows, and Treatment Facility Capacity**

Year	Population Projections	Projected Population Connected to Sewer System	Wastewater Flow (mgd)	Facility Capacity (mgd)
2006	1,946	1,856	0.12 [a]	0.114
2010	4,262	4,182	0.42	0.70
2015	4,653	4,586	0.46	0.70
2020	4,870	4,815	0.48	0.70
2025	5,350	5,308	0.53	0.70
2030	5,841	5,811	0.58	0.70

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

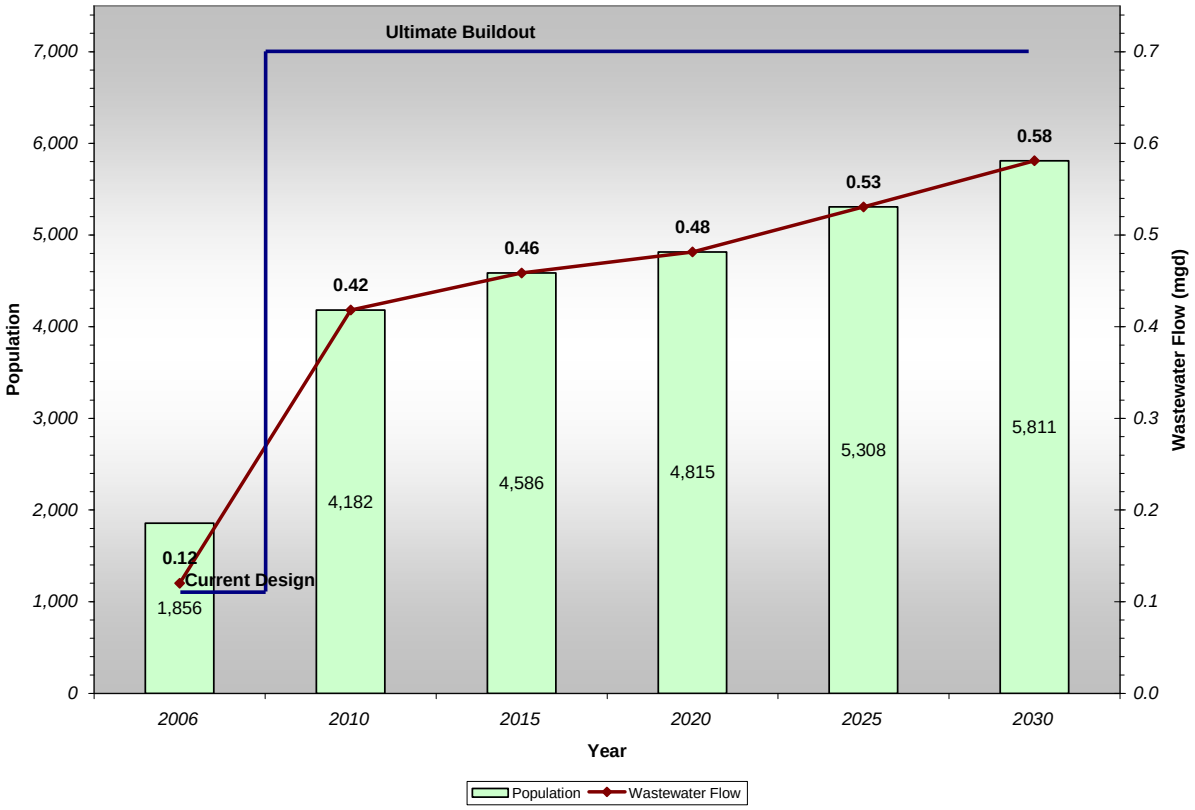


Figure 5-4
**Indian Springs Population Projections,
Wastewater Flows, and Treatment Facility Capacity**

5.3.1.1.6 Solids Handling and Effluent Disposal

According to the *CCWRD Facilities Master Plan (2004)*, an insignificant amount of solids accumulates in the ponds; thus, solids removal is unnecessary. The actual sludge level is not recorded or monitored. A septic system maintenance company occasionally pumps floating solids from the primary pond of the treatment facility and removes the floating solids that accumulate in the lift station wet well. In the future, if solids accumulation becomes an issue, a bio-culture can be introduced into the ponds to degrade the solids to acceptable levels.

The Indian Springs Wastewater Treatment System is authorized by NDEP Permit No. NEV50040 to discharge to the groundwater of Nevada.

5.3.1.1.7 Water Quality Monitoring

Groundwater monitoring is conducted quarterly for total dissolved solids (TDS), chloride, nitrate as N, total nitrogen as N, and depth to groundwater.

5.3.1.2 Planning Area 1 Septic Systems

As provided in the septic system GIS file, there are 145 septic systems in Planning Area 1. As discussed previously, there are 36 septic systems within the township of Indian Springs; thus, there are 109 septic systems in the remaining unincorporated areas of Planning Area 1. The *CCWRD Facilities Master Plan (2004)* contains no plans to convert the 109 septic systems south of Indian Springs to the sewer collection systems.

5.3.1.3 Pretreatment Program

There is no industrial pretreatment program in Planning Area 1.

5.3.1.4 Planning Area 1 Summary

Table 5-3 summarizes information for wastewater flows and the WWTF in Planning Area 1. For the unincorporated County areas that CCWRD does not serve, CCWRD's plan for the future is for developers to build the system and then the CCWRD will take over ownership and operation of the system.

Table 5-3

Planning Area 1 Summary Table

Year	Indian Springs Wastewater Treatment System	
	Capacity (mgd)	Wastewater Flows (mgd)
2006	0.114	0.12 [a]
2010	0.70	0.42
2015	0.70	0.46
2020	0.70	0.48
2025	0.70	0.53
2030	0.70	0.58

Note: [a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

5.3.2 Planning Area 2 – Muddy River and Meadow Valley Wash

Planning Area 2 includes the WWTF in Moapa Valley Township, the planned WWTF in Coyote Springs, wastewater treatment options for Moapa Township, Moapa Indian Reservation, Apex, and septic systems throughout the planning area.

5.3.2.1 Moapa Valley Township

Located approximately 60 miles northeast of Las Vegas, the Moapa Valley Township is situated in the northeast portion of unincorporated Clark County. Lying in the Lower Moapa Valley along the Muddy River between Interstate 15 and the Lake Mead NRA, the township contains the unincorporated towns of Logandale and Overton. A portion of the Moapa Valley Township is connected to a sewer system, the collection and treatment facilities of which are owned and operated by CCWRD. The remaining areas of the Moapa Valley Township rely on septic systems for wastewater treatment and disposal.

5.3.2.1.1 Existing Collection System

According to the *CCWRD Facilities Master Plan (2004)*, Overton has approximately 17.5 miles of pipeline and three lift stations--Parke Route, Lost City Museum, and Lewis Lane.

5.3.2.1.2 Existing Treatment Facilities

The existing Overton Ponds consist of a 0.350-mgd capacity evaporative pond system, composed of three primary ponds and six secondary ponds. Four floating mechanical aerators are provided in each primary pond to introduce dissolved oxygen throughout the pond and to aid in treatment and reduce offensive odors. The ponds are hydraulically interconnected by ductile iron piping, and all but two ponds are lined with asphalt. The intended use of the unlined ponds is primarily for effluent disposal into the ground via rapid infiltration basins (RIBs). The layout of the existing Overton Ponds is shown in **Figure 5-5**. According to the *SWAC 2006 Year End Summary*, in 2006, the average wastewater flows for the Overton Ponds were 0.22 mgd.

5.3.2.1.3 Moapa Valley Township Septic Systems

As provided in the septic system GIS file, there are 1,421 septic systems located in or near Overton and Logandale; however, the CCWRD handout provided at the CCWRD Coordination Meeting held on December 6, 2007, documented 531 permitted septic systems in Overton and 1,145 permitted septic systems in Logandale. Using the number of septic systems provided by CCWRD and the assumptions that each septic system is connected, at minimum, to one single-family dwelling and using 2.5 persons per single-family dwelling, the number of people using septic systems in the Townships of Overton and Logandale is 4,190 (the product of 2.5 persons per dwelling and a total of 1,676 septic systems). This number of people is subtracted from the population projections, since these people are not connected to the sewer system. All future major developments in Moapa Valley will connect to the sewer system.

5.3.2.1.4 Future Collection System

The Moapa Valley Township wastewater collection system will continue to expand during the 20-year planning horizon to meet the service needs of the current and future residents.

5.3.2.1.5 Future Treatment Facilities

The *Lower Moapa Valley Supplement to Logandale Wastewater Facilities Preliminary Feasibility Study* was developed to determine the wastewater flow rates for the entire Lower Moapa Valley; information from this study was described in the *CCWRD Facilities Master Plan (2004)*.

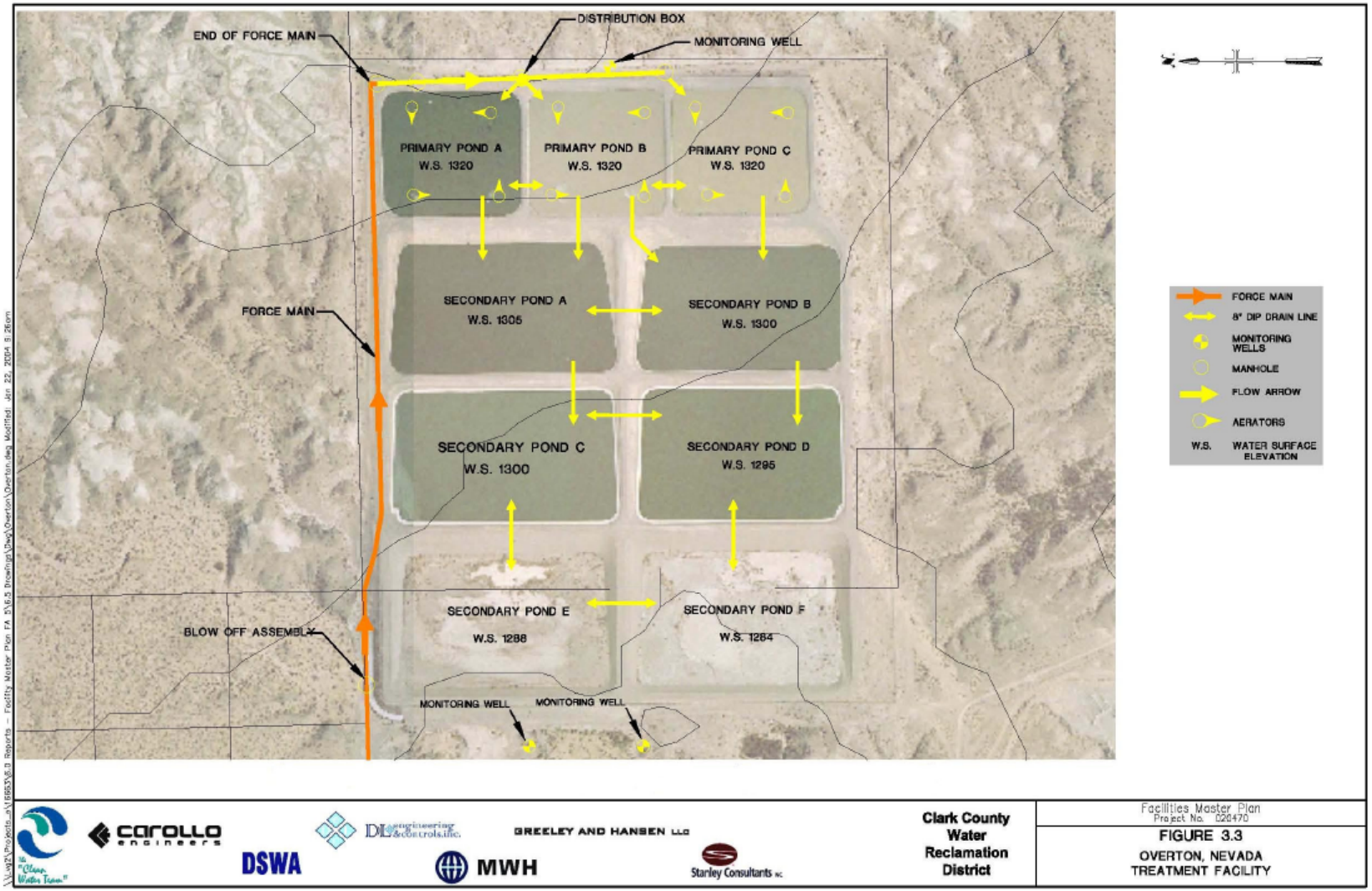


Figure 5-5
Overton Ponds Site Plan

The CCWRD is upgrading the Overton Ponds, to be known as the Moapa Valley Water Resource Center WRC, to a design capacity of 0.75-mgd annual dry weather flow, with future planned expansions to 1.5-mgd and 3.0-mgd annual average dry weather flow in approximately 2017 and 2025, respectively. The expansion in 2025 may not have to be to a 3.0-mgd design capacity if wastewater flows are not projected to increase to that rate; this should be revisited in future updates to the *Clark County Area-Wide WQMP*. The layout of the Moapa Valley WRC, as included in the *Moapa Valley Water Resource Center Modifications – Rebid 2007, Volume 4,* is shown in **Figure 5-6**.

Population projections were developed in Section 3; however, to determine the wastewater flow to WWTFs, population projections connected to the sewer system were calculated (i.e., total population minus permitted septic systems in 2007). It is recommended that if plans to convert septic systems to connection to the sewer system are developed, the wastewater flow projections in the Moapa Valley Township should be revisited in future updates to the *Clark County Area-Wide WQMP*.

Table 5-4 and **Figure 5-7** show the Moapa Valley Township population projections, wastewater flow projections, and potential WRC phased capacity expansions. **Figure 5-7** shows a design capacity expansion to 2.0 mgd in 2025, not a 3.0-mgd capacity expansion. This should be revisited in future updates to the Clark *County Area-Wide WQMP*.

5.3.2.1.6 Solids Handling and Effluent Disposal

To remove or reduce the solids that accumulate, the CCWRD uses a bio-culture that degrades the solids by as much as 65 percent. Sludge depths are recorded for the ponds, and when a level that affects the performance of treatment is reached, the bio-culture is introduced.

Operation of the Overton Ponds is authorized by NDEP Permit No. NEV50025 for four lined and two unlined evaporation/percolation ponds.

Future phases of the Moapa Valley Water Resource Center WRC will incorporate advanced wastewater treatment facilities. Discharge from this WRC may be made to the Muddy River.

5.3.2.1.7 Water Quality Monitoring

Groundwater monitoring is conducted quarterly for TDS, chloride, nitrate as N, ammonia as N, groundwater elevation reported in mean sea level (msl), and depth to groundwater.

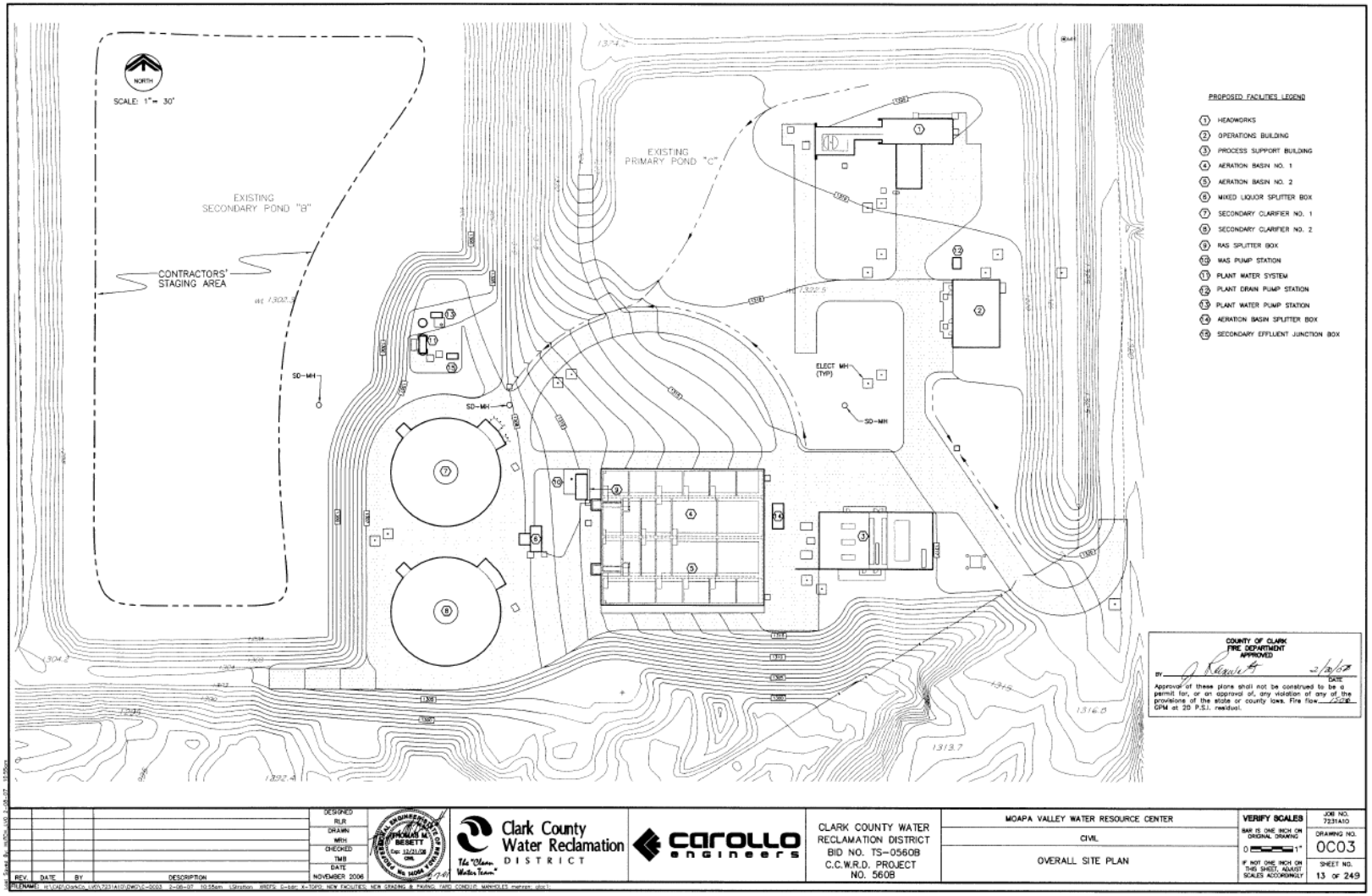


Figure 5-6 Moapa Valley WRC Modification Site Plan

Table 5-4

**Moapa Valley Population Projections,
Wastewater Flows, and Treatment Plant Capacity**

Year	Population Projections	Population Projections (connected to sewer system)	Wastewater Flow (mgd)	WRC Capacity (mgd)
2006	6,984	2,794	0.28	0.35
2010	9,541	5,351	0.54	0.75
2015	11,043	6,853	0.69	0.75
2020	14,749	10,559	1.1	1.5
2025	16,962	12,772	1.3	1.5
2030	18,408	14,218	1.4	2.0

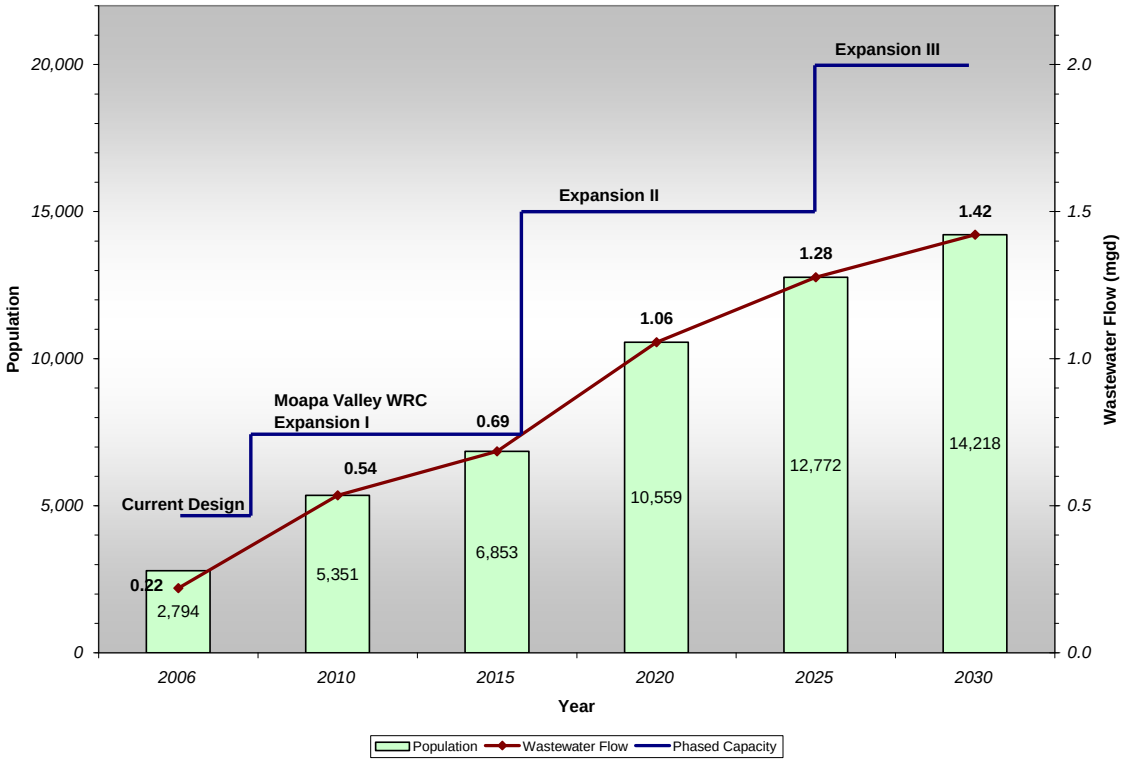


Figure 5-7
Moapa Valley
Population Projections, Wastewater Flows, and WRC Capacity

5.3.2.2 Coyote Springs

Coyote Springs is a future 42,000-acre planned golf community located approximately 50 miles north of Las Vegas, with one-third of its land within Clark County and two-thirds within Lincoln County, Nevada.

5.3.2.2.1 Proposed Treatment Facilities

According to the NDEP Fact Sheet entitled *Coyote Springs Water Resources General Improvement District 2007*, the Coyote Springs Water Resources General Improvement District (GID) will own the WWTPs and CCWRD will be the contracted operator of the WWTPs, which will be built in two phases. Phase I and Phase II are for a 0.020-mgd and a 2.1-mgd WWTP, respectively; however, at the CCWRD Coordination Meeting held on December 6, 2007, it was stated that the initial design capacity of the Coyote Springs WWTF will be for 2.1-mgd average dry weather flow. Furthermore, CCWRD noted that there is an agreement between the CCWRD and the Coyote Springs Water Resources GID that if the 2.1-mgd design capacity needs to be expanded, the Coyote Springs Water Resources GID will fund the project and there is a contractual agreement for the developer to stop building if the 2.1-mgd limit is exceeded. Upon NDEP approval, a third phase may be constructed to treat an influent flow of 4.20 mgd.

The *Coyote Springs Development WWTF 100% Design Submittal 2006* contains a plant process flow diagram, see **Figure 5-8**. Influent to the WWTF will be conveyed to the coarse screens. Screened influent will be pumped at the influent pump station to the grit chambers and fine screens. Flow from the fine screens will be routed to a splitter box and conveyed either to the equalization basins or to the membrane bioreactor (MBR) system. Permeate from the MBR process will be pumped to the chlorine contact basins and dechlorination chamber. Wastewater effluent will either be conveyed to the effluent reuse water system for the Coyote Springs Development WWTF or to the reclaimed water distribution system.

Table 5-5 and **Figure 5-9** show the Coyote Springs population projections, wastewater flow projections, and the treatment plant potential phased capacity expansions.

5.3.2.2.2 Solids Handling and Effluent Disposal

As indicated in the *Coyote Springs Development WWTF 100% Design Submittal*, the dewatering building houses two centrifuges for solids dewatering; solids are conveyed to a sludge bin. Dewatered solids are hauled from the sludge bin to a landfill.

The Coyote Springs Water Resources GID has filed an application with NDEP for a permit to discharge treated effluent from the proposed Coyote Springs Development WWTF.

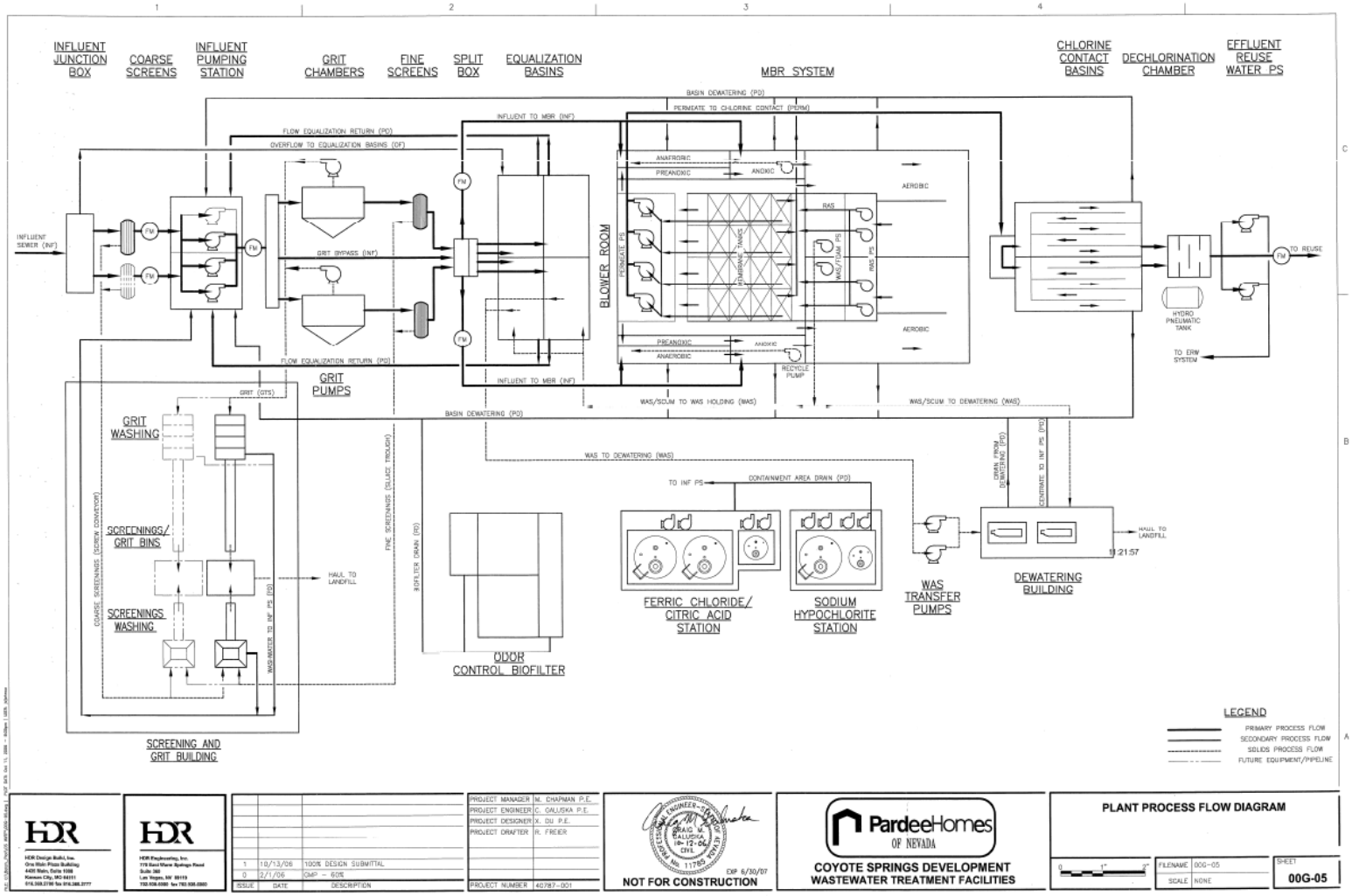


Figure 5-8
Coyote Springs Development WWTF Process Flow Diagram

Table 5-5

**Coyote Springs Population Projections,
Wastewater Flows, and Treatment Plant Capacity**

Year	Population Projections	Wastewater Flow (mgd)	WWTF Capacity (mgd)
2006	0	0.0	0
2010	2,375	0.2	2.1
2015	8,313	0.8	2.1
2020	17,219	1.7	2.1
2025	29,094	2.9	4.2
2030	40,969	4.1	4.2

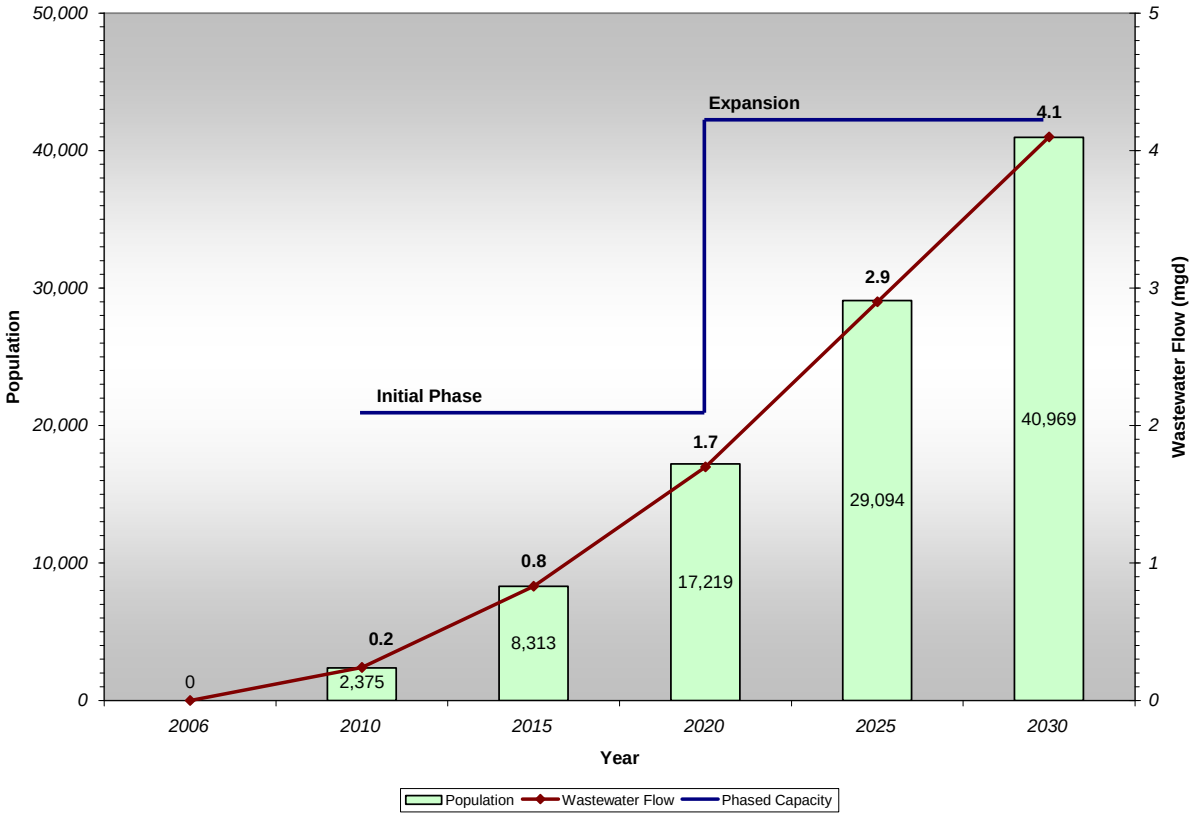


Figure 5-9
**Coyote Springs Population Projections,
Wastewater Flows, and Treatment Plant Capacity**

5.3.2.3 Moapa Township

The Moapa Township includes the Moapa Detail Area and the Warm Springs Detail Area. The Moapa Detail Area, which was formerly known as Glendale, is located along Interstate 15, on the northeast side of Planning Area 2. The Warm Springs Detail Area, which was formerly known as the Moapa Detail Area, is located in the northern part of Planning Area 2.

The operating wastewater management options for the Moapa Detail Area and Warm Springs Detail Area include septic systems and soil absorption systems. Wastewater management options for the Moapa Detail Area and Warm Springs Detail Area include the construction of publicly owned treatment works (POTW).

A newly adopted wastewater management option for the Moapa Township is the use of interim package plants. Package plants identified as "interim" are those that are to be constructed for temporary or interim use in an area where a POTW is planned, but the operational date is unknown.

In the *Amendment to Northeast Clark County 208 Water Quality Management Plan (2007)*, a newly adopted wastewater management option for the Warm Springs Detail Area and parcels in detail area categorized in the *Northeast Land Use Plan* as "industrial," is the use of package WWTPs. These may function as a long-term treatment system.

The developers of Hidden Valley and Riverview are proposing to partner in the construction of a WWTF for the Moapa Township. The plan is for the WWTF to be privately built but eventually to be turned over to the CCWRD to own and operate. Discharge from this potential WWTF, and possibly others, may be made to the Muddy River has been discussed and may be desired at some point in the future.

5.3.2.4 Moapa Indian Reservation

The Moapa Indian Reservation is located along Interstate 15 near the Valley of Fire State Park. The primary land use is residential with a small commercial development near the interstate. Title 33, Chapter 26, Section 1377 of the United States Code (USC), CWA, addresses wastewater treatment needs for Indian tribes and states that the Moapa Indian Reservation is not subject to the planning authority of the State of Nevada or its designees. It also authorizes the EPA Administrator to treat Indian tribes as states for purposes of completing area-wide waste treatment management plans.

5.3.2.5 Apex

Apex is located along Interstate 15, northeast of the Las Vegas Valley. It is a nonresidential, planned heavy industrial use park intended to accommodate heavy industrial use away from the Las Vegas Valley. There is no resident population, this area does not contain any water treatment or WWTFs. The existing industries use septic systems for the disposal of their wastewater. According to the septic system GIS files, there are 9 permitted septic systems. In addition, interim package plants are options for wastewater treatment in the Apex area. There is another option of treating wastewater flows generated from Apex at the CCWRD Main Plant, which is in Planning Area 5, which is further discussed in Section 6.

5.3.2.6 Planning Area 2 Septic Systems

As provided in the septic system GIS file, there are 1,749 septic systems located in Planning Area 2, and according to CCWRD there are 1,676 septic systems in or near Logandale and Overton.

5.3.2.7 Pretreatment Program

There is no industrial pretreatment program in Planning Area 2.

5.3.2.8 Planning Area 2 Summary

Table 5-6 summarizes information for wastewater flows and WWTFs in Planning Area 2. For the unincorporated County areas that CCWRD does not currently serve, CCWRD's plan for the future is for developers to build the system and then the CCWRD will take over ownership and operation of the system.

Table 5-6

Planning Area 2 Summary Table

Year	Overton Ponds (Future Moapa Valley WRC)		Coyote Springs Development WWTF		WWTFs in Planning Area 2 Total	
	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)
2006	0.35	0.22 [a]	0	0	0.35	0.22
2010	0.75	0.54	2.1	0.2	2.9	0.74
2015	0.75	0.69	2.1	0.8	2.9	1.49
2020	1.5	1.1	2.1	1.7	3.6	2.8
2025	1.5	1.3	4.2	2.9	5.7	4.2
2030	4	1.4	4.2	4.1	8.2	5.5

Notes:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

5.3.3 Planning Area 3 – Lower Virgin River

Wastewater treatment in Planning Area 3 includes the Mesquite WWTP, wastewater treatment options for the Township of Bunkerville, and septic systems throughout the planning area.

5.3.3.1 City of Mesquite

The Mesquite WWTP is located in the northeastern corner of Clark County, near the borders of Lincoln County, Utah, and Arizona. The Mesquite WWTP treats the wastewater flows within the Mesquite service area.

5.3.3.1.1 Existing Collection System

Mesquite's collection system consists of three main trunk lines, the Eastside, Abbott, and Westside Interceptors with pipe sizes ranging from 12 inches to 24 inches in diameter, and one lift station. The Westside Lift Station pumps wastewater from the Westside Interceptor to the Mesquite Wastewater Treatment Plant (WWTP). The lift station houses three pumps (two duty and one standby), each with a capacity of 900 gallons per minute (gpm).

5.3.3.1.2 Existing Treatment Facilities

According to the *2006 Wastewater Facilities Planning Study* for Mesquite, the annual average capacity of the Mesquite WWTP is 2.8 mgd. The headworks consist of a grinder/screen/dewatering unit, and a vortex grit chamber for grit removal. An oxidation ditch provides secondary treatment. Filtration is accomplished with two disk filter units; disinfection is accomplished by two systems, either the ultraviolet (UV) system or the sodium hypochlorite system. Vertical turbine pumps are provided to deliver effluent to the reuse system. An aerated lagoon is provided to treat influent flow, with most of that wastewater lost through evaporation. If the wastewater in the lagoon reaches a high level, wastewater is conveyed to wetlands for treatment and disposal. The Mesquite WWTP process schematic is shown in **Figure 5-10**. According to the *SWAC 2006 Year End Summary*, in 2006, the average wastewater flow for the Mesquite WWTP was 1.81 mgd.

5.3.3.1.3 Future Collection System

The Mesquite wastewater collection system may continue to expand during the 20-year planning horizon to meet the service needs of the current and future residents.

5.3.3.1.4 Future Treatment Facilities

According to the *2006 Wastewater Facilities Planning Study*, the ultimate capacity of the Mesquite WWTP, based on anticipated future buildout of Mesquite, was calculated to be 8.7 mgd. The wastewater management options identified for Mesquite include the expansion of the Mesquite WWTP and construction of satellite treatment facility(ies).

Table 5-7 and **Figure 5-11** show the Mesquite population projections, wastewater flow projections, and the treatment plant phased capacity expansions.

5.3.3.1.5 Solids Handling and Effluent Disposal

The solids handling building houses a belt press for solids dewatering. Polymer addition is available and a dry cake conveyor that deposits dewatered solids into a dumpster, which is transported offsite to a landfill. In addition, Mesquite is considering alternatives for long-term biosolids disposal.

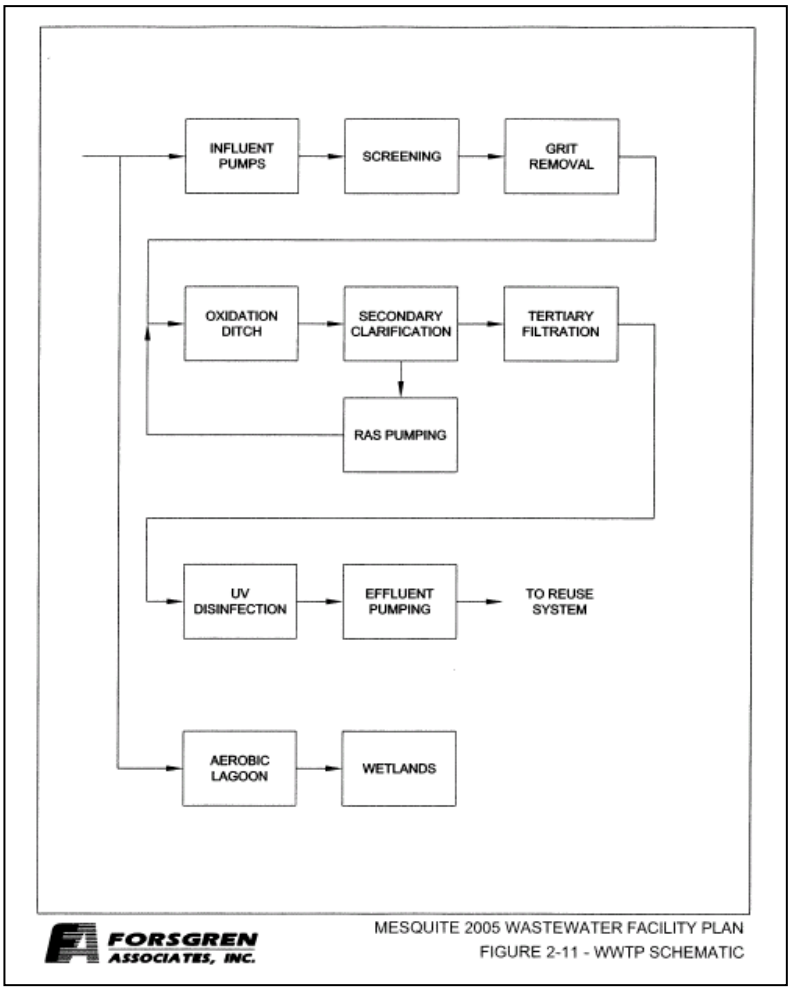


Figure 5-10
Mesquite WWTP Process Schematic

Table 5-7

**Mesquite Population Projections,
Wastewater Flows, and Treatment Plant Capacity**

Year	Population Projections	Wastewater Flow (mgd)	Mesquite WWTP Capacity (mgd)
2006	17,656	1.8[a]	3.5
2010	23,000	2.6	8.7
2015	32,000	3.7	8.7
2020	43,000	4.9	8.7
2025	55,000	6.3	8.7
2030	70,000	8.1	8.7

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

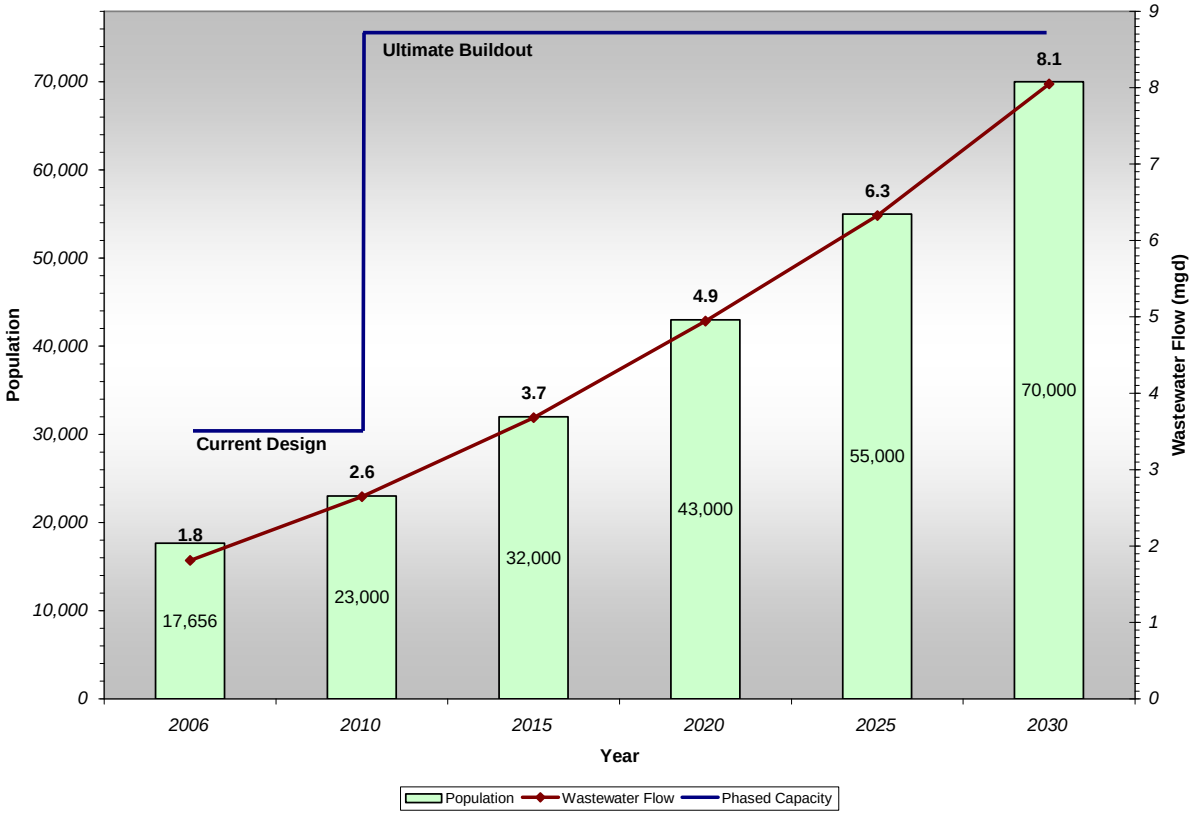


Figure 5-11
**Mesquite Population Projections,
Wastewater Flows, and Treatment Plant Capacity**

The Mesquite WWTP is authorized to discharge reclaimed water for irrigation to golf courses and a park under NDEP Permit No. NEV40011.

5.3.3.1.6 Water Quality Monitoring

Groundwater monitoring parameters are TDS, nitrate as N, total nitrogen as N, chloride, and total phosphorus as phosphorus (P).

5.3.3.2 Township of Bunkerville

The unincorporated Township of Bunkerville includes two areas, the Bunkerville Detail Area (the unincorporated town that includes the Bunkerville Town Center) and the remaining Bunkerville Township (includes the Riverside Detail Area). The entire township utilizes septic systems and soil absorption systems. Future wastewater management options for the entire Township of Bunkerville include connecting to the Mesquite WWTP or constructing a POTW. In the Bunkerville Detail Area, where there is approved zoning for densities greater than two dwelling units per acre, additional wastewater management options include either package plants and interim package plants. A newly adopted wastewater management option for the remaining Bunkerville Township (excluding the Bunkerville Detail Area) is the use of package plants or interim package plants.

5.3.3.3 Planning Area 3 Septic Systems

As provided in the septic system GIS file, there are 338 permitted septic systems in Planning Area 3.

On the current map of the Northeast Clark County Land Use Plan (CCDCP, 2006), the "residential suburban" (formerly referred to as "residential low") density category allows for up to 8 dwelling units per acre (du/ac); however, Detail Area Policy 30.4 of that plan states that 4 du/ac is the maximum for this category in Bunkerville. However, without package plants or some form of centralized public wastewater treatment, even at 4 du/ac, the corresponding septic tank densities could rapidly reach the limit of 165 units per square mile, as noted in Table 3-2. Additionally in Bunkerville any major subdivision developer seeking to build at greater than 4 du/ac would be required to obtain variances for zoning changes, even if package plants or interim package plants are included as an option for that community.

5.3.3.4 Pretreatment Program

There is no industrial pretreatment program in Planning Area 3.

5.3.3.5 Planning Area 3 Summary

Table 5-8 summarizes information for wastewater flows and the Mesquite WWTP in Planning Area 3. For the unincorporated County areas that CCWRD does not currently serve, CCWRD's plan for the future is for developers to build the system and then the CCWRD will take over ownership and operation of the system.

Table 5-8

Planning Area 3 Summary Table

Year	Mesquite WWTP	
	Capacity (mgd)	Wastewater Flows (mgd)
2006	3.5	1.8 [a]
2010	8.7	2.6
2015	8.7	3.7
2020	8.7	4.9
2025	8.7	6.3
2030	8.7	8.1

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

5.3.4 Planning Area 4 – Grand Wash and Lake Mead

According to the NPS, there are currently five WWTFs within Planning Area 4 and other wastewater is treated and disposed of by septic systems throughout the planning area. As provided in the septic system GIS file containing septic system permits, there are 12 permits issued for septic systems within Planning Area 4.

5.3.4.1 Boulder Beach

Boulder Beach is located in the Lake Mead NRA, on the west side of Boulder Basin. Boulder Beach is a destination for swimming, camping, and there is a special area restricted for SCUBA-diving only. There is a campground without hookups for use in the cooler months and a recreational vehicle (RV) park for use in the summer.

5.3.4.1.1 Existing Treatment Plant

The Boulder Beach WWTP is owned and operated by the NPS at Lake Mead NRA. According to the NDEP Fact Sheet for the Boulder Beach WWTP, the design capacity is 0.040 mgd with no plans to increase the capacity. The treatment process is a pond system with two asphalt-lined retention ponds, one soil-lined settling and evaporation pond, and a percolation/evaporation pond.

5.3.4.1.2 Effluent Disposal

The Boulder Beach WWTP is authorized by NDEP Permit No. NEV50011 to discharge to groundwater of the state.

5.3.4.2 Callville Bay

Callville Bay is a marina located in the Lake Mead NRA, in the north part of Boulder Basin. It is a destination for many boaters and fishermen due to its central location on Lake Mead. There is a small community of less than a few hundred residents, an RV Park, a campground, a retail store, and a lounge located in Callville Bay.

5.3.4.2.1 Existing Treatment Plant

The Callville Bay WWTP is owned and operated by the NPS at Lake Mead NRA. According to the NDEP Fact Sheet for the Callville Bay WWTP, the design capacity is 0.036 mgd with no plans to increase the capacity. The treatment process is a pond system with two asphalt-lined retention ponds and one soil-lined settling and evaporation pond.

5.3.4.2.2 Effluent Disposal

The Callville Bay WWTP is authorized by NDEP Permit No. NEV50012 to discharge to groundwater of the state.

5.3.4.3 Echo Bay

Echo Bay is located in the Lake Mead NRA, in the Overton Basin. It is a destination for many campers and fishermen because the area is uncongested. There is an RV Park, a campground, a restaurant, a waterside store, and a motel located in Echo Bay.

5.3.4.3.1 Existing Treatment Plant

The Echo Bay WWTP is owned and operated by the NPS at Lake Mead NRA. According to the NDEP Fact Sheet for the Echo Bay WWTP, the design capacity is 0.036 mgd with no plans to increase the capacity. The treatment process is a pond system with two asphalt-lined retention ponds, one soil-lined settling and evaporation pond, and two unlined ponds available for additional water management.

5.3.4.3.2 Effluent Disposal

The Echo Bay WWTP is authorized by NDEP Permit No. NEV50014 to discharge to groundwater of the state.

5.3.4.4 Las Vegas Bay

Las Vegas Bay is located in the Lake Mead NRA, near the western edge of Lake Mead. It is a destination for many campers and fishermen and there is a campground, Ranger Station, a small residential area, and a few commercial businesses near the Las Vegas Bay.

5.3.4.4.1 Existing Treatment Plant

The Las Vegas Bay WWTP is owned and operated by the NPS at Lake Mead NRA. According to the NDEP Fact Sheet for the Las Vegas Bay WWTP, the design capacity is 0.007 mgd with no plans to increase the capacity. The treatment process is a pond system with two asphalt-lined retention ponds, two soil-lined settling and evaporation ponds, and two native soil ponds.

5.3.4.4.2 Effluent Disposal

The Las Vegas Bay WWTP is authorized by NDEP Permit No. NEV50015 to discharge to groundwater of the state.

5.3.4.5 Overton Beach

Overton Beach is located in the Lake Mead NRA, on the far north end of Lake Mead. It is a destination for fisherman because of the shallow water. There is a marina, a trailer park; a Ranger Station, and a boat launching area in Overton Beach.

5.3.4.5.1 Existing Treatment Plant

The Overton Beach WWTP is owned and operated by the NPS at Lake Mead NRA. According to the NDEP Fact Sheet for the Overton Beach WWTP, the design capacity is 0.011 mgd with no plans to increase the capacity. The treatment process is a pond system with two aerated membrane-lined retention ponds and two soil-lined settling and evaporation ponds.

5.3.4.5.2 Effluent Disposal

The Overton Beach WWTP is authorized by NDEP Permit No. NEV50016 to discharge to groundwater of the state.

5.3.4.6 Future Wastewater Collection and Treatment Systems

The wastewater collection and treatment systems may not be required to expand during the 20-year planning horizon, as Planning Area 4 population is not projected to increase during the 20-year planning horizon.

5.3.4.7 Pretreatment Program

There is no industrial pretreatment program in Planning Area 4.

5.3.4.8 Planning Area 4 Summary

Table 5-9 summarizes information for the five WWTPs in Planning Area 4. For the unincorporated County areas that CCWRD does not currently serve, CCWRD's plan for the future is for developers to build the system and then the CCWRD will take over ownership and operation of the system.

Table 5-9

Summary of WWTPs in Planning Area 4

Year	Boulder Beach WWTP Capacity (mgd)	Callville Bay Capacity (mgd)	Echo Bay WWTP Capacity (mgd)	Las Vegas Bay Capacity (mgd)	Overton Beach Capacity (mgd)	WWTPs in Planning Area 4 Capacity (mgd)
2006	0.040	0.036	0.036	0.007	0.011	0.130
2010	0.040	0.036	0.036	0.007	0.011	0.130
2015	0.040	0.036	0.036	0.007	0.011	0.130
2020	0.040	0.036	0.036	0.007	0.011	0.130
2025	0.040	0.036	0.036	0.007	0.011	0.130
2030	0.040	0.036	0.036	0.007	0.011	0.130

5.3.5 Planning Area 5 – Las Vegas Wash

Planning Area 5 encompasses the Las Vegas Valley in which the three largest wastewater agencies in Clark County produce reclaimed water: CCWRD, COH, and CLV. Collectively, along with CNLV, these agencies are part of the CWC, whose purpose is to carry out the Systems Conveyance and Operations Program (SCOP). SCOP is a regional system designed to transport wastewater effluent from the member agencies' WWTFs to the Colorado River system.

In 1999, the Las Vegas Valley wastewater treatment agencies began Phases I and II of the *Alternate Discharge Study* – a feasibility study of alternate discharge locations to accommodate existing and projected Valley wastewater flows. The following actions were recommended:

- Construct the Effluent Interceptor (EI)
- Conduct Lake Mead water quality modeling
- Analyze Colorado River Outfall locations
- Conduct the Colorado River outfall water quality modeling
- Prepare a Water Quality Criteria Assessment

In November 2002, CLV, COH, and CCWRD (CNLV was added in 2007), formed a joint powers authority (the CWC) under NRS Chapter 277 to manage Las Vegas Valley wastewater flows from Las Vegas Wash to Lake Mead via Phase III of the Alternate Discharge Study, known as the SCOP. SCOP includes optimization of the treatment plants, increased treatment as needed, and a pipeline to discharge effluent to Lake Mead in lieu of the current discharge to Las Vegas Wash. The NPS issued a Record of Decision (ROD) on the Final Environmental Impact Statement (EIS) for the project in August 2007 (NPS and Reclamation, 2006). The selected alternative in the Final EIS (Boulder Islands North pipeline alternative) includes construction of pipeline to convey effluent from three treatment plants (the CLV WPCF, the CCWRD WWTF, and the COH WRF) to a discharge location near the Boulder Islands in Lake Mead. Construction is anticipated by 2012. **Figure 5-12** shows a layout of SCOP.

The wastewater treatment agencies have made significant capital investments in expanding the capacity of the wastewater treatment facilities and to treat the wastewater to higher standards while protecting the water resources of the area. Additional investments have been made through the Clean Water Coalition in order to carry out the Systems Conveyance and Operations Program. Due to these investments, as well as the potential for reuse credits from Lake Mead, package plants and interim package plants that are not physically connected to a public wastewater collection system are not options for wastewater management within Planning Area 5 and the Las Vegas Valley.



Figure 5-12
SCOP Layout

5.3.5.1 Clark County Water Reclamation District

The wastewater flows generated in unincorporated county areas (and some limited areas of CLV, CNLV, and COH) of Planning Area 5 are presently treated by the CCWRD.

5.3.5.1.1 Existing Collection System

The CCWRD collection system serves an area of more than 171 square miles within Planning Area 5. Due to topography and proximity of facilities, there are limited areas of the CLV, CNLV, and COH that are served by the CCWRD collection system. This service is administered through interlocal agreements.

5.3.5.1.2 Existing Treatment Facilities

The CCWRD facilities consist of the CCWRD Main Plant, which includes the Central Plant and the Advanced Wastewater Treatment (AWT) Plant, and the Desert Breeze WRC. According to the *SWAC 2006 Year End Summary*, in 2006, the average wastewater flow for the CCWRD was 101 mgd. **Table 5-10** shows the design capacity for the CCWRD WWTFs.

Table 5-10

CCWRD Wastewater Treatment Facilities

Facility	2006 Design Capacity (mgd)
CCWRD Main Plant	98
Desert Breeze WRC	5
CCWRD Total	103

5.3.5.1.2.1 Clark County Water Reclamation District Main Plant

The CCWRD Central Plant is located at the east end of Flamingo Road, and is composed of the preliminary, primary, secondary, and tertiary treatment facilities. The preliminary treatment facilities include a centralized bar screen facility, screenings handling, grit removal, grit washing, grit/screenings loading, flow sampling and metering, ferric chloride dosing, and septage receiving station. The primary treatment facilities consist of four primary influent structures, 12 120-foot-diameter primary clarifiers, and the primary sludge pumping station. The secondary treatment facilities consist of two complexes: the North Secondary Treatment Facilities and the South Secondary Treatment Facilities. The North Secondary Treatment Facilities consist of the intermediate pump station, two influent distribution structures, eight aeration basins, eight secondary clarifiers, a blower building, and four secondary sludge pumping stations. The South Secondary Treatment Facilities consist of the primary effluent pump station, four aeration basins, a mixed liquor distribution structure, four secondary clarifiers, a secondary sludge pumping station, return activated sludge (RAS) splitter box, a blower building, and an electrical building. The tertiary treatment facilities include influent pumping, 32.5-mgd annual average of conventional filtration capacity, UV disinfection, chlorination, dechlorination, and waste washwater treatment facilities. The Phase II expansion, currently (2008) under construction, includes an additional 32.5-mgd filter complex and additional UV disinfection facilities. **Figure 5-13** shows the Central Plant Facility Layout, as provided in the draft report of the *Integrated Facility Master Plan 2007 – Technical Memoranda Volume 2*.

Secondary effluent from the Central Plant can be pumped to either the tertiary treatment facilities at the Central Plant or to the AWT Plant. The AWT facilities consist of flocculation, eight tertiary clarifiers, conventional filtration, UV and chlorine disinfection, and thickeners. **Figure 5-14** shows the AWT facility layout, as provided in the draft report of the *Integrated Facility Master Plan 2007 – Technical Memoranda Volume 2*.

5.3.5.1.2.2 Desert Breeze Water Resource Center

The Desert Breeze WRC is located northeast of the intersection of Flamingo Road and Durango Drive and has a design capacity of 5 mgd. The Desert Breeze WRC treatment process consists of screening, grit removal, flow equalization, activated sludge biological process, filtration via traveling bridge filters, and UV disinfection (supplemented with sodium hypochlorite to ensure that the total coliform is met).

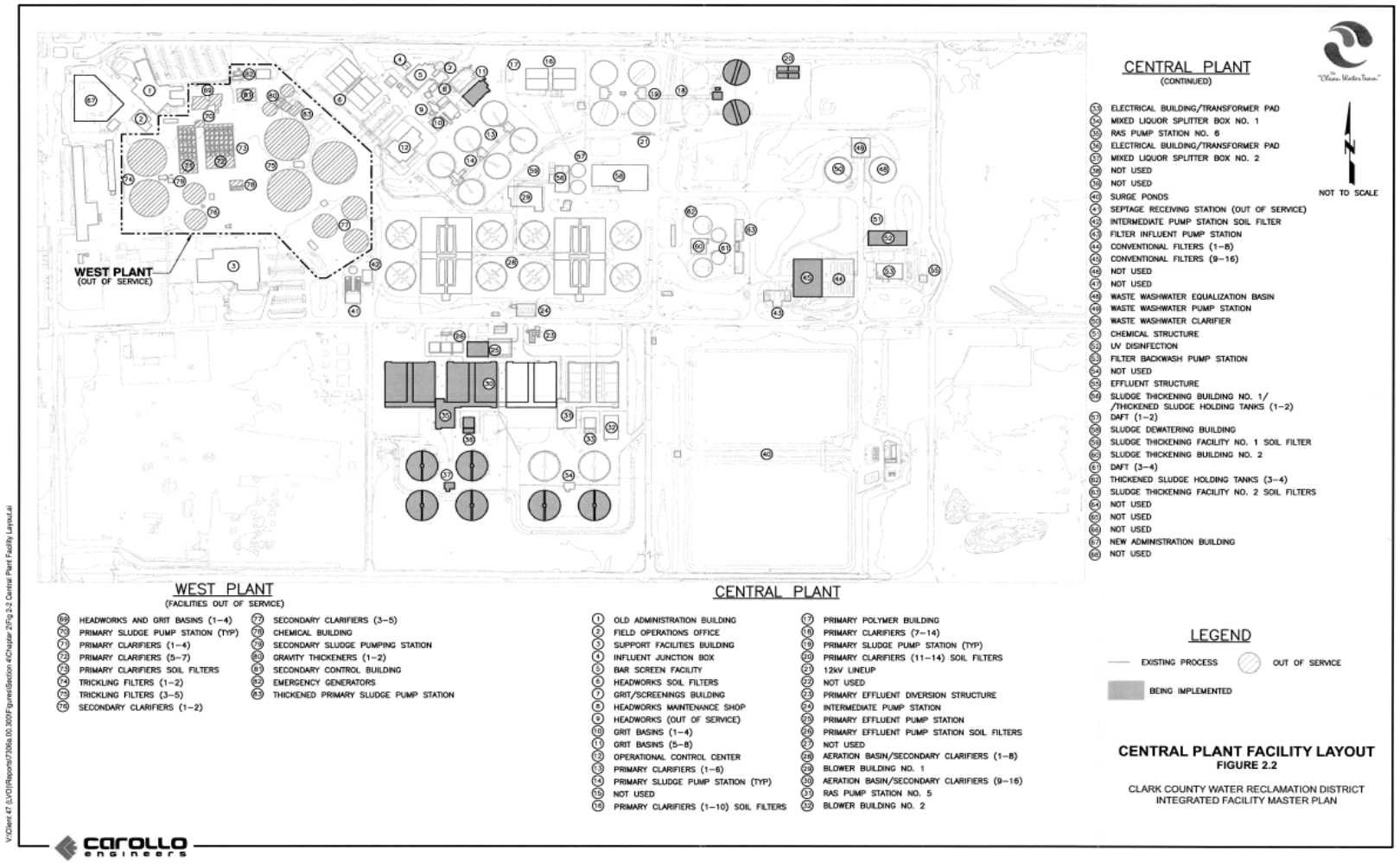


Figure 5-13
CCWRD Central Plant Site Plan

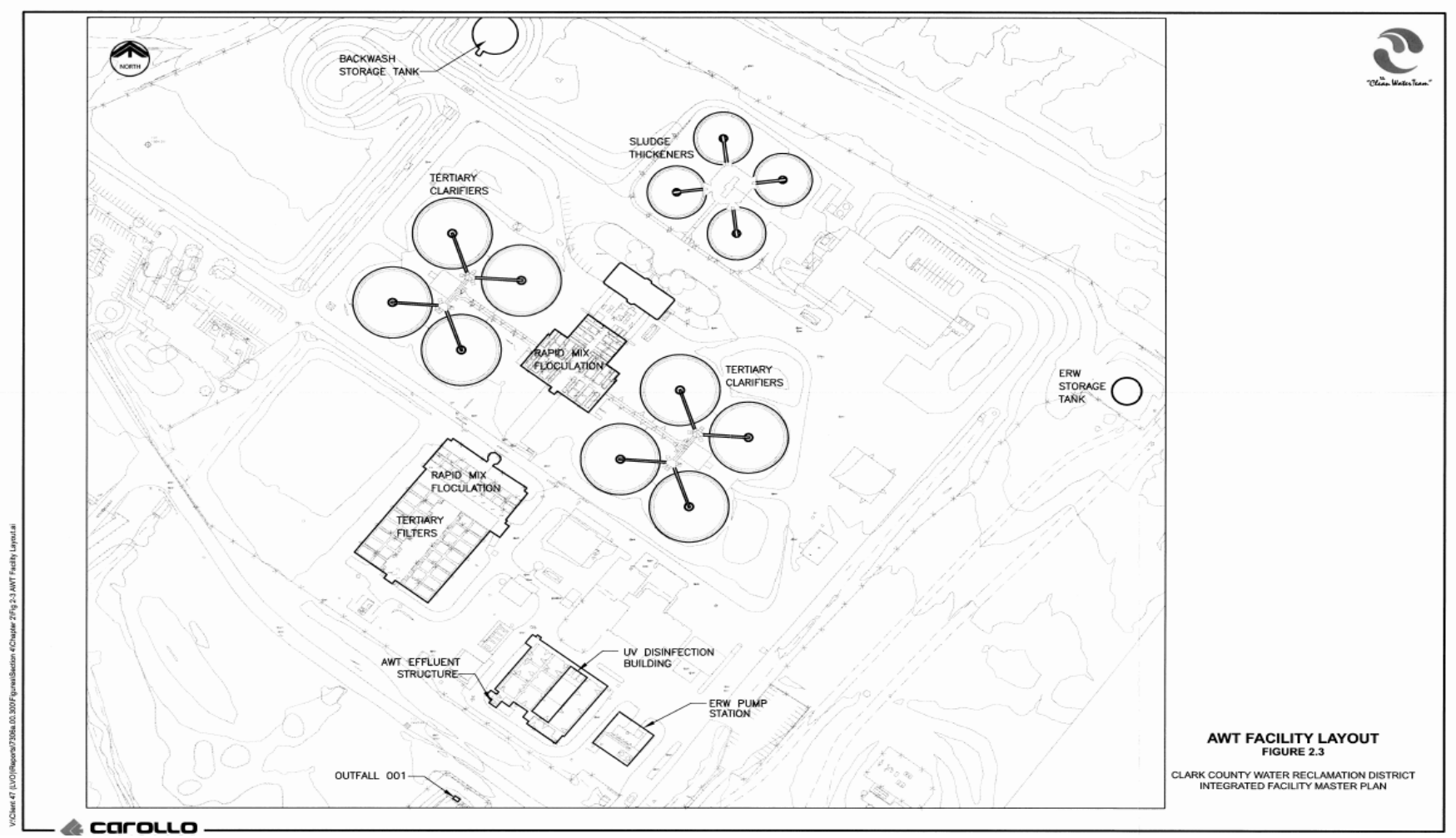


Figure 5-14
CCWRD AWT Facility Site Plan

5.3.5.1.3 Pretreatment Program

CCWRD maintains an industrial waste pretreatment program and issues discharge permits for categorical industrial users (CIUs), significant industrial users (SIUs), and Class II industrial users; the *CCWRD Pretreatment Program Annual Report (January 1, 2005 - December 31, 2005)* was obtained from CCWRD. Discharge limitations defining categorical users are defined by 40 Code of Federal Regulations (CFR) Part 403. This subsection provides a summary of the three classifications of industrial users, mentioned above, in the unincorporated county areas of Planning Area 5. During the 2005 year, CCWRD oversaw 25 permitted industrial users, including eight CIUs, sixteen SIUs, and one Class II industrial users.

Three CIUs are metal finishers with stand industrial classification (SIC) codes of 3471, three are metal finishers with SIC Codes of 9711, one is a canned and miscellaneous specialties facility with SIC Code 2035, and one is a pharmaceutical manufacturer with SIC Code 2834.

Of the 16 SIUs, four are included as significant users due to their potential for causing passthrough or interference, five are included for flow rate, two for treatment of graywater or groundwater, one for both flow rate and potential for causing passthrough or interference, one for conventional pollutant concentrations and flow, one for chemical treatment of incoming water to control TDS concentration, one for grease interceptor effluent, and one permit was allowed to expire. The SIC Codes for the SIUs in unincorporated county areas of Planning Area 6 include: 2026, 2077, 5149, 7213, 7218, 7384, 7395, 7537, 8071, 8743, 9711, and 9999. Since CNLV does not own or operate a publicly owned treatment works, wastewater is conveyed to either the CLV or CCWRD treatment facilities. The industrial users that discharge to the CCWRD facility is discussed in Section 5.4.5.4.2. One of the SIUs that discharges to the CCWRD facility is Nellis Air Force Base.

One industrial user was classified as a Class II industrial user for metals and volatile organic compound (VOC) concentrations (SIC Codes 4151 and 7542).

In 2005, CCWRD recorded no incidents related to incoming toxic materials that had the potential to cause an upset to the CCWRD processes (CCWRD, 2005).

5.3.5.1.4 Future Collection System

The CCWRD wastewater collection system will continue to expand during the 20-year planning horizon to meet the service needs of the current and future residents.

5.3.5.1.5 Future Treatment Facilities

According to the *CCWRD Annual Operating Budget Fiscal Year 2006-07*, the CCWRD Design and Construction Services Department completed planning for the Enterprise WRC in the 2005-2006 fiscal year. The Enterprise WRC will be designed as an end-of-the-line WWTF that will include preliminary, primary, secondary, and tertiary treatment and disinfection. The initial phase of the Enterprise WRC will be designed for an average daily flow of 15 mgd. According to the *Enterprise WRC Facility Plan 2006*, the Enterprise WRC will treat wastewater flows from the Blue Diamond and Southwest drainage basins; however, wastewater generated from the Southern Highlands Drainage Basin may be conveyed to the Enterprise WRC. The plan is for the Enterprise WRC to be operational by 2011.

The Phase II expansion of the CCWRD Central Plant will provide the CCWRD Main Plant with an average capacity of 130 mgd. In addition, a 25-mgd increase in capacity to the CCWRD facilities is planned within the 20-year planning period of the *Clark County Area-Wide WQMP*.

Table 5-11 and **Figure 5-15** show the Planning Area 5 unincorporated county areas' population projections, wastewater flow projections, and the treatment plant potential phased capacity expansions.

5.3.5.1.6 Solids Handling and Effluent Disposal

At the CCWRD Central Plant, thickened waste activated sludge (WAS), primary sludge, and tertiary solids are conveyed to the sludge holding tanks at the Sludge Thickening Facility. From the holding tanks, sludge is pumped to the Central Plant sludge dewatering building for dewatering, and dewatered sludge is hauled to the landfill. A new solids dewatering facility is being constructed at the AWT facility, which will replace the Central Plant Sludge Dewatering Building.

Sludge generated at the Desert Breeze WRC is discharged to the CCWRD sanitary sewer for treatment at the CCWRD Central Plant.

The Desert Breeze WRC is authorized by NDEP Permit No. NEV2001509 to discharge effluent to the groundwater of Nevada. The treated effluent from the Desert Breeze WRC is discharged to a wet well and 1.2 million-gallon storage reservoir owned and operated by the LVVWD. Additional chlorination is provided by the LVVWD before distribution to reuse sites such as golf courses, parks and schools for turf and landscape irrigation. If there is insufficient demand for reuse water, such as in the winter time when landscape irrigation use is low, treated effluent may be discharged to the sanitary sewer for conveyance to the CCWRD Central Plant.

Table 5-11

**CCWRD Population Projections,
Wastewater Flows and Treatment Facilities Capacity**

Year	Population Projections	Wastewater Flow (mgd)	CCWRD Treatment Facilities Capacity (mgd)
2006	798,941	101 [a]	103
2010	933,091	120	135
2015	1,121,733	145	150
2020	1,229,273	159	175
2025	1,248,194	161	175
2030	1,253,414	162	175

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

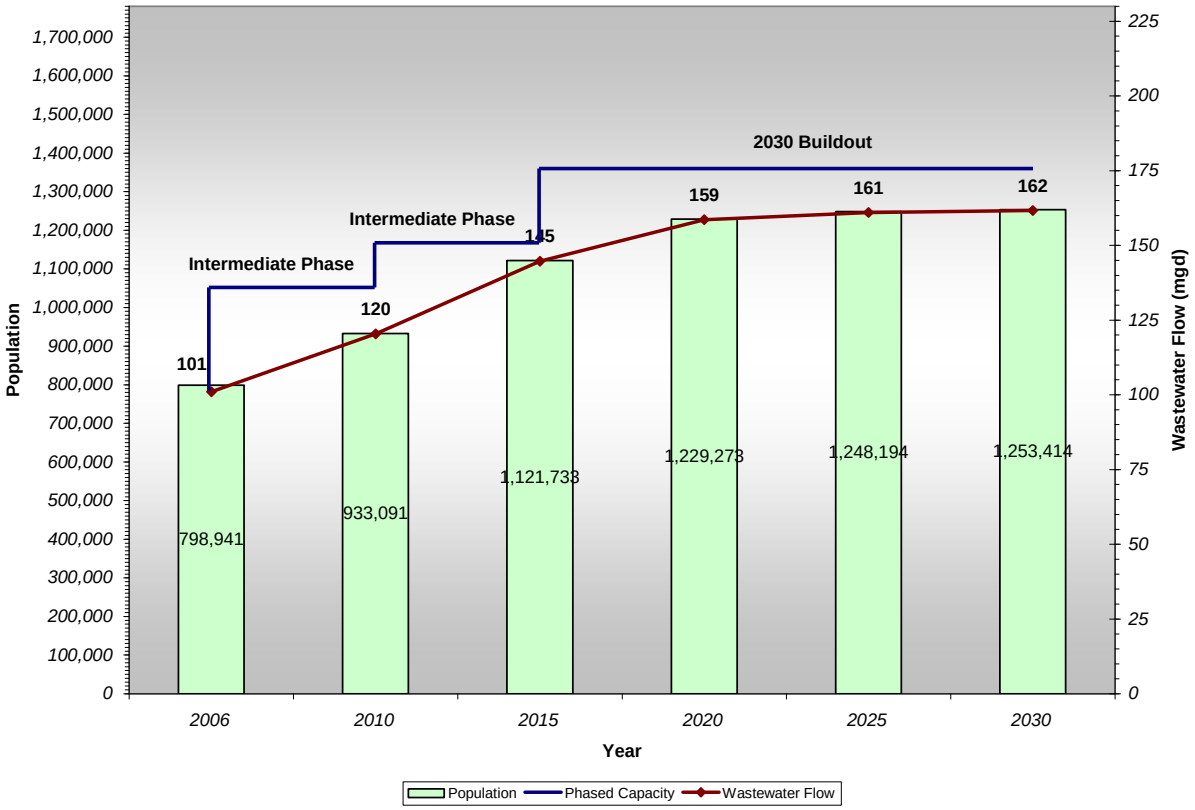


**Figure 5-15
CCWRD Population Projections,
Wastewater Flows, and Treatment Facilities Capacity**

Solids-handling facilities are not planned at Enterprise WRC. Similar to the Desert Breeze WRC, sludge will be transported via the collection system to the CCWRD Central Plant for treatment and disposal.

Enterprise WRC-treated effluent will be discharged to the onsite reclaimed water distribution system or to the Duck Creek Wash. Reclaimed water will be delivered to the reclaimed water distribution system to provide irrigation for golf courses, parks, and other landscape needs.

The CCWRD Main Plant is authorized by NDEP Permit No. NV0021261 to discharge effluent to the Las Vegas Wash. In addition, the CCWRD is authorized to discharge reclaimed water to the power plant, Silver Bowl Soccer Field, Stallion Mountain Golf Course, xeriscape, and irrigation for landscaping on site. When SCOP is operational, the CCWRD Main Plant will be permitted to discharge via SCOP.

5.3.5.2 City of Henderson

The COH is located in Planning Area 5 in the Las Vegas Valley.

5.3.5.2.1 Existing Collection System

The COH wastewater collection system covers a service area of over 95 square miles and is composed of approximately 500 miles of pipeline. Some areas within the CCWRD service area are served by the COH wastewater system, due to topography and proximity of COH facilities.

5.3.5.2.2 Existing Treatment Facilities

There are two WWTFs in operation in the COH, the COH WRF and the WWTP No. 3. According to the *SWAC 2006 Year End Summary*, in 2006, the average wastewater flows for COH were 20.3 mgd.

5.3.5.2.2.1 City of Henderson Water Reclamation Facility

The COH WRF includes preliminary, secondary, and tertiary liquid treatment and solids-handling facilities. The current capacity of the WRF, with Phase 2 expansion completed, is 24 mgd. Preliminary treatment at the COH WRF includes measurement of wastewater influent flow, three mechanical bar screens, two aerated grit basins, and three screw lift pumps. Secondary treatment includes two oxidation ditches, four final clarifiers, and a RAS/WAS pumping station. Tertiary treatment includes the supplemental phosphorus removal system composed of the intermediate pumping station, four 80-foot-diameter solids

contact clarifiers, 16 monomedia sand filters, four chlorine contact chambers, and the final pumping station. **Figure 5-16** shows the layout of the COH WRF (including Phase 3 expansion discussed below).

5.3.5.2.2.2 Wastewater Treatment Plant No. 3

The current capacity of WWTP No. 3 is 3 mgd. The WWTP No. 3 headworks consist of three screw pumps, three mechanical bar screens, and a screenings compactor. From the headworks, flow is split and conveyed to three lined aerated lagoons, each composed of three lagoon cells in series. A flow equalization pipe is connected to the aerated lagoon to convey partially treated influent to the WRF. The remainder of the lagoon effluent is disposed of via the RIBs.

5.3.5.2.3 Pretreatment Program

COH maintains an industrial waste pretreatment program and issues discharge permits for CIUs, SIUs, and Class II industrial users; the *COH Pretreatment Program Annual Report 2005* was obtained from COH. Discharge limitations defining categorical users are defined by 40 CFR Part 403. This subsection provides a summary of the three classifications of industrial users, mentioned above, in COH. During the 2005 year, COH oversaw 10 permitted industrial users, including four CIUs and six SIUs.

One CIU is a metal finisher with SIC Codes 3471, one is a blade manufacturer with SIC Code of 3291, one is a figurine manufacturing facility with SIC Code 3961, and one is a specialty coin plating facility with SIC Code 33991.

The SIUs include four food manufacturing facilities, an industrial laundry, and a mining complex. The SIC Codes for the SIUs in COH include: 1011, 2024, 2033, 2051, 2066, and 7218.

In 2005, COH recorded no incidents of upset, interference, or passthrough (COH, 2005).

5.3.5.2.4 Future Collection System

The COH wastewater collection system will continue to expand during the 20-year planning horizon to meet the service needs of the COH's current and future residents.

5.3.5.2.5 Future Treatment Facilities

COH has plans to expand the WRF, complete the Southwest Reclamation Facility and retire the WWTP No. 3 in the future. Plans for each facility are described below.

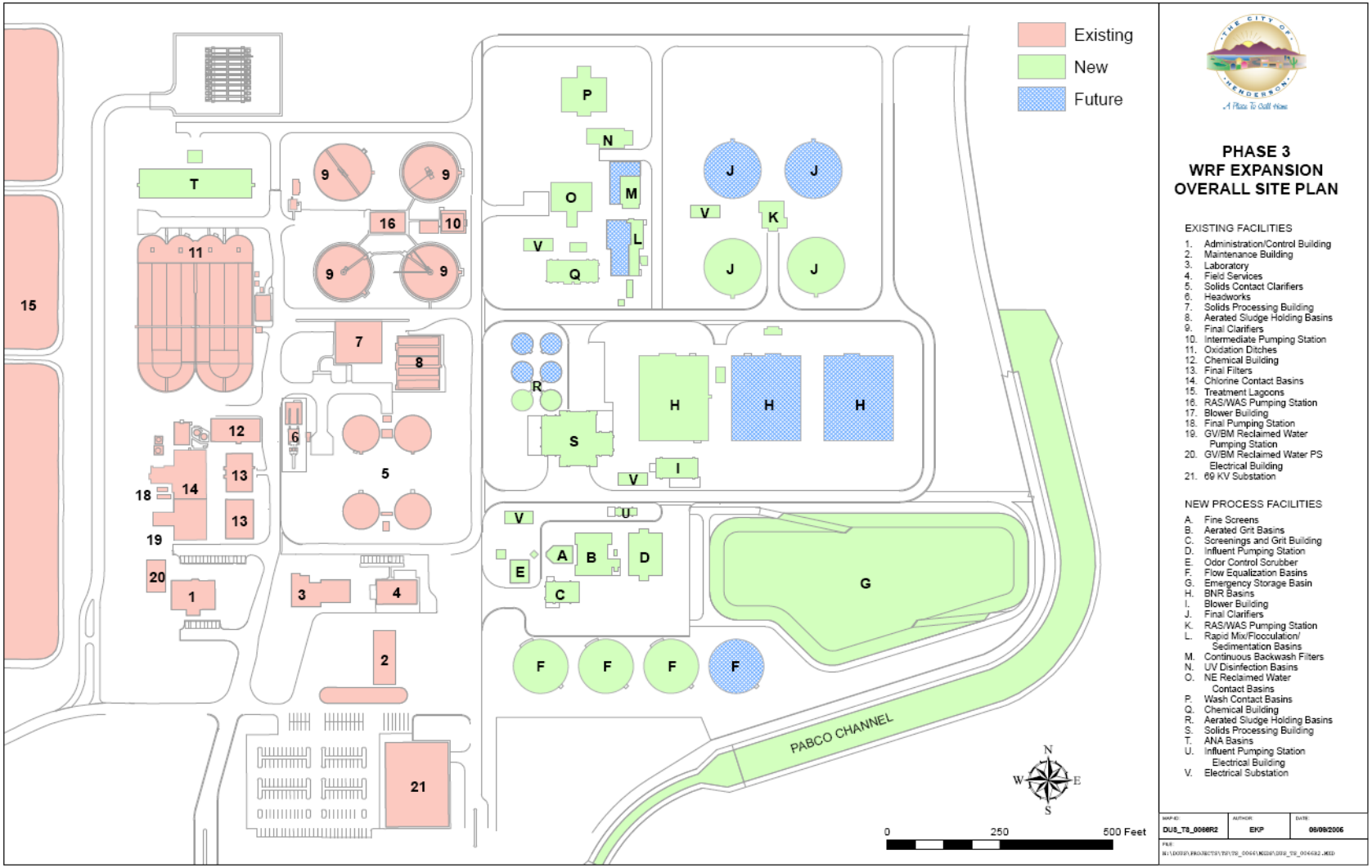


Figure 5-16
COH WRF Site Plan

5.3.5.2.5.1 City of Henderson Water Reclamation Facility

Phase 3 expansion of the COH WRF will add an additional 8 mgd, to bring capacity of the WRF to 32 mgd. The facilities include biological nutrient removal (BNR) facilities, master headworks, and UV disinfection facilities. Capability to expand the facilities to 48 mgd is provided in the Phase 3 design. **Figure 5-16** shows the layout of the COH WRF, with the Phase 3 expansion.

5.3.5.2.5.2 Wastewater Treatment Plant No. 3

According to the *Phase 3 WRF Expansion Project Design Memorandum 2003*, the WWTP No. 3 is approaching the end of its useful life and will be retired upon completion of the Phase 3 WRF Expansion Project.

5.3.5.2.5.3 Southwest Water Reclamation Facility

A third treatment facility, the Southwest WRF, is under construction for the West Henderson service area. The Southwest WRF annual average capacity for Phase 1 is 8 mgd and Phase 2, which corresponds to buildout conditions, is 16 mgd. The *SWRF Predesign Report Volume I 2005* indicates that the Southwest WRF is required to be operational in the first quarter of 2009. According to the *SWRF Predesign Report Volume I 2005*, the design of the Southwest WRF consists of influent pumping, headworks, MBRs, disinfection, and miscellaneous facilities. The design of the facilities is summarized in the following paragraph.

Influent to the Southwest WRF will be conveyed through coarse screens and then to the influent pumping station for delivery to the grit removal facilities. Following grit removal, flow will be conveyed through fine screening. Flow from the headworks will be conveyed to the bioreactor and membrane basins. Immersed membranes were selected as the membrane technology. Process air and air scour for the membrane system will be provided by single-stage blowers. Disinfection will be performed at the Southwest WRF using primary disinfection by use of UV technology and secondary disinfection by chloramines. The miscellaneous facilities at the Southwest WRF will include a Plant Water Pump Station, odor control using a dual-stage system of activated carbon and biofilter, and noise-control facilities. **Figure 5-17** shows the Southwest WRF layout, as provided in the *SWRF Predesign Report Volume I 2005*.

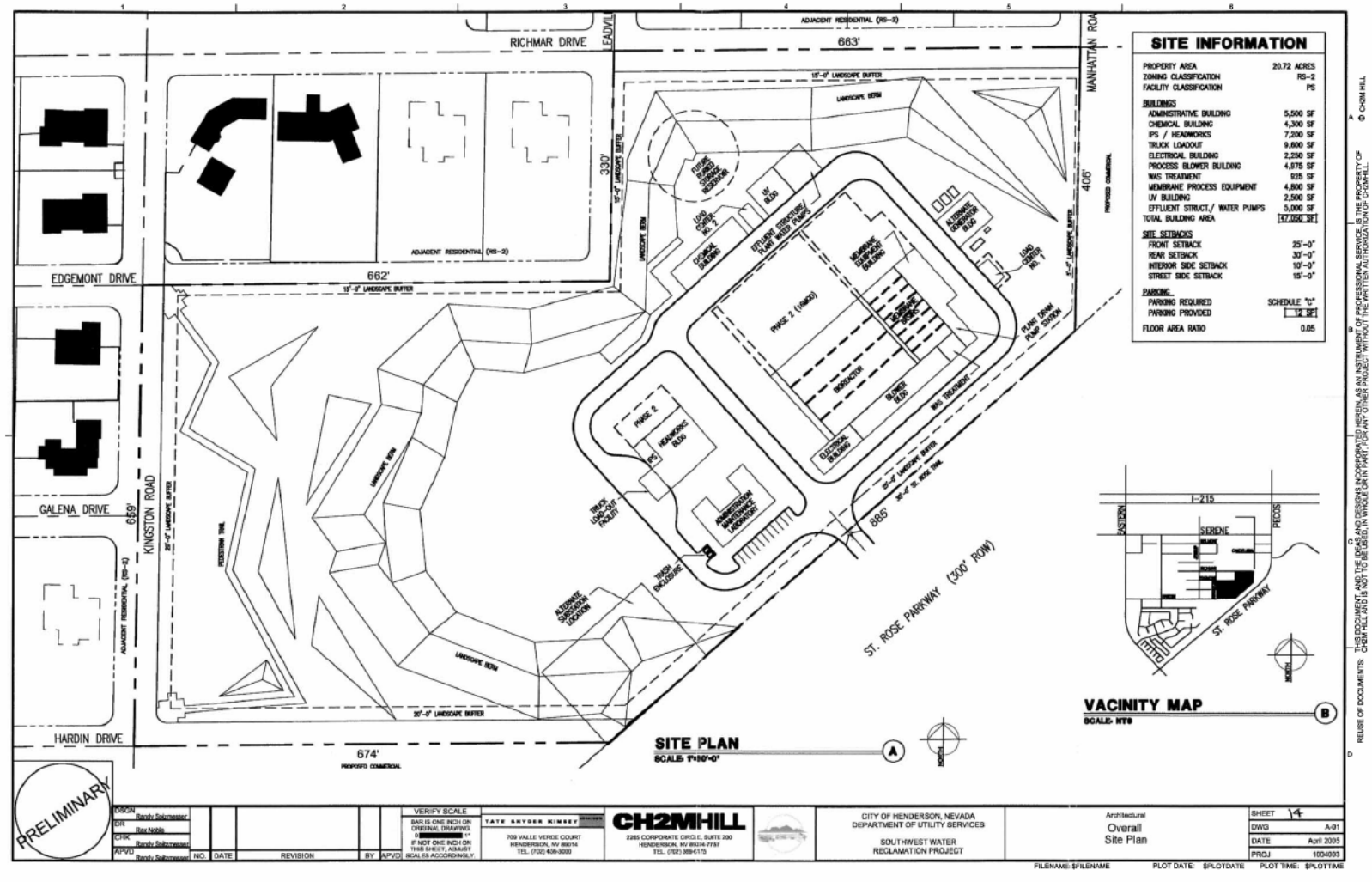


Figure 5-17
Southwest WRF Site Plan

5.3.5.2.5.4 Planning Wastewater Treatment Facility Expansions

The various phased expansions planned for the COH WRF, WWTP No. 3, and the Southwest WRF are shown in **Table 5-12**.

Table 5-12

COH Treatment Facility Planned Capacity Expansions

Phase	WWTP No. 3 (mgd)	WRF (mgd)	WRF New Complex (mgd)	Southwest WRF (mgd)	WWTP and WRF Total (mgd)
2	3	24	0	0	27
3	0	24	8	0	32
4	0	24	8	8	40
5	0	24	8	16	48
6	0	24	16	16	56
7	0	24	24	16	64

Table 5-13 and **Figure 5-18** show the COH population projections, wastewater flow projections, and the treatment plant potential phased capacity expansions.

5.3.5.2.6 Solids Handling and Effluent Disposal

Solids handling at the COH WRF consists of aerated storage, mechanical dewatering, and landfill disposal. WAS and chemical sludge is delivered to the aerated sludge holding basin complex, which consists of five 262,300-gallon rectangular tanks. Following storage, WAS and chemical sludge are decanted using downward acting weirs and are blended together in a mechanically mixed tank. Belt filter press feed pumps deliver the sludge to the Solids Processing Building where it is conditioned with polymer and dewatered using four belt filter presses. Dewatered cake is transported to a facility for storage and then hauled to the Apex Landfill for disposal.

The COH WRF is authorized to discharge treated effluent to the Las Vegas Wash at Pabco Road under NDEP Permit No. NV0022098 and, along with treated effluent from WWTP No. 3, to the RIBs, evaporation/percolation ponds, and approved effluent reuse sites under NDEP Permit No. NEV80003. When SCOP is operational, the COH WRF will be permitted to discharge via SCOP.

Table 5-13

**COH Population Projections,
Wastewater Flows, and Treatment Facilities Capacity**

Year	Population Projections	Wastewater Flow (mgd)	COH Treatment Facilities Capacity (mgd)
2006	262,112	20 [a]	27
2010	332,633	32	32
2015	436,482	41	48
2020	524,560	50	56
2025	586,972	56	64
2030	614,461	58	64

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

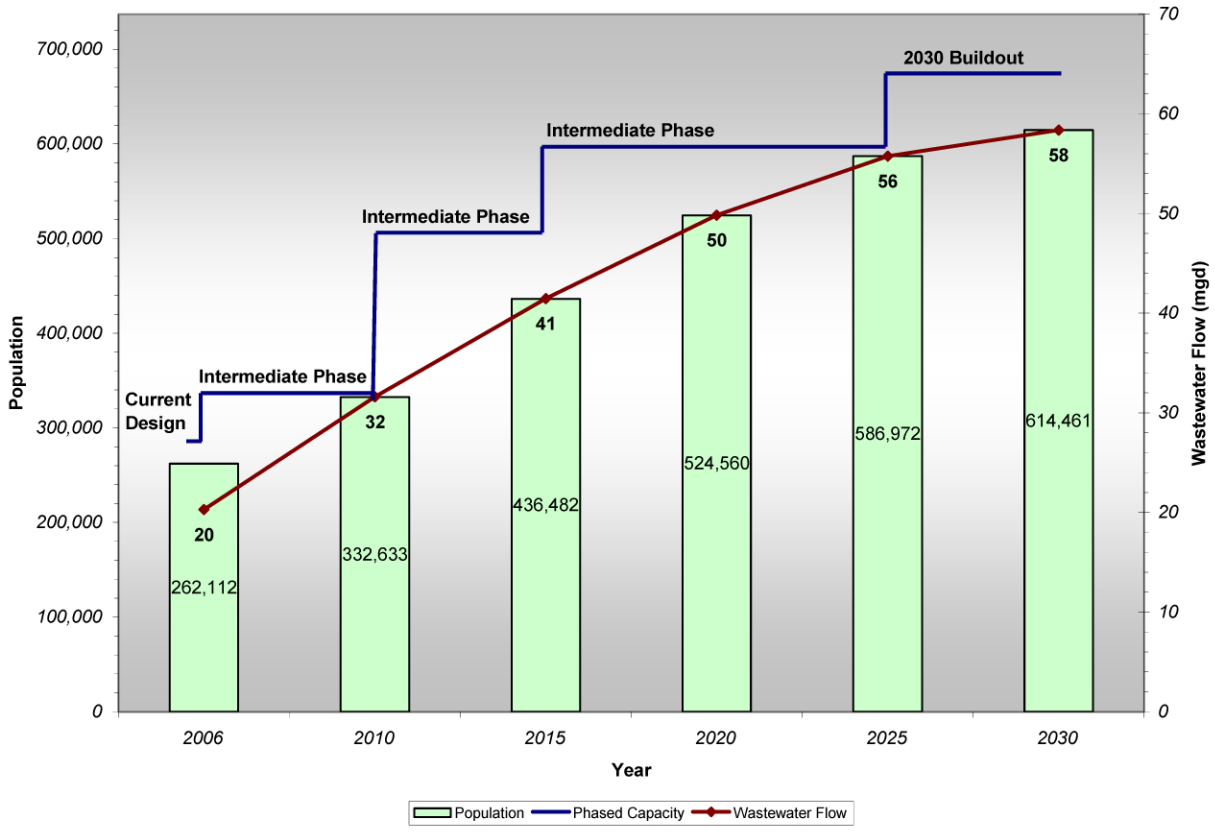


**Figure 5-18
COH Population Projections,
Wastewater Flows, and Treatment Facilities Capacity**

According to the *SWRF Predesign Report Volume I 2005*, the Southwest WRF will probably be included in the existing NDEP discharge permits as an alternate discharge point. Other than

ammonia and phosphorus, discharge requirements that apply to the COH WRF will apply to the Southwest WRF.

5.3.5.3 City of Las Vegas

The CLV is located in Planning Area 5, in the Las Vegas Valley.

5.3.5.3.1 Existing Collection System

The CLV existing wastewater collection system service area encompasses more than 65 square miles. The collection system is composed of approximately 676 miles of pipeline. There are some areas of unincorporated Clark County that are served by the CLV collection system, due to their proximity to the CLV treatment facility. This service is administered through interlocal agreements between CLV and CCWRD.

5.3.5.3.2 Existing Treatment Facilities

Three WWTFs are located in CLV, the WPCF, the Durango Hills WRC, and the Bonanza/Mojave WRC. The WPCF serves both the CLV and CNLV. **Table 5-14** shows the design capacity for the three WWTFs in CLV. According to the average of the monthly flows included in the *SWAC 2006 Year End Summary*, in 2006, the average wastewater flows for CLV were approximately 69 mgd.

Table 5-14

CLV Wastewater Treatment Facilities

Facility	2006 Design Capacity (mgd)	Design Flow Basis
WPCF	91	Maximum Month
Durango Hills WRC	10*	Seasonal Demand
Bonanza/Mojave WRC	1	Seasonal Demand
CLV Total	102	

Note:

* 10 mgd of reclamation capacity requires 11.1 mgd of influent wastewater treatment capacity

5.3.5.3.2.1 City of Las Vegas Water Pollution Control Facility

Wastewater flows from the CLV and CNLV are treated at the CLV WPCF. The facility consists of four parallel secondary treatment trickling filter secondary treatment plants and a single parallel BNR plant. The WPCF is composed of six plants with a total design capacity of 91 mgd. A centralized facility provides screenings and grit removal for all plants, and is the application point of ferric chloride for phosphorus removal. Plants 1 through 4 contain primary clarifiers, trickling filters, and secondary clarifies. Plants 5 and 6 contain primary clarifiers, a BNR pump station, BNR aeration basins, flow split, and final clarifiers. **Figure 5-19** shows the CLV WPCF site layout, as provided in the *CLV WPCF 2006 Facility Plan Update*.

5.3.5.3.2.2 Durango Hills Water Resource Center

The Durango Hills WRC provides tertiary treatment using the activated sludge process followed by filtration and UV disinfection. The reclaimed water generated at the WRC is used for 11 golf courses.

5.3.5.3.2.3 Bonanza/Mojave Water Resource Center

The Bonanza/Mojave WRC provides secondary treatment with an oxidation ditch extended aeration activated sludge process. Tertiary treatment is provided by continuous backwash filters and UV disinfection. The reclaimed water generated at the WRC is used for landscape irrigation at one golf course.

5.3.5.3.3 Pretreatment Program

The CLV maintains an industrial waste pretreatment program and issues discharge permits for CIUs, SIUs, and Class II industrial users; the *CLV Annual Report of the Industrial Waste Pretreatment Program 2008* is available from CLV. Discharge limitations defining categorical users are defined by 40 CFR Part 403. This subsection provides a summary of the three classifications of industrial users, mentioned above, in CLV. During the 2005 year, CLV oversaw eight permitted industrial users, including two CIUs, six SIUs, and 952 Class II permits issued to non-SIUs.

Since CNLV does not own or operate a publicly owned treatment works, wastewater is conveyed to either the CLV or CCWRD treatment facilities. The CNLV CIUs, SIUs, and Class II industrial users that discharge to the CLV facility are discussed in Section 5.3.5.4.2



Figure 5-19
CLV WPCF Site Plan

In 2005, CLV recorded no incidents of upset, interference, or passthrough (CLV, 2006).

5.3.5.3.4 Future Collection System

The CLV wastewater collection system will continue to expand during the 20-year planning horizon to meet the service needs of the CLV's current and future residents.

5.3.5.3.5 Future Treatment Facilities

The Deer Springs WRC is a potential satellite facility to be located at the corner of Decatur Boulevard and Deer Springs Way. In the *WPCF 2006 Plan Update*, the Deer Springs WRC is referred to as the North East WRC. The facility is projected to have a 10-mgd capacity; however, the next facility plan update will determine the feasibility and final capacity of the facility.

It is uncertain as to when the CNLV WRF and/or Deer Springs WRC will be in operation and if the satellite reclamation plants will continue to send excess reclaimed water to the WPCF. Because of this, multiple future flow scenarios and related Year 2030 WPCF design flows have been considered, and are shown in **Table 5-15** (Cases 1 through 4).

Table 5-15

CLV Future Flow Scenarios

Case No.	Status of CNLV WRF and Deer Springs WRC	Flow from Existing WRCs	2030 Maximum Month Flow to WPCF (mgd)
1	Constructed	Discharge to Wash	75.6
2	Not Constructed	Discharge to Wash	120.9
3	Constructed	Discharge to WPCF	80.7
4	Not Constructed	Discharge to WPCF	125.6

5.3.5.3.5.1 City of North Las Vegas Water Reclamation Facility and Deer Springs Water Resource Center Constructed (Cases 1 and 3)

In Cases 1 and 3, the WPCF would be modified to treat flows in the range of 75.6 to 80.7 mgd that are less than the current WPCF capacity of 91 mgd. In the *WPCF 2006 Plan Update*, for these flow scenarios, it is recommended to remove all trickling filters from service, add new anoxic and aeration basins and a new secondary clarifier to convert the entire existing plant to BNR.

5.3.5.3.5.2 City of North Las Vegas Water Reclamation Facility and Deer Springs Water Resource Center Not Constructed (Cases 2 and 4)

In Cases 2 and 4, the WPCF would be modified to treat flows up to 125.6 mgd, which exceed the current WPCF capacity of 91 mgd. In the *WPCF 2006 Plan Update*, for these flow scenarios, it is recommended to increase the flow to Plants 5 and 6 and add a 25-mgd BNR plant in the northwest corner of the WPCF site.

5.3.5.3.5.3 Planning Wastewater Treatment Facility Expansion

Table 5-16 and **Figure 5-20** show the CLV population projections, wastewater flow projections, and the treatment plant potential phased capacity expansions for the Case 3 scenario. It should be noted that the temporary decrease in the wastewater flows in 2010 shown in **Table 5-16 and Figure 5-20** is caused by the removal of CNLV flows from the CLV system. The CLV treatment facility capacity shown in **Table 5-16** includes 91 mgd at the CLV WPCF, 10 mgd at the Durango Hills WRC, and 1 mgd at the Bonanza/Mojave WRC.

Table 5-17 and **Figure 5-21** show the CLV population projections, wastewater flow projections, and the treatment plant phased potential capacity expansions for the Case 4 scenario. The CLV treatment facility capacity shown in **Table 5-17** includes 10 mgd at the Durango Hills WRC, 1 mgd at the Bonanza/Mojave WRC, and, initially, 91 mgd at the CLV WPCF with an expansion to 125.6 mgd in 2020.

5.3.5.3.6 Solids Handling and Effluent Disposal

Biosolids treatment processes at the WPCF consist of separate primary and secondary sludge thickening followed by anaerobic digestion. The primary sludge is gravity thickened and the secondary sludge is thickened using centrifuges. Following anaerobic digestion, the biosolids are mechanically dewatered using centrifuges. The CLV biosolids are rated as Class B biosolids and are trucked to a landfill for disposal.

Solids handling is not performed at the Bonanza/Mojave WRC and the Durango Hills WRC and the WAS is discharged into a sanitary sewer for conveyance to the WPCF.

Table 5-16

CLV Case 3: Population Projections, Wastewater Flows, and Treatment Facilities Capacity

Year	Population Projections	Wastewater Flow (mgd)	CLV Treatment Facilities Capacity (mgd)
2006	794,056	69 [a]	102
2010	687,751	62	102
2015	788,221	71	102
2020	867,245	78	102
2025	934,265	84	102
2030	989,723	89	102

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

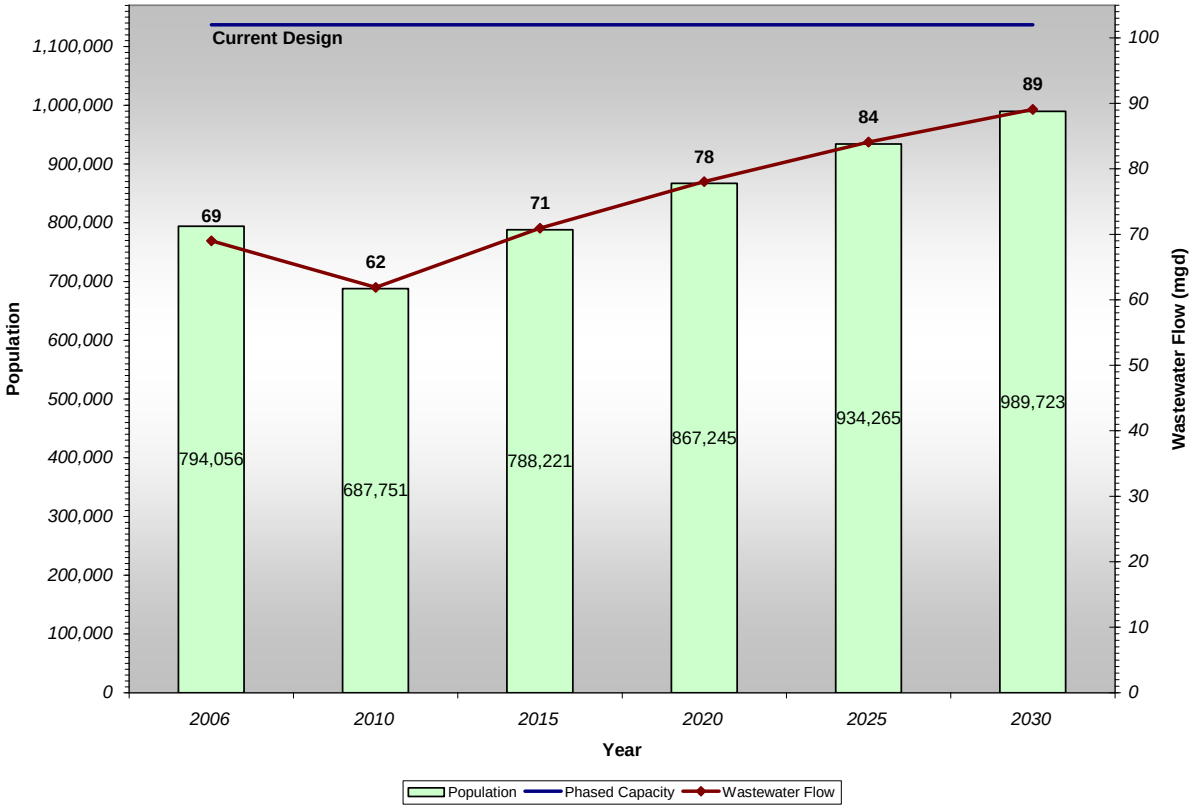


Figure 5-20
CLV Case 3: Population Projections, Wastewater Flows, and Treatment Plant Capacity

Table 5-17

CLV Case 4: Population Projections, Wastewater Flows, and Treatment Facilities Capacity

Year	Population Projections	Wastewater Flow (mgd)	CLV Treatment Facilities Capacity (mgd)
2006	794,056	69 [a]	102
2010	964,245	87	102
2015	1,126,528	101	102
2020	1,264,107	114	137
2025	1,377,614	124	137
2030	1,489,058	134	137

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

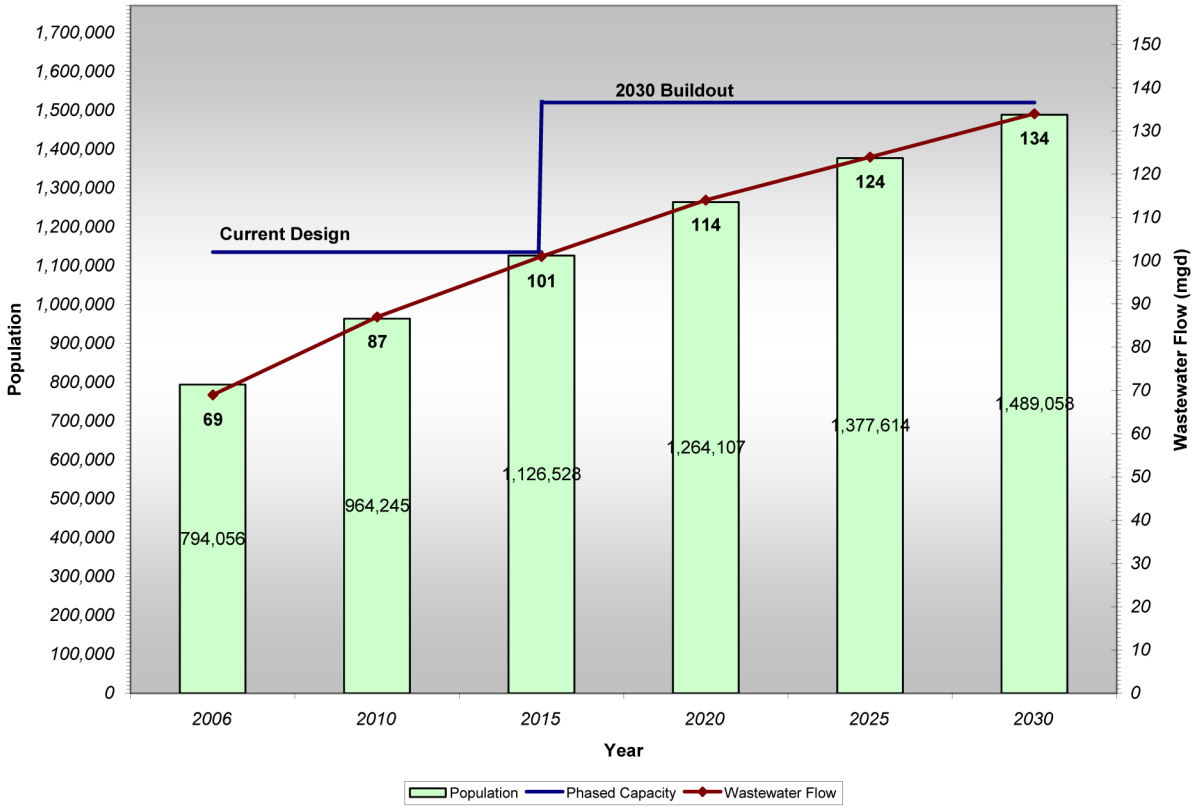


Figure 5-21
CLV Case 4: Population Projections, Wastewater Flows, and Treatment Plant Capacity

The WPCF and Durango Hills WRC are authorized by NDEP Permit No. NV0020133 to discharge effluent to Las Vegas Wash. In addition, the WPCF is authorized by NDEP

Permit No. NEV98015 to discharge reclaimed water to the Nevada Power Station, Stallion Mountain Country Club, Royal Links Golf Club, and irrigation for landscaping on site. When SCOP is operational, the WPCF will be permitted to discharge via SCOP. The Durango Hills WRC also is authorized by NDEP to discharge to groundwater of the state via reuse percolation under Permit No. NEV98005. The Bonanza/Mojave WRC is authorized by NDEP Permit No. NV96020 to discharge to the Desert Pines Golf Course and the WPCF.

5.3.5.4 City of North Las Vegas

The CNLV is located in Planning Area 5, in Las Vegas Valley. The CNLV wastewater flows are presently treated at the CLV WPCF and the CCWRD. Most, if not all, of these flows will be directed to the proposed CNLV's WRF when it is constructed. The following information for the CNLV collection system and WRF was taken from the *CNLV WRF Amendment (2005)*; it is included to describe the proposed WRF to treat wastewater flow in CNLV.

5.3.5.4.1 Existing Collection System

CNLV is delineated into five wastewater drainage subbasins that will contribute flow to the proposed WRF. CNLV has developed a wastewater collection system to collect wastewater flows within each of the individual subbasins. The current configuration of CNLV's collection system allows for wastewater flows from Subbasins 1, 2, 3 and 4 to be collected and directed to the proposed WRF by gravity. Flows from Subbasin 5 cannot be gravity drained to the WRF, and may need to be pumped to the proposed WRF, or directed to the CLV WPCF for treatment if a mutual agreement can be reached between the CNLV and the CLV. If it is decided to treat flows at the WRF, a small lift station will be provided at the intersection of Pecos Road and Owens Avenue to pump the flow to the WRF. The average daily flow from Subbasin 5 is estimated to be 3 mgd; thus, the lift station should be sized for 6 mgd peak hour factor. Wastewater flow pumped to the WRF from Subbasin 5 will be conveyed via a new force main. If the CNLV WRF is located at the Nellis Air Force Base site, all subbasins will gravity flow to the WRF site.

5.3.5.4.2 Pretreatment Program

CLV maintains an industrial waste pretreatment program and issues discharge permits for CIUs, SIUs, and Class II industrial users; the CNLV POTW Pretreatment Annual Report for the CLV 2005 and CNLV POTW Pretreatment Annual Report for the CCWRD 2005 were obtained from CNLV. Discharge limitations defining categorical users are defined by 40 CFR Part 403. This subsection provides a summary of the three classifications of industrial users, mentioned above, in CNLV.

During the 2005 year, CNLV oversaw 348 permitted industrial users, including one CIU, seventeen SIUs, and 330 Class II Users that discharge to the CLV. Thirteen of the SIUs all exceed the flow rate of 25,000 gpd (0.025 mgd) of process wastewater, categorizing them at significant users and four of the SIUs were permitted due to potential harm to the publicly owned treatment works.

In addition, CNLV oversaw 46 permitted industrial users, including six SIUs and 40 Class II Users that discharge to the CCWRD. Two of the SIUs all exceed the flow rate of 25,000 gpd (0.025 mgd) of process wastewater, categorizing them at significant users and four of the SIUs were permitted due to potential harm to the publicly owned treatment works.

5.3.5.4.3 Future Collection System

The CNLV wastewater collection system will continue to expand during the 20-year planning horizon to meet the service needs of the CNLV's current and future residents.

5.3.5.4.4 Proposed Treatment Facilities

The CNLV WRF site shown in **Figure 5-1** is the Nellis Air Force Base site; however, two sites are being considered, the Nellis Air Force Base site and the Frehner/Alexander site.

Many issues were considered when selecting the appropriate treatment process for the new WRF, such as effluent limitations, the proposed site, and life cycle cost. Based on the analyses of the proposed alternatives, the proposed WRF will be designed with the MBR process. Detailed design criteria for the treatment process for the WRF will be addressed in the facility plan. The WRF will be built in phases, with an initial average daily flow of 25 mgd and ultimate average daily flow of 50 mgd. Under the phased expansion approach, the proposed average daily flow treatment capacity will exceed the projected influent flow rates; thus, some excess capacity is available. In addition, the MBR process can be easily expanded to meet increased influent flow rates by adding additional membrane trains. An outfall and piping from the WRF to the outfall, sized to address the ultimate projected maximum month surplus effluent flow rate of 43.1 mgd, will also be incorporated in Phase I. According to the *SWAC 2006 Year End Summary*, in 2006, the average wastewater flows for CNLV were 15.9 mgd.

Table 5-18 and **Figure 5-22** show the CNLV population projections, wastewater flow projections, and the treatment plant phased capacity expansions.

Table 5-18

CNLV Wastewater Flows and Treatment Plant Capacity

Year	Population Projections	Wastewater Flow (mgd)	WRF Capacity (mgd)
2006	202,520	18	25
2010	276,494	25	25
2015	338,307	30	50
2020	396,862	36	50
2025	443,349	40	50
2030	499,335	45	50

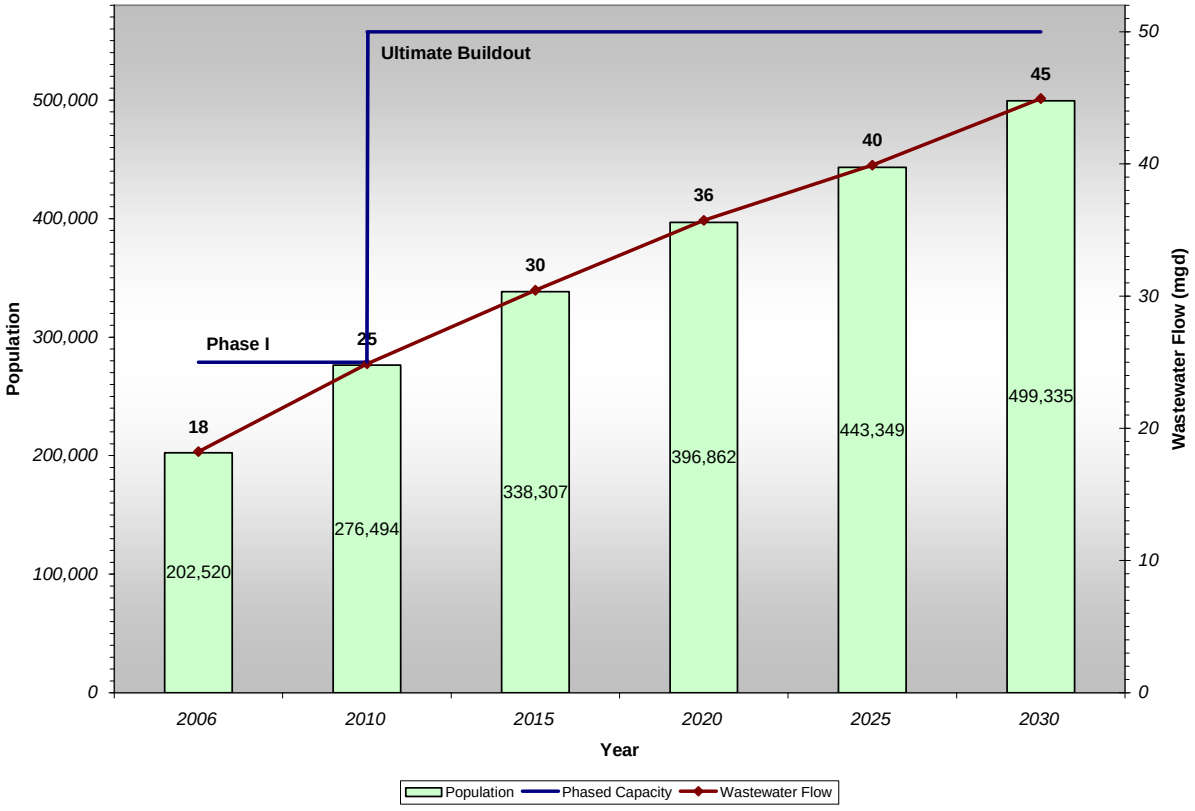


Figure 5-22
CNLV Population Projections, Wastewater Flows, and Treatment Plant Capacity

5.3.5.4.5 Solids Handling and Effluent Disposal

Solids dewatering methods under consideration include belt filter presses, centrifuges, or plate and frame presses. Further evaluation will need to be conducted for the facility plan to determine the most cost-effective dewatering alternative for the proposed WRF.

As stated in the *CNLV WRF Amendment (2005)*, the overall objective for effluent disposal from the proposed WRF is to maximize reuse for irrigation and commercial/industrial use. Black & Veatch (B&V) is under contract with the CWC and SNWA to prepare the *Southern Nevada Regional Water Reuse Study*, which may include more detailed information for reclaimed water usage for CNLV. However, demand for reuse is not expected to consistently match the wastewater flows into the WRF; thus, disposal of effluent will be required at times. Until the reuse distribution system is designed and installed, effluent flows that will be discharged will equal the WRF influent wastewater flows.

Two additional options for discharge of effluent were discussed in the *CNLV WRF Amendment (2005)*, either to surface waters or to an injection well. Surplus effluent can be discharged to the Las Vegas Wash system or to the Sloan Channel, and several alternative discharge locations are available in the upper Las Vegas Wash in the vicinity of the potential WRF sites. If the CNLV WRF is sited at the Frehner/Alexander site, significant improvements may need to be made to the Las Vegas Wash to discharge the treated effluent. If the CNLV WRF is located at the Nellis Air Force Base site, the Sloan Channel, which is concrete lined, would be the location for treated effluent discharge. Final selection of the discharge location will need to consider the selected WRF site.

A pipeline and outfall structure will be provided as part of the WRF construction to deliver treated effluent to the discharge point. CNLV plans to conduct a study to determine if there will be any impacts to the Las Vegas Wash system downstream of the WRF effluent discharge point, and perform an evaluation of the best way to mitigate identified impacts. Discussions between CNLV and jurisdictional agencies that monitor and maintain the Las Vegas Wash system have been initiated, and CNLV will also coordinate with the CWC. A potential effluent disposal method for future consideration is groundwater injection. Permit requirements for a Class V injection well stipulate that the applicant must demonstrate the underground injection of the fluid into the ground will not endanger any source of drinking water.

The discharge options for this project include treated wastewater flows to meet reuse demands and return flow credits through discharge to the Las Vegas Wash, and each of these options help to extend southern Nevada's water resources. Direct well injection does not provide a resource benefit, since Nevada law does not currently allow water resource credits to be obtained for discharge through direct well injection. The effective management of water resources in southern Nevada is an important consideration in the assessment of

potential disposal options. When SCOP is operational, the CNLV WRF will be permitted to discharge via SCOP.

5.3.5.5 Blue Diamond

The community of Blue Diamond is located 20 miles southwest of Las Vegas on State Route 159.

5.3.5.5.1 Existing Collection System

According to the *CCWRD Facilities Master Plan (2004)*, the Blue Diamond wastewater system is composed of approximately 3 miles of pipeline and 65 manholes. The Blue Diamond wastewater system consists of two main areas, the residential collection system west of the ponds, and the former James Hardie Gypsum Mine north of the ponds. Sewage generated in the community of Blue Diamond and at the gypsum mine is collected in sewer pipelines and conveyed to the Blue Diamond WWTF.

5.3.5.5.2 Existing Treatment Facilities

The Blue Diamond WWTF is owned and operated by the CCWRD and the average daily design flow rate is 0.044 mgd. The Blue Diamond WWTF includes a headworks vault, one primary pond, Pond No. 1, and two secondary ponds, Pond Nos. 2 and 3. Pond No. 1 is asphalt lined, has a surface area of 0.65 acre, and is designed to stabilize the wastewater by natural biological processes. Supernatant from Pond No. 1 flows to the unlined Pond No. 2 for disposal. Overflows from Pond No. 2 are conveyed to Pond No. 3, which functions as a RIB. The layout of the Blue Diamond WWTF is shown in **Figure 5-23**.

5.3.5.5.3 Blue Diamond Septic Systems

According to the *CCWRD Facilities Master Plan (2004)*, there are four permitted septic systems in operation in Blue Diamond; however, in the CCWRD handout provided at the CCWRD Coordination Meeting held on December 6, 2007, there are 17 permitted septic systems in Blue Diamond. Using the assumptions that each septic system is connected, at minimum, to one single-family dwelling and using 2.5 persons per single-family dwelling, the number of people using septic systems is 43 (the product of 2.5 persons per dwelling and 17 permitted septic systems). This number of people will be subtracted from the population projections, since they are not connected to the sewer system.



Figure 5-23
Blue Diamond WWTF Site Plan

5.3.5.5.4 Pretreatment Program

There is no industrial pretreatment program in Blue Diamond.

5.3.5.5.5 Future Collection System

The Blue Diamond wastewater collection system will expand during the 20-year planning horizon to meet the service needs of the current and future residents.

5.3.5.5.6 Future Treatment Facilities

The current design capacity of the Blue Diamond WWTF is 0.044 mgd. An expansion to 0.064 mgd was indicated in the *CCWRD Facilities Master Plan (2004)*.

Wastewater flows for Blue Diamond were generated from the residential population in Section 4, and in this section, wastewater flows were developed for the industrial facilities, specifically the former James Hardie Gypsum Mine. Industrial wastewater flows, as provided in the *CCWRD Facilities Master Plan (2004)*, have been included for Blue Diamond.

According to the *Enterprise WRC Facility Plan 2006*, wastewater generated in the Blue Diamond service area will be conveyed by gravity to the Enterprise WRC. As discussed previously, the Enterprise WRC is planned to be operational in 2011, so expansion of the Blue Diamond WWTF may not be required after 2011.

To determine the wastewater flow contribution, population projections connected to the sewer system (total population minus permitted sewer systems in 2007) have been calculated. It is recommended that if plans to convert septic systems to connection to the sewer system are developed, the wastewater flow projections in Blue Diamond be revisited in future updates to the *Clark County Area-Wide WQMP*.

Table 5-19 and **Figure 5-24** show the Blue Diamond population projections, wastewater flow projections, and the treatment plant potential phased capacity expansions.

Table 5-19

**Blue Diamond Population Projections,
Wastewater Flows and WWTF Capacity**

Year	Population Projections	Population Projections (connected to sewer system)	Residential Wastewater Flow (mgd)	Industrial Wastewater Flow (mgd)	Total Wastewater Flow (mgd)	WWTF Capacity (mgd)
2006	439	396	0.040	0.013	0.053	0.044
2010	467	424	0.042	0.014	0.056	0.064
2015	504	461	0.046	0.016	0.062 [a]	0.064 [a]
2020	544	501	0.050	0.017	0.067 [a]	0.064 [a]
2025	588	545	0.055	0.019	0.074 [a]	0.064 [a]
2030	635	592	0.059	0.021	0.080 [a]	0.064 [a]

Note:

[a] After 2011, wastewater may be conveyed to Enterprise WRC

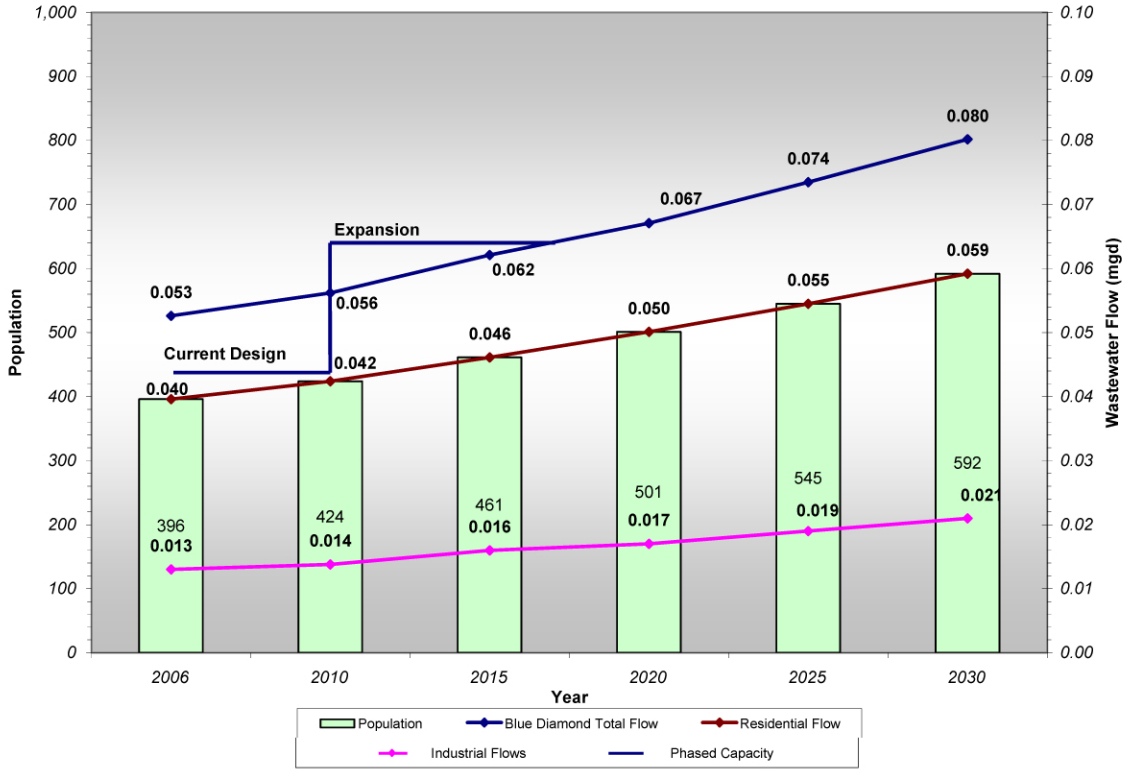


Figure 5-24
**Blue Diamond Population Projections,
Wastewater Flows, and WWTF Capacity**

5.3.5.5.7 Solids Handling and Effluent Disposal

To remove or reduce the solids that accumulate, the CCWRD uses a bio-culture that degrades the solids by as much as 65 percent. Sludge depths are recorded for the ponds, and when a level that affects the performance of treatment is reached, the bio-culture is introduced. The bio-culture is introduced once per year or whenever the solids level reaches a set point.

The Blue Diamond WWTF is authorized by NDEP Permit No. NEV50050 to discharge to groundwater through percolation.

5.3.5.5.8 Water Quality Monitoring

Groundwater monitoring is conducted quarterly for TDS, chloride, nitrate as N, total nitrogen as N, groundwater elevation, and static water level.

5.3.5.6 Sloan

Sloan is located approximately 4 miles south of the Las Vegas Valley. Sloan consists of mainly rural development, some tourist sites, a mobile home community, a mining operation, and uses septic systems. If Las Vegas development moves south, demand for utilities could increase in Sloan and change the wastewater facilities from septic systems to wastewater collection systems. If a surface water discharge occurs in the future, it is likely the discharge termination point will be via Duck Creek or Pittman Wash, which is located in Planning Area 5.

5.3.5.6.1 Proposed Southern Nevada Regional Heliport

It is anticipated that a commercial septic system would be used to treat all onsite wastewater flows. Following treatment, CCDOA intends to discharge the flows to a nearby leach field.

5.3.5.7 Planning Area 5 Septic Systems

As provided in the septic system GIS file, there are 16,739 permitted septic systems located in Planning Area 5.

5.3.5.8 Planning Area 5 Summary

Table 5-20 summarizes the information for the WWTFs within Planning Area 5 in 2006.

Table 5-20

Planning Area 5 Wastewater Treatment Facilities

Treatment Facility	2006 Capacity (mgd)	2006 Annual Average Flows (mgd)
CCWRD Main Plant	98	N/A
Desert Breeze WRC	5	N/A
CCWRD Total	103	101
CLV WPCF	91	N/A
Bonanza/Mojave WRC	1	N/A
Durango Hills WRC	10	N/A
CLV Total	102	69
COH	27	20.3
Blue Diamond WWTF	0.044	N/A
Total Planning Area 5	**232**	**190.3**

Note:

N/A – Not Available

Table 5-21 summarizes the information for the WWTFs within Planning Area 5 for the planning period. This summary includes the assumptions that the CNLV WRF will be constructed and that the Blue Diamond WWTF will not be in operation in 2020. For the unincorporated County areas that CCWRD does not currently serve, CCWRD's plan for the future is for developers to build the system and then the CCWRD will take over ownership and operation of the system.

5.3.6 Planning Area 6 – Ivanpah - Pahrump Valleys

Planning Area 6 includes the WWTFs in Boulder City, Jean, and Primm, as well as wastewater flows from the proposed Ivanpah Airport, Sandy Valley, Goodsprings, and septic systems throughout the planning area.

5.3.6.1 City of Boulder City

The Boulder City WWTF is located at 2000 Buchanan Boulevard, south of the Boulder City Municipal Airport. The WWTP serves only the residents within Boulder City.

Table 5-21

Summary of WWTFs in Planning Area 5

Year	CCWRD		COH		CLV		CNLV		Blue Diamond WWTF		WWTFs in Planning Area 5	
	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)
2006	102.5	101	27	20	102	69	0	0	0.04	0.05	232	190
2010	135	120	40	32	102	62	25.0	25	0.06	0.06	302	239
2015	150	145	48	41	102	71	50.0	30	0.06 [a]	0.06 [a]	350	288
2020	175	159	56	50	102	78	50.0	36	0.06 [a]	0.07 [a]	383	322
2025	175	161	64	56	102	84	50.0	40	0.06 [a]	0.07 [a]	391	341
2030	175	162	64	58	102	89	50.0	45	0.06 [a]	0.08 [a]	391	354

Note:

[a] After 2011, wastewater may be conveyed to Enterprise WRC

5.3.6.1.1 Existing Collection System

The sewage collection system consists of approximately 65 miles of gravity sewer pipe and 2.5 miles of force main.

5.3.6.1.2 Existing Treatment Facilities

According to the *Boulder City Master Plan*, the average daily design capacity of the Boulder City WWTF is 1.8 mgd and the process units include primary treatment, aeration basins, facultative lagoons, and a chlorine contact channel. Primary treatment consists of a comminutor and manually cleaned bar screens in the bypass channel. The aeration basins are each 2.4-acre rectangular basins that include surface aerators for mixing. The two facultative lagoons are 11 acres each, and are rectangular in shape. Before discharge, flow is disinfected in the chlorine contact chambers/channels. The process flow schematic for the Boulder City WWTF, as provided in *City of Boulder City Wastewater Treatment Plant Improvements Engineering Report – Phase II*, is shown in **Figure 5-25**. According to the *SWAC 2006 Year End Summary*, the average wastewater flows for CLV were 1.09 mgd in 2006.

5.3.6.1.3 Future Collection System

The Boulder City wastewater collection system will continue to expand during the 20-year planning horizon to meet the service needs of the Boulder City's current and future residents.

5.3.6.1.4 Future Treatment Facilities

Table 5-22 and **Figure 5-26** show the Boulder City population projections, wastewater flow projections, and the treatment plant potential phased capacity expansions. The wastewater flow projections are based on planning contribution factors provided by Boulder City. Wastewater flow should continue to be monitored by Boulder City so that plant expansions can be initiated at the appropriate time. The timing of the proposed expansions shown on **Figure 5-26** could change dependent on actual wastewater flows.

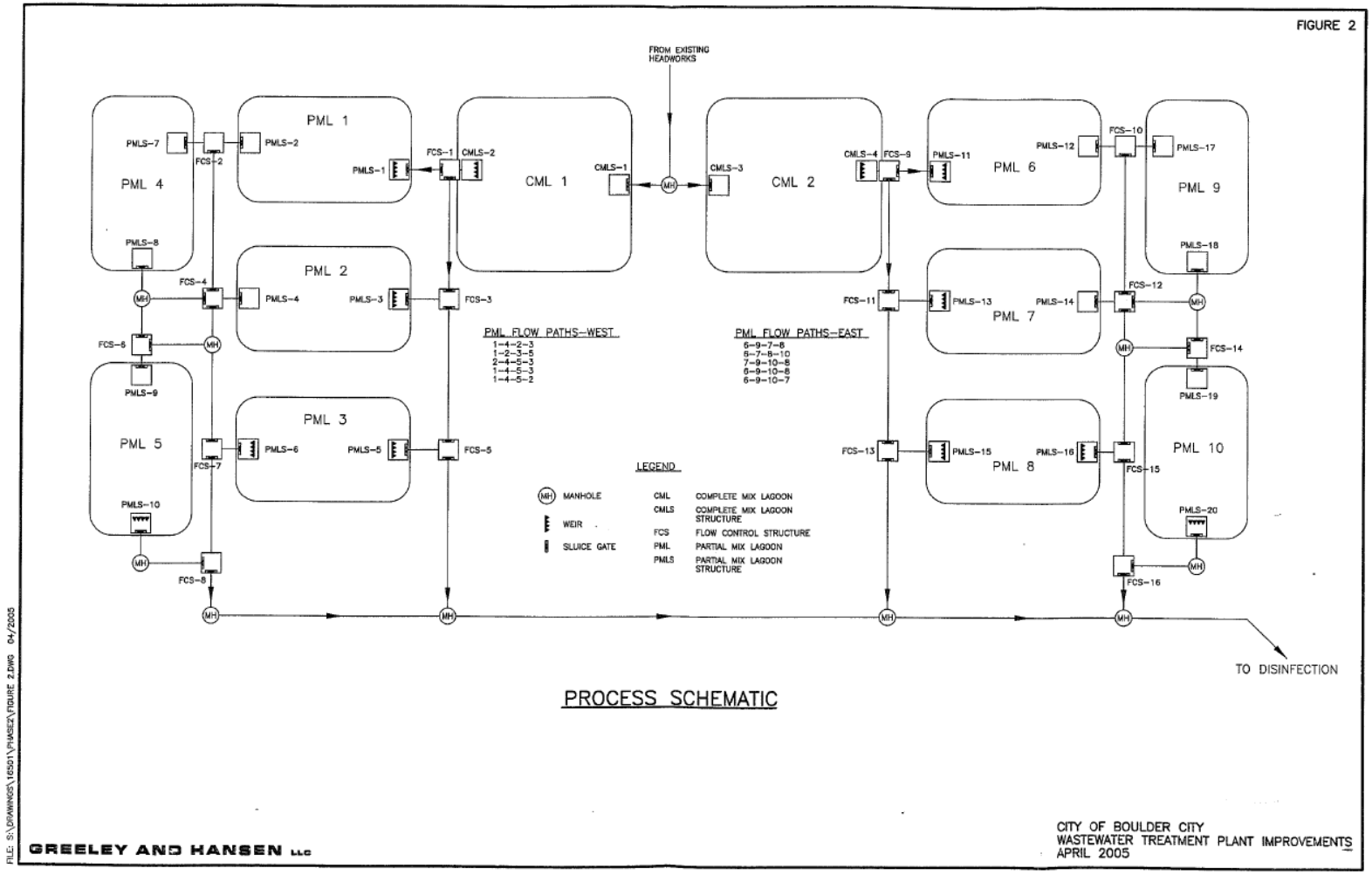


Figure 5-25
Boulder City WWTF Process Schematic

Table 5-22

Boulder City Population Projections, Wastewater Flows and Treatment Plant Capacity

Year	Population Projections	Wastewater Flow (mgd)	WRF Capacity (mgd)
2006	15,748	1.1 [a]	1.8
2010	16,000	1.8	1.8
2015	17,000	2.0	2.3
2020	18,000	2.1	2.3
2025	19,000	2.2	2.3
2030	20,000	2.3	2.8

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

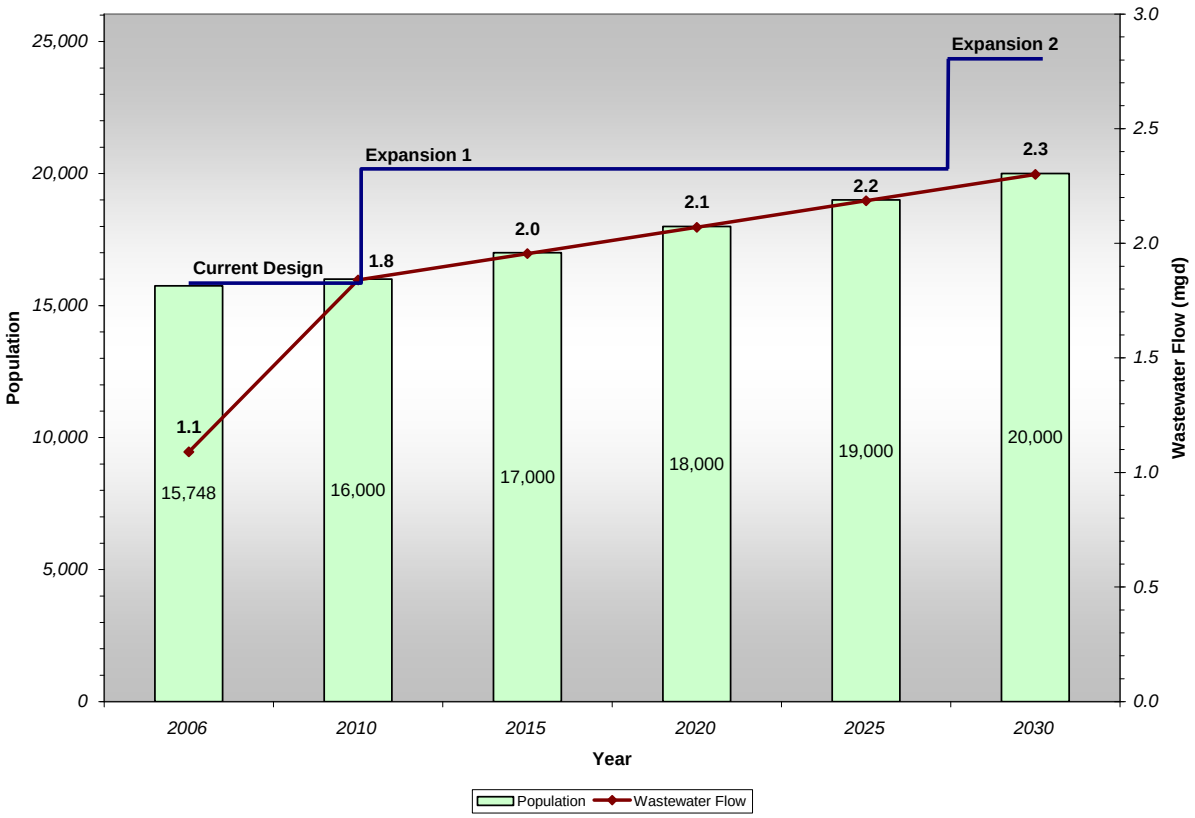


Figure 5-26
Boulder City Population Projections, Wastewater Flows, and Treatment Plant Capacity

5.3.6.1.5 Solids Handling and Effluent Disposal

Periodically, the aeration basins are dewatered and settled sludge is removed for disposal at the landfill.

The Boulder City WWTF is authorized by NDEP Permit No. TNEV2007465 to discharge effluent to groundwater via percolation from two effluent disposal channels. Effluent is also permitted to be discharged to Quarry #157 under NDEP Permit No. NEV93013 and Construx Aggregate Pit, pending approval of the NDEP permit.

5.3.6.2 Jean

Jean is located 30 miles southeast of Las Vegas on Interstate 15. The community is composed of two casinos, the Gold Strike Hotel and Gambling Hall and the Nevada Landing Casino and Hotel (which recently closed), as well as the Southern Nevada Correctional Center (please note that the Jean Conservation Camp shown in **Figure 5-27** is the Southern Nevada Correctional Center). The Jean WWTF, also known as the Gold Strike WWTF, treats wastewater from these resorts, and some of the effluent is reused for irrigation.

5.3.6.2.1 Existing Collection System

According to the *CCWRD Facilities Master Plan (2004)*, the Jean collection system, also known as the Gold Strike collection facility, is composed of over 1 mile of pipeline and 22 manholes. The Jean collection system consists of two main branches, the southern and northern branches, which serve the Gold Strike Hotel and Casino and the now closed Nevada Landing Casino and Hotel, respectively.

5.3.6.2.2 Existing Treatment Facilities

The Jean WWTF is a package plant with a design capacity of 0.6 mgd. The plant uses the activated sludge process and operates in the extended aeration mode. The Jean WWTF includes a bar rack, five aeration basins, two settling basins, and chlorine contact chambers. After the water is chlorinated, it is conveyed to one of two effluent storage basins and is ready for reuse or disposal. The Jean WWTF currently receives recharge credits for a portion of the effluent treated. Additional cells are easily designed and constructed, which will make expansions to the facility relatively simple and cost efficient. The layout of the Jean WWTF is shown in **Figure 5-27**.

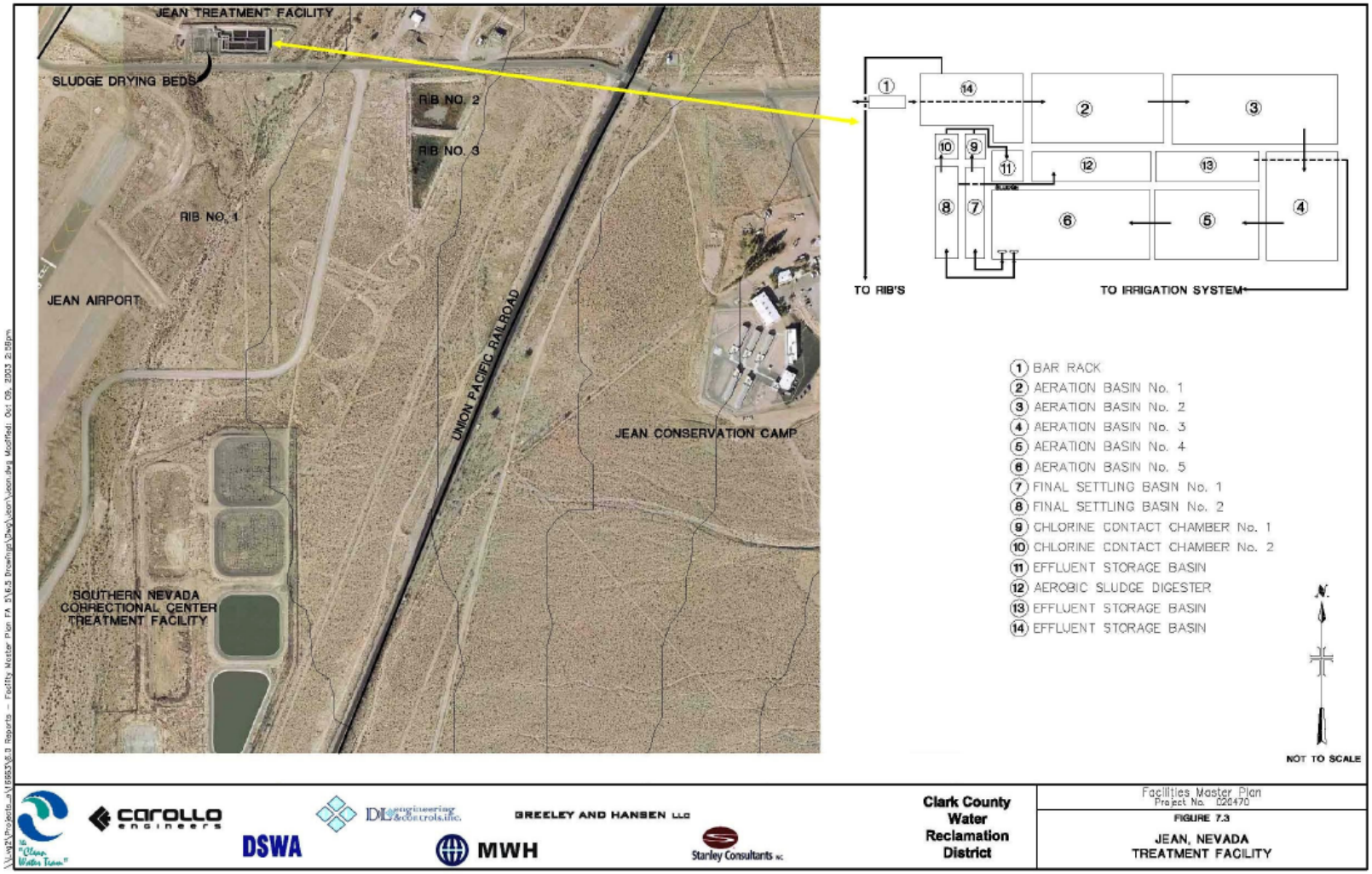


Figure 5-27
Jean WWTF Site Plan

5.3.6.2.3 Solids Handling and Effluent Disposal

Solids from the aerobic sludge digester are delivered to one of three sludge drying beds. The asphalt-lined beds consist of a decant piping network designed to return the underflow back to the start of the treatment process. The beds are constructed with a 1-foot layer of sand to promote a quicker drying period. Dried sludge is shoveled off the sand layer by a front-end loader and loaded into a truck for transportation to a landfill.

The Nevada Department of Corrections at the Southern Nevada Correctional Center and the Jean Development Company doing business as (dba) the Gold Strike Hotel are authorized by NDEP to discharge under Permit Nos. NEV87002 and NEV87006, respectively. The effluent generated in the package plant is sent to an effluent storage basin before being pumped to either the RIBs or to an irrigation system.

Jean is equipped with an irrigation system that reuses wastewater effluent for landscape irrigation for the Interstate 15/Jean Interchange, an Arco Station, the Nevada Landing Hotel, the Gold Strike Hotel, the Jean Welcome Center, and the Jean Post Office.

5.3.6.2.4 Jean Septic Systems

The *CCWRD Facilities Master Plan (2004)* indicated nine permitted septic systems in Jean; however, the CCWRD does not own nor operate the Jean WWTF and is not the permitting authority of septic systems.

5.3.6.3 Primm

Primm is located 45 miles southwest of Las Vegas on Interstate 15 at the Nevada/California border; the community is composed of Whiskey Pete's Hotel and Casino, an RV park, the Primm Valley Resort and Casino, Buffalo Bill's Resort and Casino, the Fashion Outlet Mall, a service station, a restaurant, and an employee housing development.

5.3.6.3.1 Existing Collection System

According to the *CCWRD Facilities Master Plan (2004)*, the wastewater collection system in Primm is composed of more than 2 miles of pipeline, approximately 22 manholes, and four lift stations, the Westside, the Eastside, the Fashion Outlet, and Lotto Lift Stations. The collection system can be separated into two distinct reaches on either west or east of Interstate 15.

5.3.6.3.2 Existing Treatment Facilities

The Primm package plant is designed with a 1.0-mgd capacity and consists of two grinders, two equalization basins, an anoxic chamber, four aeration basins, two final settling basins, a chlorine contact chamber, and an aerobic sludge digester. The layout of the Primm WWTF is shown in **Figure 5-28**. According to the *Enco Southwest Discharge Monitoring Reports (2006-07)*, the average wastewater flow for Primm was 0.48 mgd in 2006.

5.3.6.3.3 Solids Handling and Effluent Disposal

The WAS generated in the final settling basin flows into the aerobic sludge digester for treatment. The sludge is pumped to the sludge drying beds. There are eight existing beds and each bed has a bottom area of 5,000 square feet. Thus, the total area provided by the eight beds is 40,000 square feet.

The Reliant Energy Bighorn Generating Facility is authorized to discharge effluent under Permit No. NEV2002500 and the Primadonna Corporation LLC is authorized by NDEP to discharge under Permit No. NEV90001.

Options for discharging treated wastewater effluent include reuse at the Bighorn Generating Facility as power plant cooling water or discharge to RIBs. Effluent from the WWTP is pumped to a wet well and storage tank to supply cooling water to Bighorn Generating Facility. If the storage tank is full and no additional water is required, the effluent will overflow to a discharge line, which transports the treated effluent to the RIBs via gravity.

5.3.6.3.4 Primm Septic Systems

In the *CCWRD Facilities Master Plan (2004)*, two permitted septic systems were located in Primm; however, the CCWRD does not own nor operate the Primm WWTF and is not the permitting authority of septic systems.

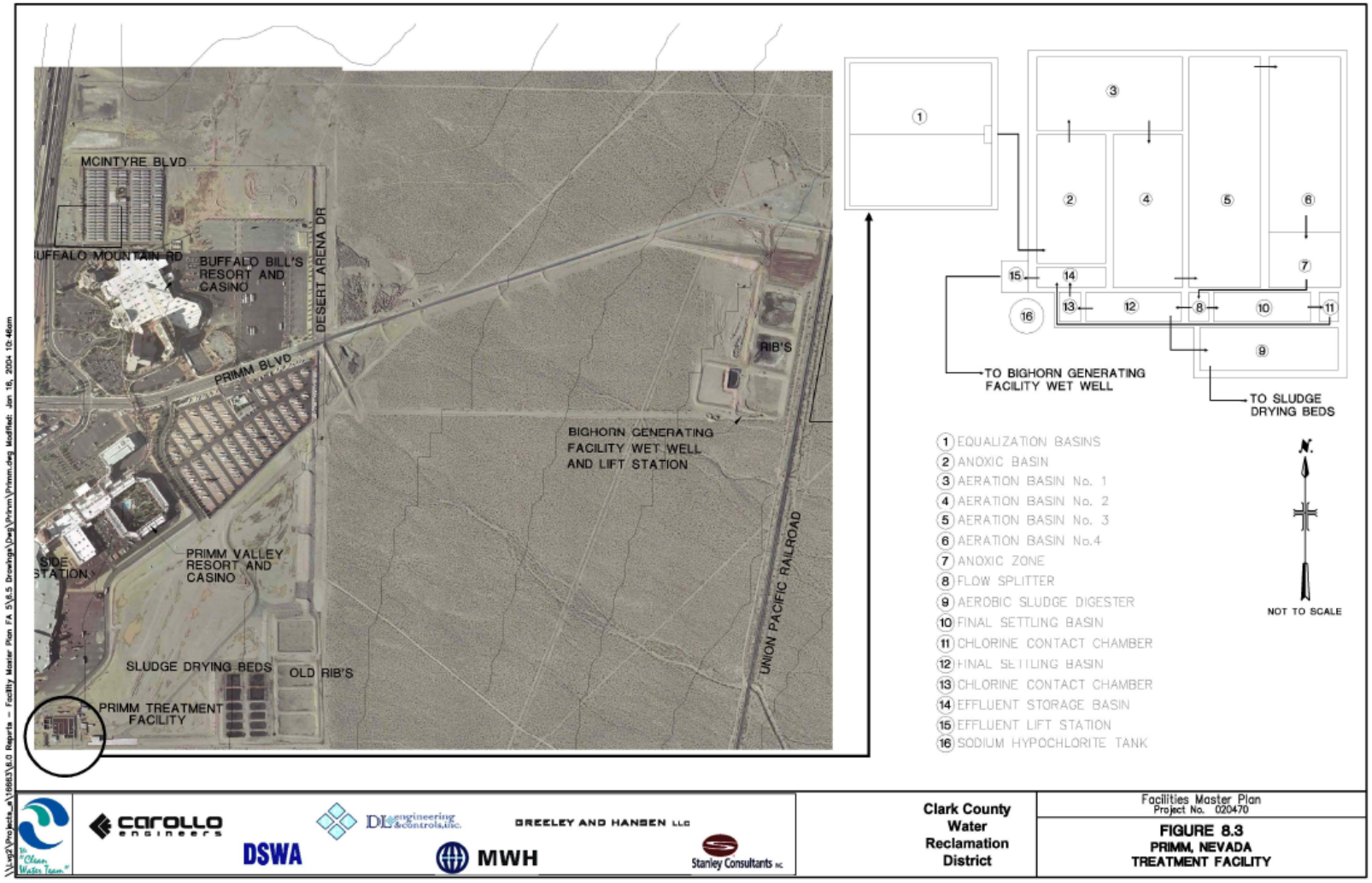


Figure 5-28
Primm WWTF Site Plan

5.3.6.4 Proposed Ivanpah Airport

The proposed Ivanpah Airport site is located south of Las Vegas in the Ivanpah Valley, between Jean and Primm. The proposed site encompasses a total of 6,000 acres, which was transferred to the County by the Ivanpah Valley Airport Public Lands Act of 2000. The airport is in the planning phase (2009) and, if the airport and associated actions are approved by the FAA and the BLM, construction could begin in 2012 with operations beginning in 2018.

The treatment plant would use an activated sludge process. To meet future conditions, the treatment would be expanded in stages by creating parallel treatment train. Following treatment, CCDOA intends to filter, disinfect, and pump the flows to the airport Central Plant to help meet cooling tower demands and possibly other water reclamation applications.

5.3.6.5 Planning Area 6 Wastewater Flows (Unincorporated Areas)

The wastewater collection system in the unincorporated areas of Planning Area 6 will continue to expand during the 20-year planning horizon to meet the service needs of the current and future residents and the proposed Ivanpah Airport. **Table 5-23** and **Figure 5-29** show the Planning Area 6 (Unincorporated Areas) population projections, wastewater flow projections, and the treatment plant potential phased capacity expansions. Boulder City was not included in this subsection because it has been discussed in a previous section.

Table 5-23

Planning Area 6
(Unincorporated Areas)
Population Projections, Wastewater WWTF Capacity

Year	Population Projections	Wastewater Flow (mgd)					WWTF Capacity (mgd)
		Residential	Jean Casino	Primm Casino	Proposed Ivanpah Airport	Total	
2006	2,970	0.3	0.34	0.48	0.0	1.1	1.6
2010	3,485	0.3	0.34	0.49	0.0	1.2	1.6
2015	3,781	0.4	0.34	0.49	0.0	1.19	1.6
2020	4,041	0.4	0.34	0.49	0.36	1.59	3.0
2025	4,611	0.5	0.34	0.49	0.47	1.79	3.0
2030	5,128	0.5	0.34	0.49	0.58	1.88	3.0

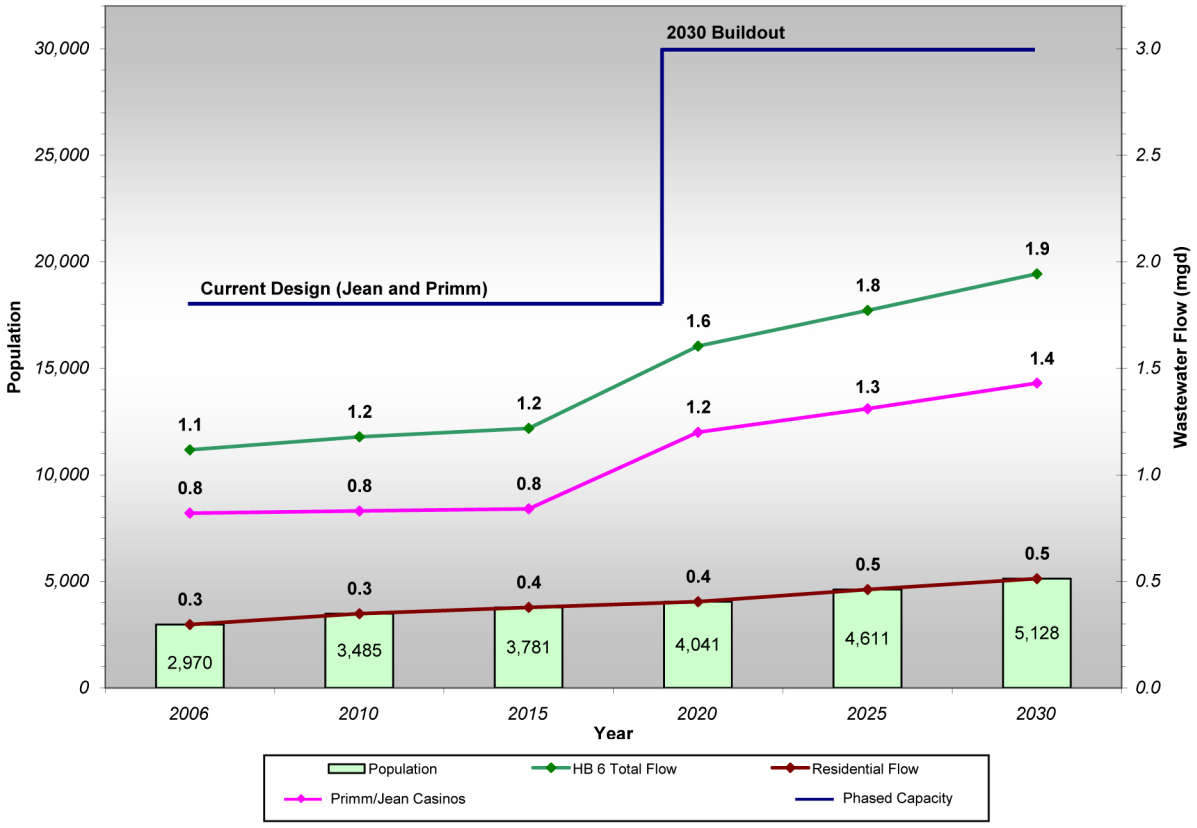


Figure 5-29
Planning Area 6 (Unincorporated Areas)
Population Projections, Wastewater Flows, and Treatment Plant Capacity

5.3.6.6 Sandy Valley

Sandy Valley is located west of Goodsprings, near the California state line. The average wastewater flow in Sandy Valley was 0.090 mgd in 2002 and is projected to increase to 0.540 mgd. This increase in wastewater flow indicates the potential need for a centralized wastewater treatment system to prevent septic system contamination of groundwater supply wells and for the development of a water reclamation program.

5.3.6.7 Goodsprings

Goodsprings is located east of Sandy Valley and west of Jean, Nevada. The average wastewater flow in Goodsprings was 0.0285 mgd in 2002 and is projected to increase to 0.064 mgd. Goodsprings is predicted to increase in water use and wastewater flow, which indicates a potential need for a transition to a centralized wastewater treatment system to prevent septic system contamination of groundwater supply wells and for the development of a water reclamation program.

5.3.6.8 Planning Area 6 Septic Systems

As provided in the septic system GIS file, there are 1,005 septic systems located in Planning Area 6. Sandy Valley and Goodsprings have 822 and 82 permitted septic systems, respectively. According to the *CCWRD Facilities Master Plan (2004)*, there are nine septic systems located in Jean and two septic systems in Primm. The remaining septic systems are scattered throughout Planning Area 6, however, they are concentrated in Sandy Valley and Goodsprings. The CCWRD does not own or operate the Jean or Primm WWTFs and is not the permitting authority of septic systems.

The vast majority of septic systems in the Planning Area (areas within Planning Areas 6 through 8) accommodate single-family dwellings. It was also noted that potential problems could result from septic system failure. Sandy Valley and Goodsprings soil types allow for rapid infiltration for onsite septic systems, but problems have been reported regarding failure.

5.3.6.9 Pretreatment Program

There is no industrial pretreatment program in Planning Area 6.

5.3.6.10 Planning Area 6 Summary

Table 5-24 summarizes information for wastewater flows and the WWTFs in Planning Area 6. For the unincorporated County areas that CCWRD does not currently serve, CCWRD's plan for the future is for developers to build the system and then the CCWRD will take over ownership and operation of the system.

Table 5-24

Planning Area 6 Summary Table

Year	Boulder City WWTF		Jean, Primm, and Proposed Ivanpah Airport		WWTFs in Planning Area 6	
	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)
2006	1.8	1.1 [a]	1.6	1.1	3.4	2.2
2010	1.8	1.8	1.6	1.2	3.4	3.0
2015	2.3	2.0	1.6	1.19	3.9	3.19
2020	2.3	2.1	3.0	1.59	5.3	3.69
2025	2.3	2.2	3.0	1.79	5.3	3.99
2030	2.8	2.3	3.0	1.88	5.8	4.18

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

5.3.7 Planning Area 7 – Havasu - Mohave Lakes

Planning Area 7 includes the Laughlin WRF, Cottonwood Cove WWTF, the community of Nelson, and septic systems throughout the planning area.

5.3.7.1 Laughlin

Laughlin is situated along U.S. Route 95 on the borders of Arizona and California and the Ft. Mojave Indian Reservation; the Laughlin WRF serves the community's wastewater needs. The facility is an advanced secondary WWTP that uses the activated sludge process in the extended aeration mode. In addition, tertiary treatment is performed to allow effluent discharge to the Colorado River.

5.3.7.1.1 Existing Collection System

The collection system for Laughlin is composed of approximately 26 miles of pipeline, 298 manholes, and three lift stations. Two main networks collect wastewater in Laughlin, one network serves the gaming district along Casino Drive and the other serves the residential district.

5.3.7.1.2 Existing Treatment Facilities

The Laughlin WRF has a capacity of 8 mgd and is an advanced secondary WWTF consisting of primary, secondary, and tertiary treatment processes. The primary treatment processes include a bar rack, equalization basins, a shredder, and grit chambers. The secondary treatment processes include the denitrification facility, aeration basins, and secondary clarifiers. The tertiary treatment processes include a flocculation clarifier, filters, and a chlorination system. The layout of the Laughlin WRF is shown in **Figure 5-30**. According to the *SWAC 2006 Year End Summary*, the average wastewater flow for Laughlin was 2.38 mgd in 2006.

5.3.7.1.3 Laughlin Septic Systems

As provided in the septic system GIS file and the handout at the CCWRD Coordination Meeting held on December 6, 2007, there are 27 septic systems in Laughlin. In the *CCWRD Facilities Master Plan (2004)*, due to the low number of permitted septic systems in comparison with the total wastewater flow in Laughlin, flows from septic systems were not incorporated into the wastewater flow projections. Flows from the septic systems will not be incorporated into the wastewater flow projections for Laughlin for the *Clark County Area-Wide WQMP*.

5.3.7.1.4 Future Collection System

The Laughlin wastewater collection system may need to expand during the 20-year planning horizon to meet the service needs of the current and future residents.

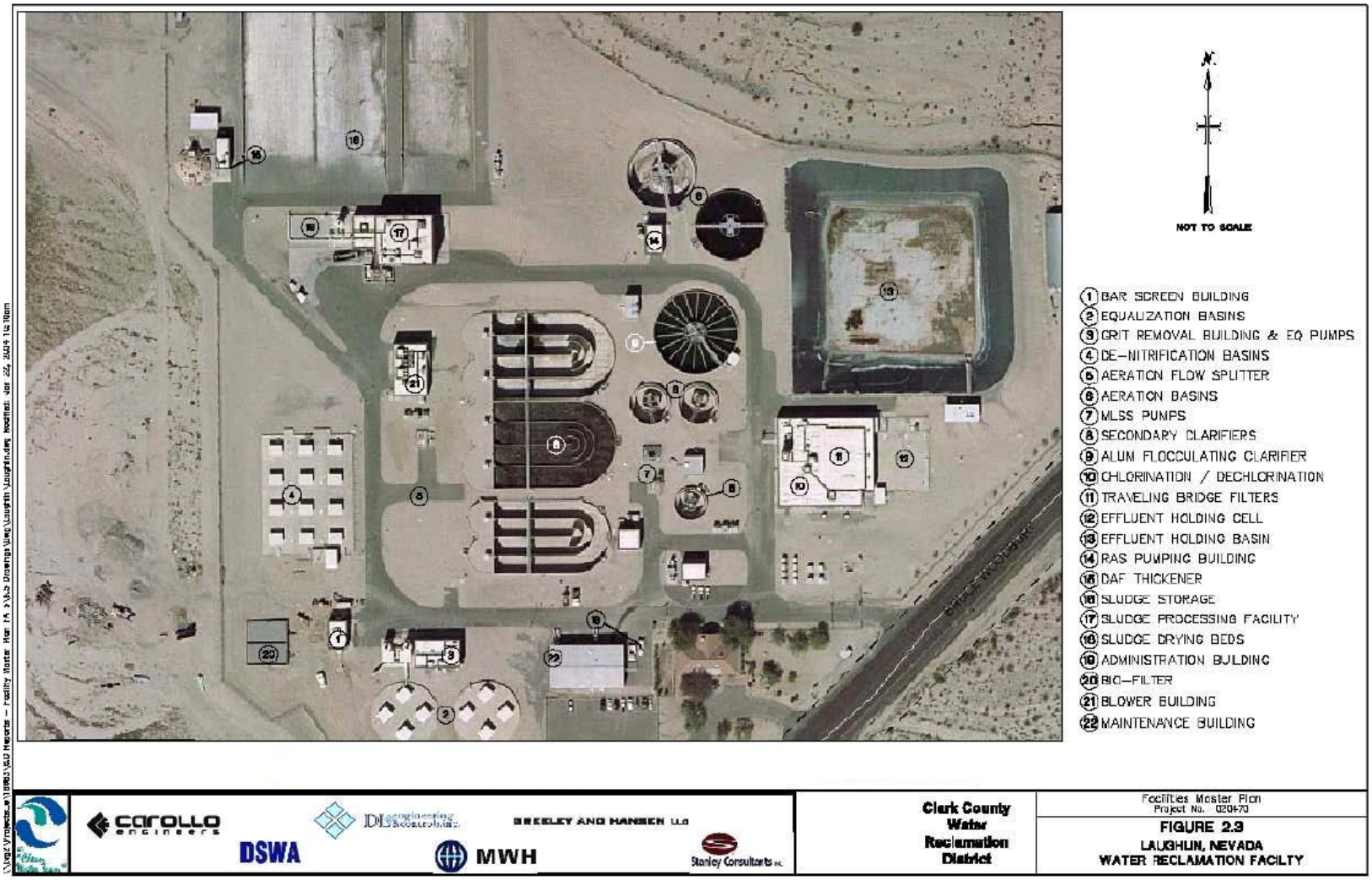


Figure 5-30
Laughlin WRF Site Plan

5.3.7.1.5 Future Treatment Facilities

Table 5-25 and **Figure 5-31** show the Laughlin population projections, wastewater flow projections, and the treatment facility capacity.

It was recommended by CCWRD that, in future updates to the *Clark County Area-Wide WQMP*, the population projections and wastewater flows be revisited, to identify future design capacity expansions for the Laughlin WRF. In addition, wastewater flow should continue to be monitored by the Laughlin WRF so that plant expansions can be initiated, if necessary, at the appropriate time.

The SNWA Cooperative Agreement includes provisions allocating water among the SNWA members, including the Big Bend Water District (BBWD) that serves the Laughlin area. The SNWA's 2005 Water Budget indicates that the BBWD's available water resources are estimated to be 15,352 acre-feet/year of Colorado River water. If BBWD is interested in obtaining additional water resources, the SNWA will work with BBWD under the SNWA Cooperative Agreement to identify regional water resource opportunities that may be available.

5.3.7.1.6 Solids Handling and Effluent Disposal

Wastewater sludge generated at the Laughlin WRF is dewatered in the dissolved air flotation thickener and is disposed of at a landfill.

The effluent from the Laughlin WRF is discharged into the Colorado River near the Laughlin Bridge, north of the casinos. The effluent flows by gravity from the treatment plant through a pressure pipe to a vault and then is dispersed into the river.

The Laughlin WRF is authorized by NDEP Permit No. NV0021563 to one or all of: discharge to the Colorado River, to groundwater of the state via effluent percolation at approved reuse sites, to emergency onsite land application, and to an effluent pump station and reuse export pipeline for Emerald River reuse via landscape irrigation.

Table 5-25

**Laughlin Population Projections,
Wastewater Flows and Treatment Plant Capacity**

Year	Population Projections Residential	Population Projections Hotels/Casinos	Total Wastewater Flow (mgd)	WRF Capacity (mgd)
2006	8,757	11,000	2.4 [a]	8.0
2010	14,567	13,579	5.5	8.0
2015	25,109	14,737	6.9	8.0
2020	33,996	15,819	8.1	11.0
2025	48,995	16,877	9.9	11.0
2030	53,690	17,940	10.7	11.0

Note:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*

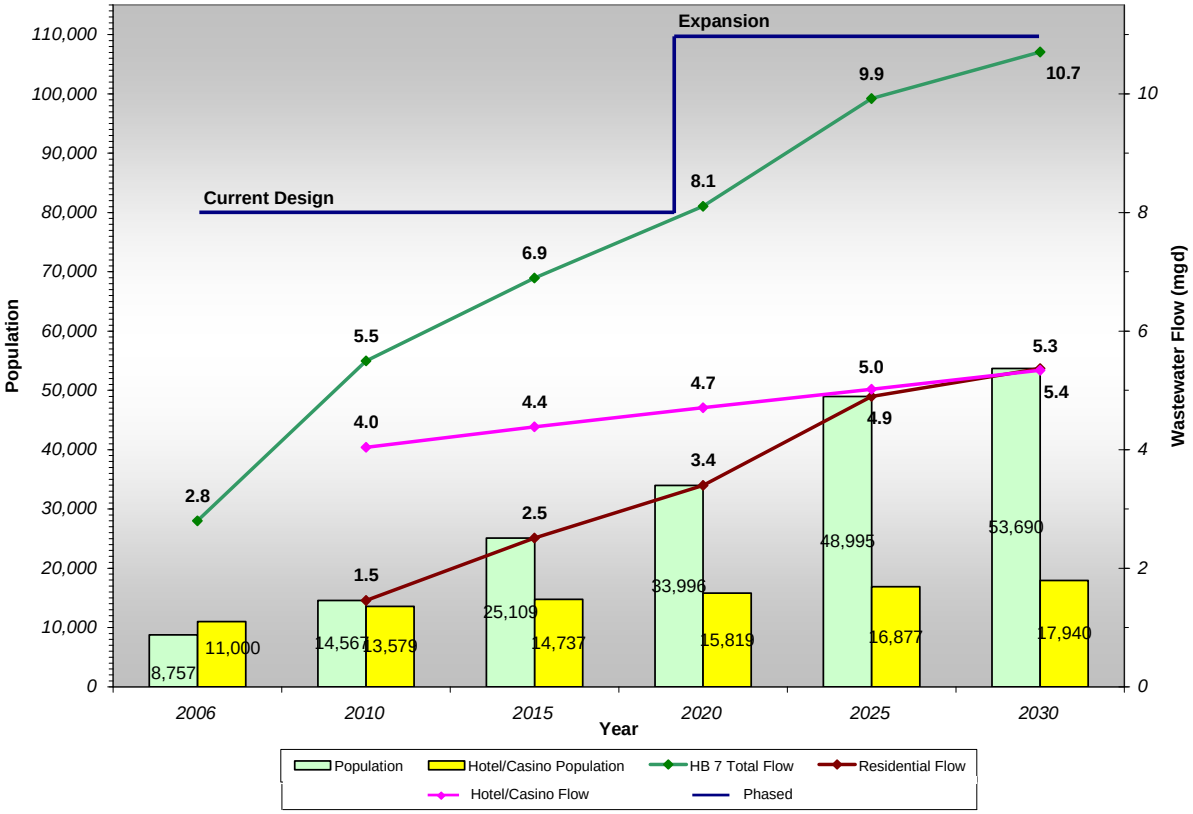


**Figure 5-31
Laughlin Population Projections,
Wastewater Flows, and Treatment Facility Capacity**

5.3.7.1.7 Water Quality Monitoring

Effluent quality monitoring is conducted as indicated in the discharge permit authorized by NDEP for the Laughlin WRF. Groundwater monitoring is conducted monthly for TDS, chloride, nitrate as N, total nitrogen as N, total phosphorus as P, groundwater elevation, and depth to groundwater.

5.3.7.2 Cottonwood Cove

Cottonwood Cove is a marina located in the Lake Mead NRA, near Lake Mohave. In the summer months, Cottonwood Cove is a destination for water-skiers and boaters and the remaining months, it is mainly occupied by fishermen. There are 300 permanent employee-housing residents, two campgrounds, and a motel with a restaurant.

5.3.7.2.1 Existing Treatment Facility

The Cottonwood Cove WWTF is owned and operated by the NPS at Lake Mead NRA. The design capacity of the Cottonwood Cove WWTF is 0.033 mgd and no plans to increase the capacity have been established. The treatment process is a pond system with two asphalt-lined retention ponds and an overflow pond.

5.3.7.2.2 Effluent Disposal

The Cottonwood Cove WWTF is authorized by NDEP Permit No. NEV50013 to discharge to groundwater of the state.

5.3.7.2.3 Water Quality Monitoring

The Cottonwood Cove WWTF is in compliance with the discharge limits for fecal coliform, TSS, and Biological Oxygen Demand (BOD), as stated in the NDEP discharge permit.

5.3.7.3 Community of Nelson

The community of Nelson is a small unincorporated community located approximately 40 miles southeast of Las Vegas. The community is on onsite septic tank systems. Population growth will be limited due to a lack of developable land, with future wastewater flows accommodated by septic tanks.

5.3.7.4 Planning Area 7 Septic Systems

As stated previously, the *South County WQMP (2004)* indicated that the vast majority of septic systems accommodate single-family dwellings and potential problems could result from septic system failure.

5.3.7.5 Pretreatment Program

There is no industrial pretreatment program in Planning Area 7.

5.3.7.6 Planning Area 7 Summary

Table 5-26 summarizes information for wastewater flows and WWTFs in Planning Area 7. For the unincorporated County areas that CCWRD does not currently serve, CCWRD's plan for the future is for developers to build the system and then the CCWRD will take over ownership and operation of the system.

Table 5-26

Planning Area 7 Summary Table

Year	Laughlin WRF		Cottonwood Cove		WWTFs in Planning Area 7	
	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)	Capacity (mgd)	Wastewater Flows (mgd)
2006	8.0	2.4 [a]	0.033	N/A	8.0	2.4
2010	8.0	5.5	0.033	N/A	8.0	5.5
2015	8.0	6.9	0.033	N/A	8.0	6.9
2020	11.0	8.1	0.033	N/A	11.0	8.1
2025	11.0	9.9	0.033	N/A	11.0	9.9
2030	11.0	10.7	0.033	N/A	11.0	10.7

Notes:

[a] Wastewater flow (mgd) for 2006 was provided in the *SWAC 2006 Year End Summary*
N/A – Not Available

5.3.8 Planning Area 8 – Paiute Wash

Planning Area 8 includes Searchlight and Cal-Nev-Ari.

5.3.8.1 Community of Searchlight

The community of Searchlight is situated in the Colorado River Basin approximately halfway between Laughlin and Las Vegas at the junction of U.S. Route 95 and State Route 164.

5.3.8.1.1 Existing Collection System

The collection system for Searchlight is composed of approximately 6 miles of pipeline, 102 manholes, and one lift station.

5.3.8.1.2 Existing Treatment Facilities

The Searchlight WRC has a 0.090-mgd design capacity and is composed of five stabilization ponds, two primary ponds, two secondary ponds, and one overflow/RIB. The primary and secondary ponds are constructed with an asphalt lining and soil cement base to prohibit percolation into the ground. The overflow/RIB is constructed with a scarified bottom and lining along the sides, to encourage percolation of the effluent. The layout of the Searchlight WRC is shown in **Figure 5-32**.

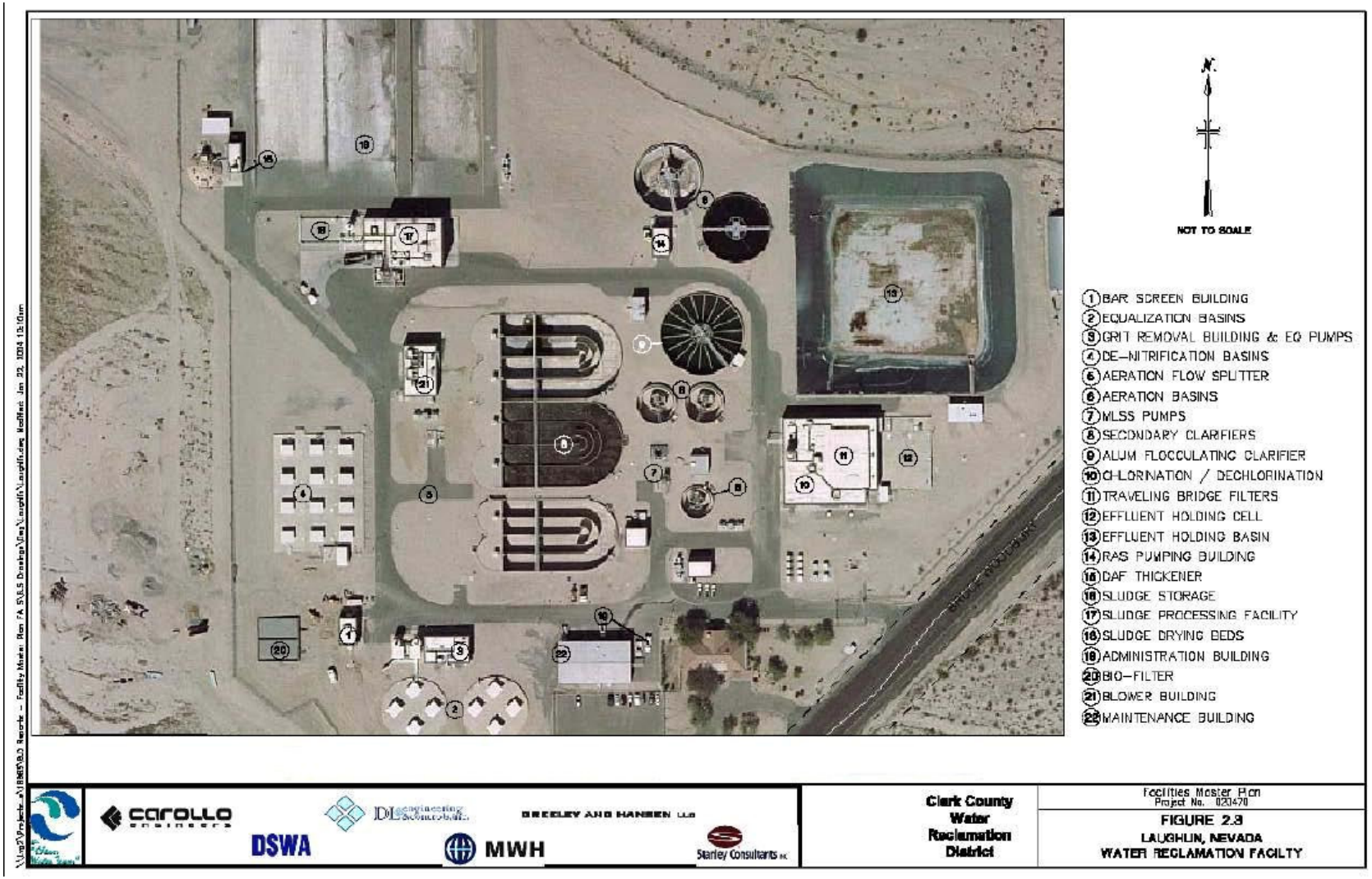


Figure 5-32
Searchlight WRC Site Plan

5.3.8.1.3 Searchlight Septic Systems

As provided in the septic system GIS file, there are approximately 90 permitted septic systems located in or near Searchlight within Planning Area 8; however, in the CCWRD handout provided at the CCWRD Coordination Meeting held on December 6, 2007, there are 104 permitted septic systems in Searchlight. Using the assumptions that each septic system is connected, at minimum, to one single-family dwelling and using 2.5 persons per single-family dwelling, the number of people using septic systems is 260 (the product of 2.5 persons per dwelling and 104 permitted septic systems). This number of people will be subtracted from the population projections, since these people are not connected to the sewer system.

According to the *CCWRD Facilities Master Plan (2004)*, for a conservative estimate of future wastewater flows for Searchlight, units using septic systems were assumed to connect to the wastewater collection network at a rate of three units per year. In addition, the *CCWRD Facilities Master Plan (2004)* also assumed that new residents of Searchlight would connect into the future sewer collection system. Because some information in the *CCWRD Facilities Master Plan (2004)* is considered by CCWRD to be out of date, this conversion of septic systems to the sewer system connections was not included in the population projections and wastewater flows for Searchlight. It is recommended in future updates to the *Clark County Area-Wide WQMP* that this topic be revisited.

5.3.8.1.4 Future Collection System

The Searchlight wastewater collection system may need to expand during the 20-year planning horizon to meet the service needs of the current and future residents.

5.3.8.1.5 Future Treatment Facilities

According to the *Searchlight WRC Preliminary Design Report (2007)*, the CCWRD is planning to expand the existing Searchlight WRC to a design capacity of 0.5 mgd. The project schedule included in the *Searchlight WRC Preliminary Design Report (2007)* indicates that the design of the Searchlight WRC is projected to be completed near the end of 2008. The layout of the Searchlight WRC expansion, as provided in the *Searchlight WRC Preliminary Design Report (2007)*, is shown in **Figure 5-33**.

Population projections were developed in Section 3; however, to determine the wastewater flows to WWTFs, projected population connected to the sewer system (total population minus permitted sewer systems) has been calculated in this section. **Table 5-27** and **Figure 5-34** show the Searchlight population projections, wastewater flow projections, and the WRC capacity.

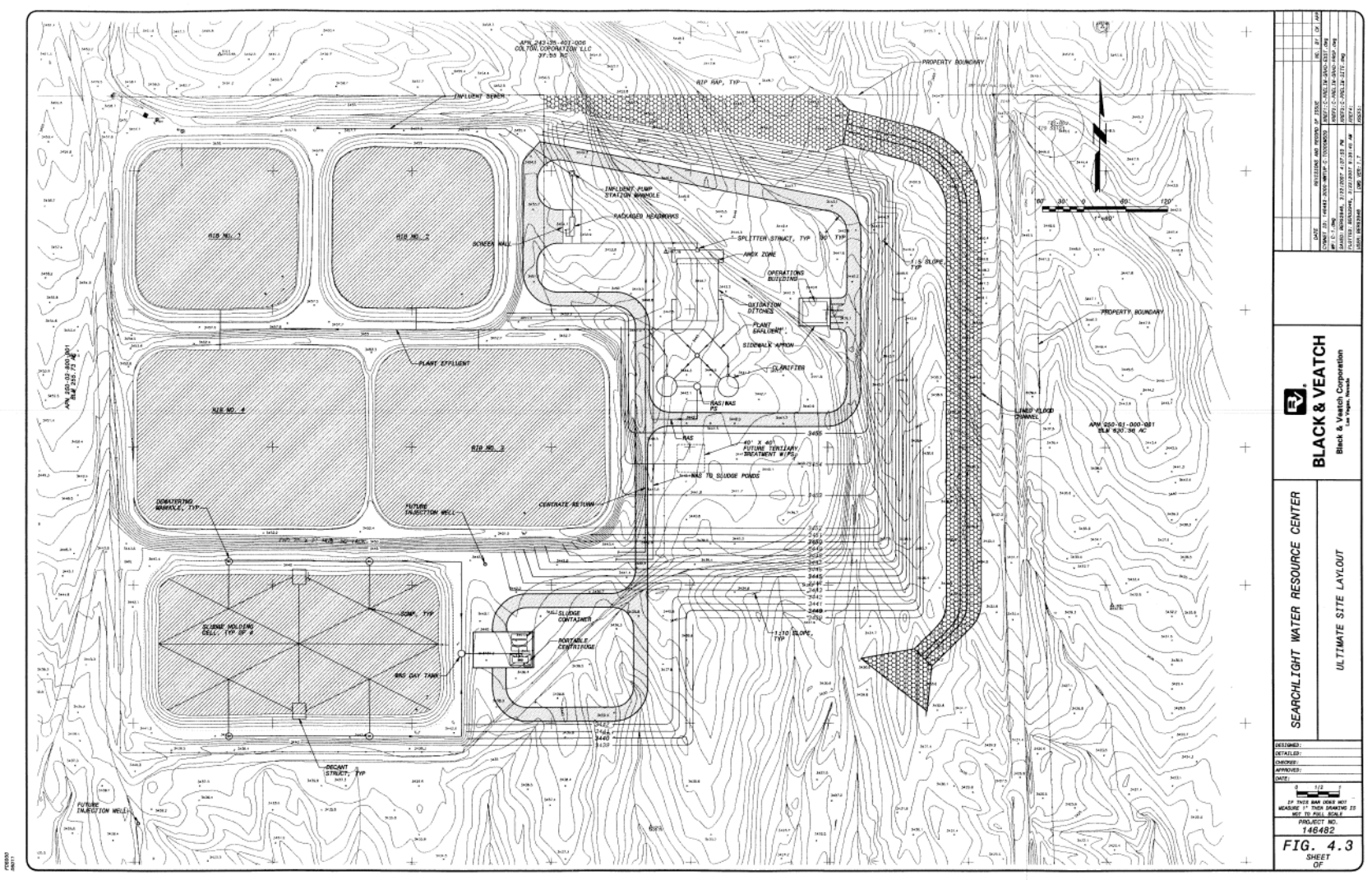


Figure 5-33
Searchlight WRC Expansion Site Plan

Table 5-27

Searchlight Population Projections, Wastewater Flows and WRC Capacity

Year	Population Projections	Population Projections (connected to sewer system)	Wastewater Flow (mgd)	WRC Capacity (mgd)
2006	780	520	0.05	0.09
2010	1,539	1,279	0.13	0.50
2015	1,817	1,557	0.16	0.50
2020	2,130	1,870	0.19	0.50
2025	2,130	1,870	0.19	0.50
2030	2,130	1,870	0.19	0.50

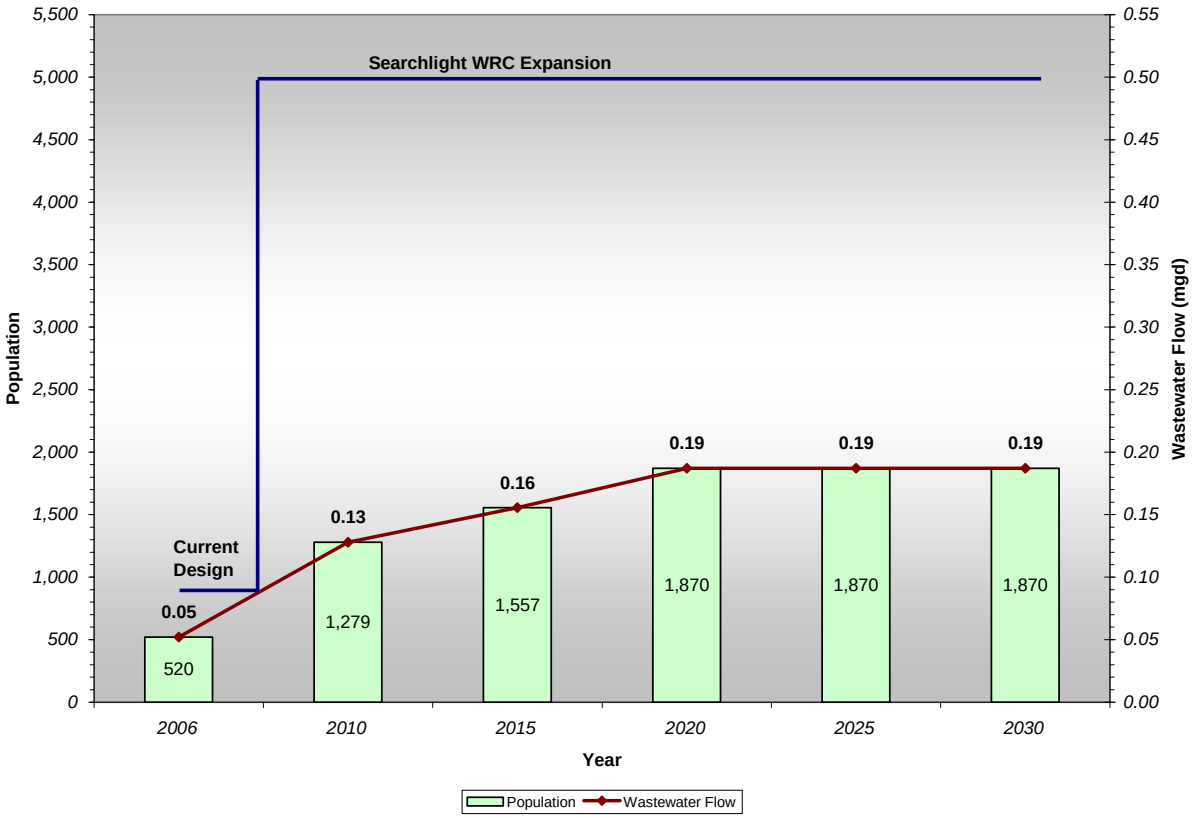


Figure 5-34
Searchlight Population Projections, Wastewater Flows, and WRC Capacity

5.3.8.1.6 Solids Handling and Effluent Disposal

Sludge depth recordings are gathered to record the amount of solids that accumulate in the treatment ponds. When the level of solids affects the pond performance, the sludge is removed or reduced. The CCWRD uses the bio-cultures to reduce solids in the Searchlight ponds.

The Searchlight WRC is authorized by NDEP Permit No. NEV40038 to discharge effluent to groundwater of the state via percolation through the RIBs.

5.3.8.1.7 Water Quality Monitoring

Groundwater monitoring is conducted quarterly for TSS, BOD, as well as pond water level.

5.3.8.2 Cal-Nev-Ari

Cal-Nev-Ari is located between Las Vegas and Needles, California along U.S. Route 95, and consists of a casino, a restaurant and lounge, a general store, a laundromat, an RV park, a mobile home park, and the Kidwell Airport.

Wastewater treatment within Cal-Nev-Ari is provided with septic systems, which are regulated by the Southern Nevada Health District (SNHD). The GIS file indicates there are 121 septic systems located in Cal-Nev-Ari.

The *CCWRD Facilities Master Plan (2004)* recommended that the community of Cal-Nev-Ari remain on septic systems as long as the replacement of outdated septic systems can be accommodated for existing properties. If problems arise regarding the relocation of these septic systems or a major expansion of Cal-Nev-Ari occurs, then a feasibility study should be performed to evaluate Cal-Nev-Ari wastewater collection and treatment facilities.

5.3.8.3 Planning Area 8 Septic Systems

As provided in the septic system GIS file, there are 245 permitted septic systems located in Planning Area 8. There are 104 permitted septic systems in Searchlight (as identified at the CCWRD Coordination Meeting held on December 6, 2007), 121 permitted septic systems in Cal-Nev-Ari (as provided in the septic system GIS file), with the remainder of the permitted septic systems (20 septic systems) in other unincorporated County areas of Planning Area 8.

The vast majority of septic systems accommodate single-family dwellings and potential problems could result from septic system failure and subsequent impact to the groundwater in the area.

5.3.8.4 Pretreatment Program

There is no industrial pretreatment program in Planning Area 8.

5.3.8.5 Planning Area 8 Summary

Table 5-28 summarizes information for wastewater flows and the WWTF in Planning Area 8. For the unincorporated County areas that CCWRD does not currently serve, CCWRD's plan for the future is for developers to build the system and then the CCWRD will take over ownership and operation of the system.

Table 5-28

Planning Area 8 Summary Table

Year	Searchlight WRC	
	Capacity (mgd)	Wastewater Flows (mgd)
2006	0.09	0.05
2010	0.50	0.13
2015	0.50	0.16
2020	0.50	0.19
2025	0.50	0.19
2030	0.50	0.19

5.4 COSTS AND FINANCING

Unit costs, in dollars per gallon, to treat projected wastewater flows have been generated for the study and feasibility levels of planning. The cost opinions assume a design-bid-build method, construction will be performed by licensed contractors, will comply with NRS and NAC requirements, and will use commonly accepted means and methods. The unit costs were developed based on 2006 United States dollars. It is important to note that construction costs have escalated over the past few years and may continue to increase in the future. For facility construction or expansion, unit costs in the range of $15 to $30 per gallon can be used for facility studies. This range in values includes primary, secondary, and tertiary treatment, incorporating BNR and sludge treatment, support and appurtenant facilities, administration, engineering, and contingency. For feasibility studies, it is recommended by the Association for the Advancement of Cost Engineering International (AACEI) to use a Class 4 level of accuracy (range of cost will be -30 to +50 percent of estimate).

NDEP facility wastewater discharge permits require each entity monitor actual wastewater flows and, in addition, NDEP requires that planning of facility capacity expansions must be initiated when wastewater flows reach 85 percent of the facility capacity. Each entity's planning process should include setting priorities for wastewater treatment facility development and monitoring financing options. Possible sources of financing new and expansions to wastewater treatment facilities include user charges, rate increases, system capacity fees, general obligation and revenue bonds, developer-funded mechanisms, direct-cost participation, NDEP state Revolving Funds, and federal funds.

On May 6, 2008, the CCWRD Board of Trustees approved a new rate structure. All areas served by CCWRD will have universal sewer service charges, effective July 1, 2008. In addition, effective January 1, 2009, all areas served by CCWRD, with the exception of Laughlin, will have universal sewer connection fees. This will enable CCWRD to upgrade or build new facilities in smaller areas with less of an impact on the customer base.

5.5 SUMMARY

Table 5-29 summarizes information for wastewater flows and WWTF treatment capacity for each planning area and the total for Clark County over the planning horizon through 2030. Capacity increases are planned for every planning area, with the exception of Planning Area 4.

Table 5-29

Summary of WWTF Capacity and Flows in Clark County

Year	Planning Area 1		Planning Area 2		Planning Area 3		Planning Area 4		Planning Area 5		Planning Area 6		Planning Area 7		Planning Area 8		Clark County	
	Capacity (mgd)	WWTF Flows (mgd)	Capacity (mgd)	WWTF Flows (mgd)	Capacity (mgd)	WWTF Flows (mgd)	Capacity (mgd)	WWTF Flows (mgd)	Capacity (mgd)	WWTF Flows (mgd)	Capacity (mgd)	WWTF Flows (mgd)	Capacity (mgd)	WWTF Flows (mgd)	Capacity (mgd)	WWTF Flows (mgd)	Total Capacity (mgd)	Total WWTF Flows (mgd)
2006	0.114	0.12	0.2	0.22	3.5	1.8	0.13	N/A	232	190	3.4	2.2	8.0	2.4	0.09	0.05	247	197
2010	0.7	0.42	2.9	0.74	8.7	2.6	0.13	N/A	302	239	3.4	3.0	8.0	5.5	0.05	0.13	326	251
2015	0.7	0.46	2.9	1.49	8.7	3.7	0.13	N/A	350	288	3.9	3.2	8.0	6.9	0.05	0.16	374	303
2020	0.7	0.48	3.6	2.8	8.7	4.9	0.13	N/A	383	322	5.3	3.7	11.0	8.1	0.05	0.19	412	342
2025	0.7	0.53	5.7	4.2	8.7	6.3	0.13	N/A	391	341	5.3	4.0	11.0	9.9	0.05	0.19	422	366
2030	0.7	0.58	8.2	5.5	8.7	8.1	0.13	N/A	391	354	5.8	4.2	11.0	10.7	0.05	0.19	425	383

Notes:

N/A – Not Available

5.6 RECOMMENDATIONS

The recommendations for wastewater collection, treatment, and disposal were compiled from previous WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to wastewater collection, treatment, and disposal for the *Clark County Area-Wide WQMP*:

- Member agencies in Planning Area 5 should periodically review and update the *Design and Construction Standards for Wastewater Collection System – Southern Nevada.*

- Some information in the CCWRD *Facilities Master Plan (2004)* is considered by CCWRD to be out of date. CCWRD should consider updating this report.

- CCWRD should continue to monitor the actual wastewater flows conveyed to the Overton wastewater treatment facility and provide an expansion plan for the Overton wastewater treatment facility when flows reach 85 percent of existing plant capacity.

- In Planning Area 3, implementation of a combined sewer service area for the City of Mesquite and Bunkerville should be evaluated and considered as the area continues to grow.

- The Southern Nevada Health District should be responsible for establishing a monitoring program in Planning Area 2 for the Moapa Valley groundwater, to explore and assess potential groundwater contamination.

- Coordination should continue between the Southern Nevada Health District and Moapa Valley and Virgin Valley Water Districts (Planning Area 2) in monitoring groundwater, to update recorded nitrate data.

- If plans to convert septic systems to connection to the sewer system are developed, the wastewater flow projections in each planning area should be revisited in future updates to the *Clark County Area-Wide WQMP*. If problems arise regarding the decommission of these septic systems or a major expansion occurs, then a feasibility study should be performed for the respective wastewater collection and treatment facilities.

- The respective Clark County wastewater treatment agencies should continue their respective efforts to plan, design and build wastewater treatment facilities and collection system improvements that will meet population projections over the 20-year planning period.

- The respective Clark County wastewater treatment agencies should consider various sources of funding, including rate increases, bond debt and federal funding to finance future expansions of treatment facilities and collection systems.

- The Clark County wastewater treatment agencies should consider constructing satellite treatment facilities and water reuse projects in the outlying segments of their service areas to meet future growth.

- Mesquite and the CCWRD should consider partnership arrangements with developers of large residential and commercial projects to build on-site satellite water reclamation facilities for public and multi-use landscaped areas.

- The Clark County wastewater treatment agencies should consider alternative methods of wastewater treatment in conjunction with the facility planning process.

- The Clark County wastewater treatment agencies should continue their coordination and consultation on facility planning needs through the Sewage and Wastewater Advisory Committee (SWAC) as recommended in Nevada Revised Statute 445A.

- Each wastewater treatment agency should continue researching and providing for partnerships for implementation of demonstration projects utilizing various methods of biosolids disposal/use.

- Require existing wastewater treatment facilities to review preparation of industrial pretreatment standards in anticipation of growth and increased entertainment construction or economic diversification in Clark County.

- Expand household and commercial/industrial chemical and hazardous waste education and collection programs in accordance with potential growth in Clark County.

- Continue having the respective wastewater agencies permit and inspect industrial sites for compliance with their Industrial Pretreatment Programs and include prevention of stormwater runoff pollution.

- Request that CCWRD prepare a facility needs assessment for Goodsprings and Sandy Valley (Planning Area 6) to assess the need for sewers, lift stations, wastewater treatment, sludge disposal, and effluent disposal requirements.

- Continue coordination between the Southern Nevada Water Authority and the Las Vegas Valley wastewater dischargers to assure a proactive approach to identify future needs in the township of Sloan.

5.7 REFERENCES

Association for the Advancement of Cost Engineering International, *Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries TCM Framework: 7.3 – Cost Estimating and Budgeting*, February 2005.

City of Boulder City, *Wastewater Treatment Plant Improvements Engineering Report – Phase II*, Prepared By Greeley and Hansen, April 2005.

City of Henderson, *Department of Utilities Pretreatment Program Annual Report*, 2005.

----- *Phase 3 WRF Expansion Design Memorandum*, Prepared by Black & Veatch, March 2003.

----- *Southwest Water Reclamation Facility Predesign Report – Volume 1*, December 2005.

City of Las Vegas, *CLV Annual Report of the Industrial Waste Pretreatment Program 2005*, May 2006.

----- *Water Pollution Control Facility 2006 Plan Update - Final.* February 2, 2007.

City of Mesquite, *Wastewater Facilities Planning Study*, Prepared by Forsgren Associates Inc., December 2005.

City of North Las Vegas, *City of North Las Vegas Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 Water Quality Management Plan*, Prepared by MWH, October 2005.

----- *POTW Pretreatment Annual Report for the CLV 2005*, June 14, 2006.

----- *POTW Pretreatment Annual Report for the CCWRD 2005*, June 14, 2006.

Clark County Code, *Chapter 24: Water, Sewage, and other Utilities.* Accessed January 23, 2008, at:
http://municipalcodes.lexisnexis.com/codes/clarknv/

Clark County Department of Air Quality and Environmental Management, *Amendment to Northeast Clark County 208 Water Quality Management Plan,* February 2007.

Clark County Department of Comprehensive Planning, *Geographically Integrated Land Use Information System (GILIS)*, April 2007.

----- *Clark County, Resident Population Estimates*, July 1, 2006.

----- *Las Vegas Valley 208 WQMP Amendment*, Prepared by MWH, July 1997.

----- *South County Water Quality Management Plan Amendment*, Prepared by CH2M Hill, June 2004.

Clark County GISMO. Accessed August 15, 2007, at: http://gisgate.co.clark.nv.us/gismo/freedata.htm

Clark County Sewage and Wastewater Advisory Committee, *2006 Year End Summary*, January 10, 2007.

Clark County Water Reclamation District, Annual Operating Budget Fiscal Year 2006-07. Accessed at: http://www.cleanwaterteam.com/pdf/facility/main/om_budget_2007_rev.pdf

----- CCWRD Coordination Meeting, December 6, 2007 (2007a).

----- *Indian Springs Wastewater Treatment System Upgrades – Drawings*, Prepared by Kennedy/Jenks Consultants, October 2006 (2006a).

----- *Enterprise Water Resource Center Facility Plan*, Prepared by Greeley and Hansen, July 2006 (2006b).

----- *Facilities Master Plan*, Prepared by Stanley Consultants, 2004.

----- *Integrated Facility Master Plan Technical Memoranda – Volume 2*, Prepared by Carollo Engineers, June 2007 (2007b).

----- *Moapa Valley Water Resource Center Modifications – Rebid, Volume 4*, Prepared by Carollo Engineers, July 2007(2007c).

----- *Pretreatment Program Annual Report* (January 1 - December 31, 2005).

----- *Searchlight Water Resource Center Preliminary Design Report – Draft*, Prepared by Black & Veatch, March 2007 (2007c).

Clean Water Coalition, Clean Water Coalition website. Accessed January 16, 2008, at: http://www.cleanwatercoalition.com/

Coyote Springs Development Wastewater Treatment Facilities, *100% Design Submittal*, Prepared by HDR, October 13, 2006.

Enco Southwest, *Discharge Monitoring Reports*, January-December 2006.

Nevada Administrative Code. *Chapter 445A Water Controls*. Accessed January 23, 2008, at: http://www.leg.state.nv.us/nac/NAC-445A.html

Nevada Division of Environmental Protection, *Coyote Springs Water Resources General Improvement District,* Revised July 2007. Accessed January 7, 2008, at: http://ndep.nv.gov/docs_07/nev2007501_f07.pdf

----- *Fact Sheet: Boulder Beach WWTP, 2005*. Accessed March 20, 2008, at: http://ndep.nv.gov/docs_04/nev50011_fs05.pdf

----- *Fact Sheet: Callville Bay WWTP, 2005*. Accessed March 20, 2008, at: http://ndep.nv.gov/docs_04/callville_fs05.pdf

----- *Fact Sheet: Echo Bay WWTP, 2005*. Accessed March 20, 2008, at: http://ndep.nv.gov/docs_04/echo_bay_fs05.pdf

----- *Fact Sheet: Las Vegas Bay WWTP, 2005*. Accessed March 20, 2008, at: http://ndep.nv.gov/docs_04/las_vegas_bay_fs05.pdf

----- *Fact Sheet: Overton Beach WWTP, 2005*. Accessed March 20, 2008, at: http://ndep.nv.gov/docs_04/overton_fs05.pdf

Nevada Revised Statutes, *Chapter 445A Water Controls*. Accessed January 23, 2008, at: http://www.leg.state.nv.us/Nrs/NRS-445A.html

Section 6

Section 6
Water Reclamation / Reuse

6.1 INTRODUCTION

This section discusses the reclaimed water distribution facilities for each planning area, including the pipes, pumping stations, and reservoirs needed to supply reclaimed water to customers. The information was compiled from numerous WWTF plans, previous 208 plans within Clark County, and the *AWRS (2000)*.

The CWC and SNWA are preparing the *Southern Nevada Regional Water Reuse Study,* which will update information provided in the *AWRS (2000)*. It is recommended that in future updates to the *Clark County Area-Wide WQMP,* the reclaimed water and reuse opportunities be revised with information included in the updated study.

6.2 PURPOSE OF THE REUSE PLAN

Treated wastewater from the Las Vegas Valley is reclaimed and beneficially used by returning it to the Colorado River as return flow credits as well as direct reuse. In Southern Nevada, Colorado River return flow credits constitute a significant portion of the region's water resources, since Colorado River return flow credits are credited to Nevada's Colorado River diversions to calculate the total use of Nevada's 300,000 acre-foot annual Colorado River consumptive use allocation. Direct reuse opportunities can be, but are not limited to, irrigation of golf courses, parks, and other green spaces, and commercial or industrial uses such as process cooling water and temporary applications including construction and dust control. The implementation of reuse, where Colorado River return flow credits are available would not extend water resources, since the use of reuse would be offset by a corresponding reduction in Colorado River return flow credits only. In instances where Colorado River return flow credits through the Colorado River and Lake Mead are unavailable, reuse and other reclamation options may help optimize water resources. The coordination of various reclamation opportunities (e.g., parks, golf courses, etc.) should involve planning departments, drinking water agencies, wastewater agencies and other parties to ensure that beneficial use opportunities are identified and thoroughly explored.

6.3 WATER REUSE REGULATIONS

The NDEP is the regulatory agency that governs the water quality protection and water reuse. The NAC contains technical requirements and standards for permitting wastewater facilities, including treatment plants. All aspects of wastewater facilities including design, construction, and operation must comply with NAC provisions. The most current (2007) NDEP reuse regulations are indicated in NAC 445A.275, and are shown in **Figure 6-1**.

1. A person shall not use treated effluent unless:
   (a) The person has:
      (1) Received the approval of the Division of a plan for the management of effluent; and
      (2) Obtained a permit pursuant to NAC 445A.228 to 445A.263, inclusive; and
   (b) The treated effluent has received at least secondary treatment.

2. As used in this section: (a) "Five-day inhibited BOD" means the amount of dissolved oxygen required to stabilize the carbonaceous decomposable organic matter by aerobic bacterial action at 20 degrees centigrade for 5 days.
   (a) "Plan for the management of effluent" means:
      (1) An effluent management plan; or
      (2) A site-specific management plan.
   (b) "Secondary treatment" means the treatment of sewage until the sewage has,
   calculated as a 30-day average:
      (1) A 5-day inhibited BOD concentration of 30 mg/L or less;
      (2) A total suspended solids concentration of 30 mg/L or less; and
      (3) A pH of 6.0 to 9.0 Standard Units (SU).

Figure 6-1
NAC 445A.275 General Requirements and Restrictions

Treated effluent used for an activity approved for a reuse category (A through E) must meet the requirements for bacteriological quality for that category, established by NDEP. **Table 6-1** includes a summary of NAC 445A.276, and indicates the reuse categories and the disinfection requirements for treated effluent. **Table 6-2** summarizes NAC 445A.2762 through NAC 445A.2771, which indicate the approved uses for the reuse categories A through E. The reuse regulations as included in this section are the most current (2007) regulations from NDEP; however some references are from documents dated 1997 and 2000. These documents may have been issued with previous reuse regulations.

Table 6-1

NAC 445A.276 Disinfection Requirements

Reuse Category	Total Coliform CFU or MPN/100mL	Fecal Coliform CFU or MPN /100mL			
	A	B	C	D	E
30-Day Geometric Mean	2.2	2.2	23	200	No Limit
Maximum Daily Number	23	23	240	400	No Limit

Note:

As used in this table, "CFU or MPN/100mL" means colony-forming units or most probable number per 100 milliliters of the treated effluent.

Table 6-2

Reuse Category and Approved Uses

Reuse Category	Approved Uses
A	Treated effluent that meets the requirements for bacteriological quality set forth in NAC 445A.276 for reuse Category A may be used for: 1. Spray irrigation of land used as a cemetery, commercial lawn, golf course, greenbelt, or park even if: (a) Public access to the area of use is not controlled; and (b) Human contact with the treated effluent can reasonably be expected to occur. 2. An impoundment in which swimming is prohibited even if: (a) Public access to the impoundment is not controlled; and (b) Human contact with the treated effluent can reasonably be expected to occur. 3. Any activity approved for reuse Category B, C, D or E. 4. Any other use that is approved by the Division.

Table 6-2 (Continued)

Reuse Category and Approved Uses

Reuse Category	Approved Uses
B	Treated effluent that meets the requirements for bacteriological quality set forth in NAC 445A.276 for reuse Category B may be used for: 1. Spray irrigation of land used as a cemetery, commercial lawn, golf course, greenbelt, or park if: (a) Public access to the area of use is controlled; and (b) Human contact with the treated effluent cannot reasonably be expected to occur. 2. Subsurface irrigation of land used as a commercial lawn, greenbelt or park. 3. Cooling water in an industrial process. 4. Fire-fighting operations in an urban area if approved by the fire department, fire protection district or other fire-fighting agency in whose district the fire occurs. 5. Any activity approved for reuse Category C, D or E. Any other use that is approved by the Division.
C	1. Treated effluent that meets the requirements for bacteriological quality set forth in NAC 445A.276 for reuse Category C may be used for: (a) Spray irrigation of land used as a cemetery, golf course, or greenbelt if: (1) Public access to the area of use is controlled; (2) Human contact with the treated effluent does not occur; and (3) A buffer zone of not less than 100 feet is maintained. (b) Watering of nursery stock if public access to the area of use is controlled. (c) Establishment, restoration, or maintenance of a wetland if public access to the wetland is controlled. (d) Washing of gravel used in concrete mixing. (e) Feed water for a boiler. (f) An impoundment if: (1) Public access to the impoundment is controlled; and (2) Human contact with the treated effluent cannot reasonably be expected to occur. (g) Fire fighting of forest or other wild land fires if approved by the fire department, fire protection district or other fire-fighting agency in whose district the fire occurs. (h) Any activity approved for reuse Category D or E. (i) Any other use that is approved by the Division.

Table 6-2 (Continued)

Reuse Category and Approved Uses

Reuse Category	Approved Uses
C (Cont'd)	2. As used in this section: (a) "Nursery stock" has the meaning ascribed to it in NRS 555.23562. (b) "Wetland" has the meaning ascribed to it in NRS 244.388.
D	1. Treated effluent that meets the requirements for bacteriological quality set forth in NAC 445A.276 for reuse Category D may be used for: (a) Spray irrigation of land used for agricultural purposes if: (1) Public access to the area of use is prohibited; and (2) A buffer zone of not less than 400 feet is maintained. (b) Surface irrigation of land used: (1) As greenbelt if: (I) Public access to the area of use is prohibited; and (II) Human contact with the treated effluent does not occur. (2) For agricultural purposes; and (3) For the cultivation of fruit-bearing trees or nut-bearing trees. (c) Subsurface irrigation of land used for agricultural purposes if public access is controlled. (d) Dust control. (e) Soil compaction. (f) Flushing sewer lines. (g) An impoundment if: (1) Public access to the impoundment is prohibited; (2) All human activities involving contact with the treated effluent are prohibited; and (3) Human contact with the treated effluent does not occur. (h) Any activity approved for reuse Category E. (i) Any other use approved by the Division. 2. As used in this section, "dust control" means the program required pursuant to NAC 445B.22037 to prevent controllable particulate matter from becoming airborne.
E	1. Treated effluent that meets the requirements for bacteriological quality set forth in NAC 445A.276 for reuse Category E may be used for: (a) Spray irrigation of land used for agricultural purposes if: (1) Public access to the area of use is prohibited; and (2) A buffer zone of not less than 800 feet is maintained. (b) Any other use that is approved by the Division.

6.4 SOUTHERN NEVADA WATER AUTHORITY

SNWA was formed in 1991 by a cooperative agreement among seven water and wastewater agencies in Southern Nevada: Big Bend Water Authority, Boulder City, COH, CLV, CNLV, CCWRD, and LVVWD. The SNWA member agencies are each individually responsible for providing retail water service and wastewater service to customers in their respective service areas.

SNWA is a wholesale water provider to municipal water agencies. In addition, SNWA acquires and manages long-term water resources for Southern Nevada. From its inception, SNWA has worked to seek water resources for Southern Nevada, manage existing and future water resources, prepare long-term regional water resource plans, construct and manage regional water facilities and promote conservation.

SNWA prepared its first *Water Resource Plan* in 1996. Since then, the plan has been reviewed annually and updated as needed. The current plan (2008) represents the seventh revision in 12 years. The plan provides a comprehensive overview of SNWA's portfolio of water resources for meeting long-term water demands in Southern Nevada. This portfolio consists of a diverse mix of resources including the following: water conservation, groundwater, Colorado River, and reclaimed water resources.

6.4.1 Water Conservation

SNWA encourages regional water conservation through the promotion of more efficient water use to ensure the effective management of water resources and to help meet long-term water demands. Since the formation of SNWA in 1991, SNWA has worked with its member agencies to implement aggressive regional water conservation through the implementation of incentive programs, water conservation oriented rates, education, and regulations. These SNWA water conservation efforts have succeeded in reducing water demands, as Southern Nevada water use declined by 15 billion gallons between 2002 and 2007, while the local population increased by more than 400,000. The SNWA plan reflects a continued commitment to additional water conservation and effective water resource management.

6.4.2 Groundwater

Groundwater and surface water in Nevada are managed and controlled by the Nevada State Engineer. SNWA and its members have surface and groundwater rights as well as applications for rights in Nevada. In 2008, the CNLV and LVVWD owned approximately 46,000 acre-feet/year groundwater rights for use in their meeting a portion of the water demands in Southern Nevada. SNWA also holds applications and groundwater rights in five groundwater basins located in Clark, Lincoln, and White Pine Counties as part of its plans to develop between 125,000 acre-feet/year and 164,000 acre-feet/year of groundwater for

consumptive use by SNWA's member agencies, and SNWA is in the process of obtaining right-of-ways for the development of these rights and applications. SNWA also holds water rights for 10,600 acre-feet/year from Three Lakes Valley (North and South) and Tikaboo Valley (North and South), and pending receipt of necessary state and environmental approvals, is considering development of these rights within Three Lakes Valley (South). In addition, SNWA has filed for applications for 16,000 acre-feet/year of groundwater rights from Indian Springs Valley.

The Moapa Valley Water District, Coyote Springs GID and the SNWA have groundwater rights in northeast Clark County. The SNWA currently owns 9,000 acre-feet/year of the 16,100 acre-feet/year of permitted groundwater rights in Coyote Spring Valley. To develop the 9,000 acre-feet/year and potentially utilize other existing water rights or future water rights, if permitted, the SNWA is constructing a 15-mile pipeline from Coyote Spring Valley to the Moapa Valley Water District's existing distribution system. This will enable the SNWA to convey its Coyote Spring Valley groundwater rights to the Lower Moapa Valley, and/or the Muddy River and Lake Mead. The SNWA anticipates obtaining credit for augmenting the mainstem of the Colorado River. These credits can then be withdrawn by the SNWA from Lake Mead through its existing facilities.

The SNWA is working with the Moapa Valley Water District and Muddy Valley Irrigation Company to construct facilities that will enable Coyote Spring Valley groundwater to be discharge to the Muddy River.

6.4.3 Colorado River Water

Nevada is allocated 300,000 acre-feet annually from Colorado River for consumptive use. The Colorado River is primarily withdrawn from Lake Mead, and it provides approximately 90 percent of the existing Southern Nevada water supply. These withdrawals include the recycling of water through returning highly treated effluent to Lake Mead for Colorado River return flow credits. Since Nevada's rights to the Colorado River are based on "consumptive use", any water that is withdrawn from the system and later returned, primarily as highly-treated wastewater flows, is effectively refunded. These "return flows" allow Nevada the ability to maximize the volume of water that can be diverted under its Colorado River apportionment.

The Secretary of Interior recently implemented interim guidelines providing flexibility to Colorado River operations through the year 2026. These guidelines provide for operations over a wide range of water supply conditions, including surplus, normal and shortage conditions. These Interim Guidelines also created a new type of surplus called Intentionally Created Surplus (ICS). ICS will enable SNWA to develop some of its non-Colorado River resources by conveying them to the Colorado River and receiving ICS credits for the

additional water. SNWA will also receive ICS credits for funding a system efficiency project on the Colorado River. SNWA currently has three ICS projects moving forward:

- Coyote Spring Valley Groundwater Imported ICS – SNWA has 9,000 acre-feet/year of groundwater rights in Coyote Spring Valley and another 27,512 acre-feet/year in pending applications. Up to 15,000 acre-feet/year can be developed from these rights and applications for Imported ICS credits.

- Virgin and Muddy Rivers Tributary Conservation ICS – It is anticipated that approximately 30,000 acre-feet/year of consumptive use rights (rights that have a priority date that preceded the June 25, 1929 effective date of the 1928 Boulder Canyon Project Act) will be acquired on the Muddy and Virgin Rivers and conveyed to Lake Mead for ICS credit.

- Drop 2 Reservoir System Efficiency ICS Project – SNWA has agreed to fund a portion of the Drop 2 Reservoir System Efficiency ICS Project in exchange for receiving at least 400,000 acre-feet of available water (consumptive use volume) from Lake Mead under normal conditions on the Colorado River. Diversions are limited to a maximum consumptive use volume of 40,000 acre-feet/year. SNWA can begin taking this water in 2011.

SNWA has also developed several sources of banked water. This includes water banked under an agreement with the Arizona Water Banking Authority. SNWA is guaranteed 1.25 million acre-feet/year of water from Arizona to be delivered through Lake Mead. This water may be utilized at a maximum annual rate of 40,000 acre-feet/year of consumptive use. SNWA also has an agreement with California and has banked 20,000 acre-feet in the California Water Bank. Within the Las Vegas Valley Groundwater Basin, SNWA has stored approximately 320,000 acre-feet of water for future use.

6.4.4 Reclaimed Water

SNWA reclaims Colorado River water through return-flow credits and water reuse. Development of in-state groundwater resources will create additional wastewater that, if treated and reused directly or through return flow credits, has the potential to increase their yield.

Further details on SNWA efforts and the current Water Resources can be obtained at www.snwa.com.

6.5 REUSE AND RECLAMATION POTENTIAL

The State of Nevada takes an active role through the NDEP to set stringent regulations. These regulations ensure that the reclaimed water quality is safe to return to the environment.

For purposes of this Plan, gray water is defined as wastewater that originates from residential clothes washers, bathtubs, showers, and sinks (except kitchen sinks) but does not include wastewater from toilets. It is not treated.

Many desert communities see gray water as a beneficial use. Gray water distribution systems can range from simple to complex. An important consideration is the suitability of gray water for residential use.

Because the Las Vegas Valley has traditionally employed return flow credits rather than recycling water, a review of expanded use of gray water has not been fully explored. The Southern Nevada Water Authority and the Clean Water Coalition, in partnership with the Cities of Henderson, Las Vegas and North Las Vegas, Clark County Water Reclamation District, Las Vegas Valley Water District, Southern Nevada Water Authority, Clark County Department of Air Quality & Environmental Management, Black and Veatch, James Crook Environmental Consulting and Katz & Associates is currently undertaking a study to examine the reuse of water. This study, which compares water reuse practices in Southern Nevada to those in other arid or semi-arid communities, focuses on water rights, resources, and demands for each community, and considers other factors that shape water reuse practices including: public health and safety, the cost of public infrastructure, and public acceptance of reuse supplies. Recommendations from the Southern Nevada Regional Water Recycling Study are forthcoming.

Implementation Challenges

The Clark County Uniform Plumbing Code removed the section permitting residential gray water systems in 1997. The Code would have to be amended to permit residential gray water use. Partnering with the Southern Nevada Health District would have to occur for the code development process to begin. Gray water systems are most cost effective in new construction. It is costly to retrofit existing homes.

Some allege that gray water may have health implications and any standing water could become a breeding ground for mosquitoes, the vectors of West Nile virus. This virus is endemic to the Las Vegas Valley. A crucial aspect of this endeavor involves a high degree of assurance that public health and safety can be sufficiently safeguarded. This would involve not only establishing a regulatory program but also identifying the appropriate lead agency.

The CCWRD, or potentially other publicly owned wastewater treatment providers, will operate interim package plants, and will look for adequate regional reuse opportunities. In the case of regular package plants, reuse opportunities will only be available for the owner of the package plant (development, etc.).

The following presents reclaimed water use potential by planning area within the planning area. The WWTFs in Clark County are described in Section 5 and are shown in **Figure 5-1** and listed in **Table 5-1**. Each planning area will contain subsections discussing the primary opportunities for water reclamation at each WWTF and their future reuse opportunities.

6.5.1 Planning Area 1 – Sand Spring - Tikaboo Valleys

The primary opportunity for water reclamation in Planning Area 1 is in the town of Indian Springs.

6.5.1.1 Indian Springs

Although Indian Springs does not have an effluent reuse system, wastewater is treated at the Indian Springs Wastewater Treatment System, which is owned and operated by the CCWRD. The average daily design capacity of the facility is 114,000 gpd. According to the *SWAC 2006 Year End Summary*, the average wastewater flows for the Indian Springs Wastewater Treatment System in 2006 were 0.12 mgd. The effluent generated in the Indian Springs Wastewater Treatment System is permitted to discharge via evaporation and by percolation. The Indian Springs Wastewater Treatment System is in the design phase for expansion with upgraded treatment processes to achieve secondary discharge requirements; thus, the facility will be eligible for certain reuse possibilities.

Effluent from the Indian Springs Wastewater Treatment System is not currently being reused. The demand for reclaimed water is low in the community. If future demands warrant it, then a study should be conducted to determine the feasibility of installing a reclaimed water distribution system.

6.5.1.2 Summary of Planning Area 1

Table 6-3 displays the WWTFs within Planning Area 1.

Table 6-3

Planning Area 1
2006 Reclaimed Water Use

Treatment Facility	Capacity (mgd)	2006 Annual Average Flows (mgd)	2006 Reclaimed Water Use (mgd)	2006 Reclaimed Water Use (acre-feet/year)
Indian Springs Wastewater Treatment System	0.11	0.12	0	0

6.5.2 Planning Area 2 – Muddy River - Meadow Valley Wash

The primary opportunities for water reclamation in Planning Area 2 are in the Moapa Valley Township, Apex, the future Coyote Springs development, and Moapa Township. Apex, the future Coyote Springs development, and Moapa Township do not have a WWTF; however, Coyote Springs Water Resources GID has applied for a discharge permit for the future WWTF. Future reuse opportunities for the Moapa Valley Township, Apex, Coyote Springs, and the Moapa Township are discussed in the following paragraphs.

6.5.2.1 Moapa Valley Township

The CCWRD and the Moapa Valley Water District should work together to provide an effluent management plan (EMP) for the Overton Ponds, future Moapa Valley WRC, and evaluate potential opportunities for water reclamation in the Moapa Valley Township. Opportunities for water reuse from the Overton Ponds would be limited in the Moapa Valley Township for at least the following three reasons:

1. The amount of available wastewater flows is small (0.35-mgd design capacity of the Overton Ponds).
2. The 2007 WWTF effluent quality, particularly with respect to high levels of TDS, which has been measured in the range of 1,600 to 2,700 mg/L (TDS for the Muddy River is the standard for the Colorado River System, as included in NAC 445.A.143, less than 879 mg/L).
3. Both Overton and Logandale would prefer to irrigate agricultural land with surface water from the Muddy River.

However, this preference may need to be reevaluated in light of the potential increases in wastewater flows expected to be generated by the newly proposed developments in Moapa Valley Township. As more agricultural lands convert to residential developments in these areas, there will be less land requiring reclaimed water for irrigation.

If septic systems are replaced with a centralized POTW or interim package plant, there may be more treated effluent available for water reclamation. Additionally, the possibility of

piping or trucking excess volumes of reclaimed water from Mesquite to the unincorporated areas in Muddy Valley would continue to be too costly for the low demand level.

The CCWRD *Facilities Master Plan (2004)* states that reuse of effluent from the Moapa Valley WRC is a possibility. The Moapa Valley WRC is (2008) in design for an initial capacity of 0.75 mgd and, according to the *SWAC 2006 Year End Summary*, the average wastewater flows for 2006 were 0.22 mgd. The design of the Moapa Valley WRC, which includes secondary treatment processes, influences the potential for reclamation through either reclaimed water applications, with approved uses included in **Table 6-2**, or discharge to the Overton Wildlife Management Area or Lake Mead. In addition, when the Moapa Valley WRC is operational, the limiting factors for reclaimed water applications may no longer be applicable. SNWA, Moapa Valley Water District, and CCWRD continue to work closely together to evaluate reclaimed water opportunities and optimize water resources in the Moapa Valley area.

The potential acreage for water reclamation was determined by reviewing the land use for the Moapa Valley Township, as indicated in the Northeast Clark County Land Use and Development Guide. Using an annual average turf water consumption of 80 inches, which was the same consumption standard used in the Las Vegas Valley, the reclaimed water demand was determined to be an annual average of 9 mgd to irrigate a total of 5,320 acres of construction sites, parks, and recreation areas.

6.5.2.2 Apex

Apex is a nonresidential, planned heavy industrial use park intended to locate heavy industry away from the Las Vegas Valley. Existing developments include a gypsum mine, a chemical lime facility, soil treatment facility, and the Apex Landfill. Since there is no resident population, this area does not contain any water treatment facility and WWTF, although the existing industries use septic systems for the disposal of their wastewater.

The potential for using reclaimed water in future development at Apex depends on the method of wastewater management. If wastewater from the Apex site was collected and conveyed for treatment at the CCWRD facility in the Las Vegas Valley, there would be no opportunity to use reclaimed water at Apex. However, the opportunity would be enhanced if package WWTPs were constructed on site as development occurs. Reclaimed water collected and retained in Apex could be used for dust control at construction sites during various development phases, some production lines and cooling systems, and for irrigating green areas. In addition, interim package plants are options for wastewater treatment in the Apex area. The potential for water reclamation, the type of usage, and the demand would be dictated by the wastewater management methodology and the type of industry in each phase of development.

Although Apex is outside of the study area of the *AWRS (2000)*, a brief discussion on water demand for Apex was included. The *AWRS (2000)* is dated and information included for Apex may no longer be accurate. In future updates to the *Clark County Area-Wide WQMP*, information on the water demand estimates for Apex should be updated.

6.5.2.3 Coyote Springs

Coyote Springs is a future 42,800-acre planned golf community located approximately 50 miles north of Las Vegas, with one-third of its land within Clark County and two-thirds within Lincoln County.

According to the NDEP Fact Sheet entitled *Coyote Springs Water Resources General Improvement District*, the facilities will discharge the treated effluent from the Coyote Springs WRF initially to one golf course and then to a second golf course as it is developed and flows are increased. Reclaimed water will also be used to irrigate common areas, parks, and streetscapes, and is also authorized for onsite construction and dust control uses.

6.5.2.4 Moapa Township

The Moapa Township includes the Moapa Detail Area and the Warm Springs Detail Area. The potential use of reclaimed water in the Moapa Detail Area and the Warm Springs Detail Area will be at construction sites. The reclaimed water demand was determined to be an annual average of 0.44 mgd to supply a total of 5,760 acres of construction sites.

There is little opportunity for water reclamation in the unincorporated county areas of Planning Area 2, unless septic systems are replaced with a public WWTF. The potential uses for reclaimed water should be updated, if package plants, interim package plans, or the Warm Springs WWTF are planned for the Moapa Detail Area and the Warm Springs Detail Area.

6.5.2.5 Summary of Planning Area 2

Table 6-4 displays the WWTFs within Planning Area 2.

Table 6-4

Planning Area 2
Wastewater Treatment Facilities and 2006 Reclaimed Water Use

Treatment Facility	Capacity (mgd)	2006 Annual Average Flows (mgd)	2006 Reclaimed Water Use (mgd)	2006 Reclaimed Water Use (acre-feet/year)
Overton Ponds (future Moapa Valley WRC)	0.35	0.22	0	0
Coyote Springs WRF[a]	2.1	0	0	0

Note:

[a] Coyote Springs WRF is a proposed facility.

Table 6-5 displays the potential reclaimed water customers, the acreage of land, and the average reclaimed water demands in mgd and acre-feet/year in Planning Area 2.

Table 6-5

Reclaimed Water Demands by Potential Land Use Customer in Planning Area 2

Community	Potential Land Use Customer	Area (acres)	Average Reclaimed Water Demand (mgd)	Average Reclaimed Water Demand (acre-feet/year)
Overton	Parks and Recreation Area	1,280	7.6	8,533
	Site Construction	1,920	0.1	54
Logandale	Parks and Recreation Area	200	1.2	1,333
	Site Construction	1,920	0.1	54
Subtotal for Moapa Valley Township		**5,320**	**9.0**	**9,974**
Moapa Township /Glendale	Site Construction	2,560	0.22 [a]	247 [b]
Moapa Township	Site Construction	3,200	0.22 [a]	247 [b]
Subtotal for Glendale and Moapa Township		**5,760**	**0.44**	**494**
Apex	Industrial	N/A	N/A	N/A
Coyote Springs	Golf Courses [c]	N/A	N/A	N/A
Total for Planning Area 2		**11,080**	**9.44**	**10,468**

Notes:

[a] Values recommended in Table J-6 in the *Northeast Clark County 208 Water Quality Management Plan (2000)*

[b] Values provided in Table J-5 in the *Northeast Clark County 208 Water Quality Management Plan (2000)*

[c] One golf course constructed, others to be constructed in the future

N/A – Not Available

6.5.3 Planning Area 3 – Lower Virgin River

The primary opportunity for water reclamation in Planning Area 3 is in Mesquite and the unincorporated town of Bunkerville.

6.5.3.1 Mesquite

The Mesquite WWTP is designed for an annual average capacity of 2.8 mgd and, according to the *2006 Year End Summary*, the average wastewater flow for 2006 was 1.81 mgd.

Mesquite produces reclaimed water and is expected to meet future water reclamation needs as outlined in the *Mesquite Effluent Management Plan* (City of Mesquite, 1995). Mesquite is permitted by the NDEP to discharge up to 3.5 mgd. After 2010, flows are projected to exceed the permitted discharge limit of 3.5 mgd, which will require the discharge permit to be revised to accommodate the future increased wastewater flows, and enhance water reclamation opportunities.

The Mesquite WWTP effluent meets standards for Category B reuse (see **Table 6-2**). The reclaimed water demand for Mesquite was determined to be an annual average of 4.3 mgd to irrigate a total of 2,862 acres of construction sites, golf courses, parks, and recreation areas. The annual average reclaimed water demand for the golf courses is 1 mgd for the Oasis Golf Course, 1.5 mgd for the Falcon Ridge Golf Course, and 1 mgd for the Wolf Creek Golf Club.

According to the *2006 Wastewater Facilities Planning Study*, the reclaimed water distribution system for Mesquite consists of a 12-inch pipeline that conveys the reclaimed water to the Oasis Ponds for their use on the Oasis Golf Course. The reclaimed water distribution system was expanded to provide water to the Virgin Valley High School and the City Baseball Complex. In Phase I of the reclaimed water distribution system improvements project, the Pulsipher Wash Pump Station and various pipelines on the western side of Mesquite were constructed in 2004 to provide reclaimed water to the Falcon Ridge Golf Course. Phase 2 consisted of a reuse storage pond and associated detention basin for two washes, Pulsipher and Abbott. The proposed storage ponds have a design capacity of 6 million gallons (mg) for Pulsipher and 5.7 mg for Abbott. **Figure 6-2** shows the reuse system for Mesquite that was provided in the *2006 Wastewater Facilities Planning Study*.

Mesquite and CCWRD should each consider partnership arrangements with developers of large residential and commercial projects to build onsite satellite water reclamation facilities for public and multi-use landscape areas and for other water reuse projects in outlying growth areas.

As recommended in the *Amendment to Northeast Clark County 208 Water Quality Management Plan (2007)*, "The City of Mesquite should coordinate with nearby unincorporated communities such as Bunkerville to determine their requirements for water reclamation when excess reclaimed water is available." However, as stated in the same reference for Mesquite, "the last alternative is to distribute reclaimed water to Bunkerville if excess reclaimed water is available. This would be possible after 2015 when enough excess reclaimed water is projected to be available to meet Bunkerville's needs."

6.5.3.2 Bunkerville

According to the *Amendment to Northeast Clark County 208 Water Quality Management Plan (2007)*, although Mesquite has the capacity to provide reclaimed water to Bunkerville, surface water from the Virgin River is conveniently available for irrigating planned green areas in the community. In order to utilize surface water for irrigation, or other purposes, potential users must comply with reuse regulations administered by the Nevada Division of Water Resources. If and when Bunkerville begins to reclaim its own water for reuse, as is expected if planned large-scale development occurs, the previous statement with respect to possible excess reclaimed water from Mesquite would need to be reassessed. According to the *Northeast Clark County 208 Water Quality Management Plan (2000)*, the reclaimed water demand for Bunkerville was determined to be an annual average of 0.22 mgd to irrigate a total of 3,210 acres of construction sites, parks, and recreation areas. The *Amendment to Northeast Clark County 208 Water Quality Management Plan (2007)* suggested that piping or trucking reclaimed water to Bunkerville would likely be too costly for the low demand.

However, as described in the *Amendment to Northeast Clark County 208 Water Quality Management Plan (2007)*, CCWRD recently completed the *Bunkerville Wastewater Collection and Water Reclamation System Feasibility Evaluation* (CCWRD, 2006). An element of this study included the evaluation of the most appropriate and cost-effective future water reclamation system and reuse opportunities for Bunkerville.

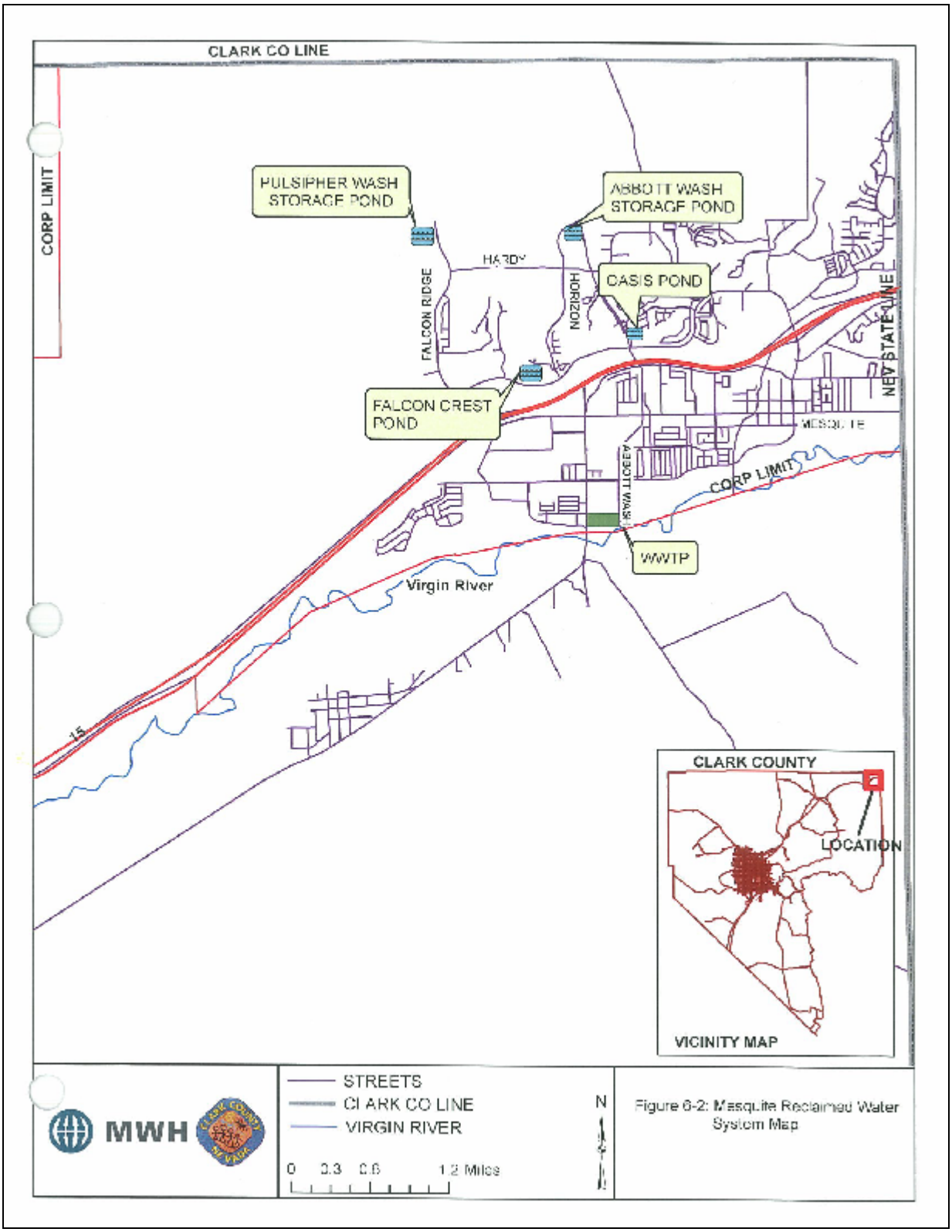


Figure 6-2: Mesquite Reclaimed Water System Map

6.5.3.3 Summary of Planning Area 3

Table 6-6 displays the WWTF within Planning Area 3.

Table 6-6

Planning Area 3 Summary Table and 2006 Reclaimed Water Use

Treatment Facility	Capacity (mgd)	2006 Annual Average Flows (mgd)	2006 Reclaimed Water Use (mgd)	2006 Reclaimed Water Use (acre-feet/year)
Mesquite WWTP	2.8	1.81	1.81	2,030

Table 6-7 lists reclaimed water demand by customers, the land area, and the average reclaimed water demands in mgd and acre-feet/year in Planning Area 3.

Table 6-7

Reclaimed Water Demands by Customers in Planning Area 3

Community	Potential Land Use Customer	Area (acres)	Average Reclaimed Water Demand	
			(mgd)	(acre-feet/ year)
Mesquite	Oasis Golf Course – 27 holes and Landscaped Area	240	1.0	1,124
	Rodeo/Fairgrounds and Greenbelts	90	0.54	600
	800-foot Buffer Zone of Tree Area	12	0.16	180
	Site Construction	1,920	0.1	111
	Falcon Ridge Golf Course – 18-hole	600	1.5	1,681
	Wolf Creek Golf Club – 18-hole	N/A	1.0	1,120
	Subtotal	**2,862**	**4.3**	**4,816**
Bunkerville	Park and Recreation Area	10	0.06	67
	Site Construction	3,200	0.16	91
	Subtotal	**3,210**	**0.22**	**158**
	Planning Area 3 Total	**6,072**	**4.52**	**4,974**

6.5.4 Planning Area 4 – Grand Wash and Lake Mead

Planning Area 4 consists of unincorporated county areas. Water is not being reused and there are no water reclamation plans for the future.

6.5.5 Planning Area 5 – Las Vegas Wash

Planning Area 5 encompasses the Las Vegas Valley where three wastewater agencies produce reclaimed water, CCWRD, COH, and CLV. Collectively, along with CNLV, these agencies are part of the CWC.

SNWA serves as the water provider to the municipal water agencies in the Las Vegas Valley and Boulder City. In addition, SNWA has been responsible for seeking new water resources for southern Nevada, managing existing and future water resources, constructing and managing regional water facilities, and promoting conservation. In 1996, SNWA prepared the first *Water Resource Plan* to outline the work performed by SNWA, and since then, the *Water Resource Plan* has undergone multiple revisions, with the latest revision in 2008.

Included below is a discussion on the SNWA *Water Resource Plan* (2008) and existing and future reuse opportunities for each agency in the CWC and Blue Diamond. Existing reclaimed water distribution facilities and their future expansions and planned facilities to meet the reclaimed water demand will also be discussed.

6.5.5.1 Southern Nevada Water Authority Reuse Threshold

Annual reclaimed water use thresholds were established for the southern Nevada wastewater agencies in the 1995 SNWA Amended Cooperative Agreement. These thresholds are applicable to the SNWA members who provide wastewater service. A member can supply reuse in excess of the established thresholds with prior approval of the applicable SNWA purveyor member who provides water service in the area. A reduction in an authorizing purveyor may occur in the event the increase in reuse influences the ability to assure deliveries to the other purveyor members. SNWA reuse thresholds by agency are provided in **Table 6-8**.

Table 6-8

SNWA Reuse Threshold by Agency

Agency	SNWA Annual Reuse Threshold (acre-feet/year)	SNWA Equivalent Average Day Reuse Threshold (mgd)
COH	7,500	6.7
CLV	2,000	1.8
CCWRD	11,100	9.9
CNLV	1,200	1.1
Total Las Vegas Valley	**21,800**	**19.5**

Source: *Las Vegas Valley 208 WQMP Amendment (1997)*.

6.5.5.2 Reclaimed Water Quantity

There are several water conservations efforts implemented in the Las Vegas Valley that affect reclaimed water quantity. These efforts are effective in conserving water through ordinances that limit irrigation, turf, and artificial lakes (through the Artificial Lakes Ban). As stated in the *AWRS (2000)*, the CLV, CNLV, and Clark County have ordinances that prohibit artificial lakes, with the exception of golf course lakes and impoundments for reclaimed water. According to the *AWRS (2000)*, the ordinances limit golf course lake surface areas. According to the *AWRS (2000)*, before constructing a reclaimed water storage impoundment, an irrigation district is to be created.

A second water conservation effort that affects reclaimed water quantity in the Las Vegas Valley is turf restrictions. According to the *AWRS (2000)*, CLV, CNLV and Clark County ordinances restrict new 18-hole golf courses to 100 acres of turf. Ordinances regarding turf restrictions for new residential and commercial developments also limit turfs on front lawns and grass on outside property for businesses.

Irrigation restrictions are another conservation effort operating in the COH, CNLV, CLV, and unincorporated areas of Clark County. As discussed in the *AWRS (2000)*, outdoor irrigation by consumers is prohibited at certain hours of the day.

Other water conservation efforts have been in effect in the Las Vegas Valley area. According to the information provided from the LVVWD website, water is being budgeted for golf courses using LVVWD potable, raw, reclaimed, and recycled water. Per the website, "water budgets are calculated based on the number of acres currently being irrigated." Other conservation efforts described in the website include compliance with water

limitations for public parks and community use recreational turf areas, and water to fill or refill decorative water features and man-made lakes.

6.5.5.3 Unincorporated Clark County

The main facility for the CCWRD is located at the east end of Flamingo Road. The CCWRD WWTP consists of the Central Plant and the AWT Plant.

6.5.5.3.1 Clark County Water Reclamation District Main Plant

The CCWRD is authorized by NDEP to discharge a combined flow of 150 mgd from both the Central Plant and the AWT Plant.

6.5.5.3.2 Existing Water Reuse Systems

Per the *AWRS (2000)*, the CCWRD has two effluent disposal options from the WWTP. The first option is wastewater reuse, primarily through landscape irrigation and electric power generation with flows, and the second effluent disposal option is to discharge to the Las Vegas Wash. The WWTP provides reclaimed water to both the Sunrise and Clark Station power plants, the Desert Rose Golf Course (Desert Rose), the Silver Bowl Park soccer fields, and can also serve the Stallion Mountain Golf Course.

The Desert Breeze WRC located northeast of the intersection of Flamingo Road and Durango Drive in Clark County opened for operation in April 2003. According to the Clark County website (June 2003), the plant was designed and constructed with a 5-mgd capacity (expandable to 10 mgd). Operated as a continuous average plant, the reclaimed water is delivered to adjacent LVVWD facilities for storage and pumping to the Desert Breeze Recycled Water Distribution System (RWDS). The Desert Breeze RWDS consists of a reservoir, three main pipelines, and two pumping stations. The reclaimed water from the Desert Breeze RWDS is used for irrigation of golf courses located in the southwest part of the valley. The reclaimed water sites in the Desert Breeze RWDS include:

- Red Rock Country Club
- Siena Golf Club
- Bear's Best Golf Course (formerly known as Summerlin Village 17A Golf Course)
- Rhodes Ranch Golf Club
- Spanish Trail Country Club
- Section 5 Park

By using reclaimed water from the Desert Breeze WRC, the golf courses reduce the demand for potable water.

6.5.5.3.3 Future Reuse Opportunities

For future reuse opportunities, Clark County requires new golf courses and nearby landscape areas to use reclaimed water.

The initial phase of the Enterprise WRC will be designed for an average daily flow of 15 mgd. Enterprise WRC effluent will be discharged to the onsite reclaimed water distribution system or to the Duck Creek Wash. Reclaimed water will be delivered to the reclaimed water distribution system to provide irrigation for golf courses, parks, and other landscape needs.

Information on annual water usage for the existing, proposed, and future golf courses in unincorporated county areas were provided in the *AWRS (2000)*, and the tabulated information has been included in this section. **Table 6-9** shows a summary of the annual water usage at existing golf courses in unincorporated county areas of Planning Area 5. **Table 6-10** shows a summary of the annual water usage at proposed and future golf courses in unincorporated county areas of Planning Area 5.

According to the *AWRS (2000)*, parks are significant potential demands for reclaimed water irrigation. Information on annual water usage for the existing, planned, and proposed parks in unincorporated county areas were provided in the *AWRS (2000)*, and the tabulated information has been included in this section. **Table 6-11** shows a summary of the total acreage, the irrigated area in acres, and the annual water usage at existing, planned, and proposed parks in unincorporated county areas of Planning Area 5. The annual demand (acre-feet/year) was calculated in the *AWRS (2000)* assuming that 50 percent of the total park is turf and that the turf requires 6.3 acre-feet/year/acre of irrigation.

Table 6-9

Existing Golf Courses
Within Unincorporated Clark County Water Usage Summary

Golf Course	No of Holes	Irrigated Area (acres)	Annual Water Usage (acre-feet/year)					Annual Average (mgd)	Rate (acre- feet/acre/ year)
			Potable	Untreated Lake Mead	Wells	Reuse	Total		
Bali Hai Golf Club	18	155	977	0	0	0	977	0.87	6.3[a]
Callaway Golf Center	9	25	248	0	0	0	248	0.22	9.92
Bear's Best	18	100	0	0	0	630	630	0.56	6.3
Desert Inn Golf Club	18	136	907	0	608	0	1,515	1.35	11.1
Desert Rose Golf Course	18	116	86	0	0	700	786	0.7	6.8
Las Vegas National Golf Club	18	127	0	0	952	0	952	0.85	7.5
Las Vegas Country Club	18	146	930	0	440	0	1,370	1.22	9.4
Red Rock Country Club Mountain	18	100[a]	0	0	0	630	630	0.56	6.3[a]
Red Rock Country Club Arroyo	18	100[a]	0	0	0	630	630	0.56	6.3[a]
Rhodes Ranch Golf Club	18	129	0	0	0	1,161	1,161	1.04	9.0
Royal Links Golf Club[b]	18	169	0	0	0	1,065	1,065	0.95	6.3[a]
Siena Golf Club	18	135	0	0	0	851	851	0.76	6.3[a]
Southern Highlands Golf Club	18	135	851	0	0	0	851	0.76	6.3[a]
Spanish Trail Country Club Canyon Course	9	244	0	0	0	1,525	1,525	1.36	6.3
Spanish Trail Country Club Lakes Course	9								
Spanish Trail Country Club Sunrise Course	9								
Stallion Mountain Golf Course[b]	18	449	74	0	0	2,174	2,248	2.01	5.0
Sunrise Vista Golf Club	9	196	0	0	598	0	598	0.53	3.0
Sunrise Vista Golf Club	18								
Total Clark County (Rate is Average)	**315**	**2,362**	**4,073**	**0**	**2,598**	**9,366**	**16,037**	**14.30**	**7.0**

Notes:

[a] Estimated
[b] Served by CLV
Average Golf Course Irrigated Area per Hole = 6.9 acres
Average Irrigation Application Rate = 6.3 acre-feet/acre/year

Table 6-10

Proposed and Future Golf Courses
Within Unincorporated Clark County Water Usage Summary

Proposed Golf Courses Within the Study Area - Water Usage Estimates								
Golf Course	Irrigated Area (acres)[a]	Annual Water Usage (acre-feet/year)					Annual Average (mgd)	Rate (acre-feet/acre/year)[b]
		Potable	Untreated Lake Mead	Wells	Reuse	Total		
Proposed Golf Courses								
Blue Valley Golf Course	100	630	0	0	0	630	0.56	6.3
Cashman Park No. 1	100	630	0	0	0	630	0.56	6.3
Cashman Park No. 2	100	630	0	0	0	630	0.56	6.3
Champions	100	0	0	0	630	630	0.56	6.3
CMA Golf Course	100	630	0	0	0	630	0.56	6.3
Desert Breeze	100	0	0	0	630	630	0.56	6.3
Sloan Golf Course	100	630	0	0	0	630	0.56	6.3
Sunrise Mountain Landfill No. 1	100	0	0	0	630	630	0.56	6.3
Sunrise Mountain Landfill No. 2	100	0	0	0	630	630	0.56	6.3
Sunrise Mountain Landfill No. 3	100	0	0	0	630	630	0.56	6.3
Sunrise Mountain Landfill No. 4	100	0	0	0	630	630	0.56	6.3
Subtotal (Rate is Average)	**1,100**	**3,150**	**0**	**0**	**3,780**	**6,930**	**6.16**	**6.3**
Future Golf Courses								
CMA Golf Course No. 2	100	0	0	0	630	630	0.56	6.3
CMA Golf Course No. 3	100	0	0	0	630	630	0.56	6.3
Sloan Golf Course No. 2	100	0	0	0	630	630	0.56	6.3
South Strip No. 1	100	0	0	0	630	630	0.56	6.3
South Strip No. 2	100	0	0	0	630	630	0.56	6.3
Subtotal (Rate is Average)	**500**	**0**	**0**	**0**	**3,150**	**3,150**	**2.80**	**6.3**
Total (Rate is Average)	**1,600**	**3,150**	**0**	**0**	**6,930**	**10,080**	**8.96**	**6.3**

Notes:

[a] Turf at proposed golf courses restricted to 100 acres per 18 holes.
[b] Average Irrigation Application Rate = 6.3 acre-feet/acre/year

Table 6-11

Summary of Parks Water Usage in Unincorporated County Areas of Planning Area 5

Facility	Area (acres)	Irrigated Area (acres)	Annual demand (acre-feet/year)
Existing Parks	991.16	307.64	3,420
Planned Parks	411.97	N/A	1,420[a]
Proposed Parks	1,155.00	N/A	3,980 [a]
Total	**2,558.13**	**307.64**	**8,820**

Notes:

[a] Value provided in *AWRS (2000)*
N/A – Not Available

In the unincorporated county areas of Planning Area 5, reclaimed water is used at the CCWRD WWTP and as cooling water at the Sunrise and Clark Station power plants. **Table 6-12** shows a summary of the annual water usage at these existing facilities. In the *AWRS (2000)*, no planned or proposed industrial facilities in unincorporated county areas were identified as potential reclaimed water users.

Table 6-12

Summary of Industrial Reclaimed Water Demand in Unincorporated County Areas of Planning Area 5

Facility	Annual demand (acre-feet/year)
Sunrise Station Power Plant	600
Clark Station Power Plant	1,740 [a]
CCWRD WWTP	782 [a]
Total	**3,122**

Note:

[a] 1994 through 1998 average, CCWRD only

6.5.5.4 City of Henderson

The COH is responsible for treating all of the wastewater conveyed to its primary treatment facility, the WRF. The COH is also served by a second WWTF called WWTP No. 3. According to the *SWAC 2006 Year End Summary*, the COH average wastewater flows for 2006 were 20.31 mgd.

6.5.5.4.1 Existing Water Reuse Systems

The COH has two existing reclaimed water systems called Black Mountain and Green Valley. The Black Mountain system serves the irrigation demands for two 18-hole golf courses, a cemetery, on site at the WRF, and the COH Boulder Highway Beautification Project. The Black Mountain system consists of two pumping stations, 10 miles of pipeline, and three reservoirs. The Green Valley system provides reclaimed water for eight 18-hole golf courses. It consists of four pumping stations, 12 miles of pipeline, and five reservoirs. The COH reclaimed water distribution systems serve the following reuse sites:

- Black Mountain Golf Course
- Tuscany Golf Course/Rhodes Ranch
- Anthem Country Club Revere Golf Course
- Del Webb Communities, Desert Willow Golf Course
- Foothills Partners, DragonRidge Golf Club
- Legacy Golf Club Course
- Troon Lexington at Revere Golf Course
- Troon Concorde at Revere Golf Course
- Rio Secco Golf Club (7 Hills Golf Course) Harrah's Operating Unit
- Wildhorse Golf Course
- Palm Mortuary
- COH Boulder Highway Beautification Project
- COH WRF, on site

6.5.5.4.2 Future Reuse Opportunities

According to the *AWRS (2000)*, extension of both the Black Mountain and Green Valley systems will be required for future water demands, as well as the design of two new systems called the Northeast and Low Pressure systems. The Southwest WRF is under construction at St. Rose Parkway, south and east of Pecos Road. The facility is designed with an initial capacity of 8 mgd, with the capability of expansion to 16 mgd. The facility will support the community's increasing wastewater treatment demands and provide reclaimed water to their customers. The Southwest WRF will tie into COH's existing Green Valley reclaimed system to provide reclaimed water to existing golf courses at higher elevations in southwest COH. New reclaimed water needs in the area will be met from this facility also.

Information on annual water usage for the existing, proposed, and future golf courses in COH was provided in the *AWRS (2000)*, and the tabulated information has been included in this section. **Table 6-13** shows a summary of the annual water usage at existing golf courses in COH. **Table 6-14** shows a summary of the annual water usage at proposed and future golf courses in COH.

Information on annual water usage for the existing, planned, and proposed parks in COH was provided in the *AWRS (2000)*, and the tabulated information has been included in this section. **Table 6-15** shows a summary of the total acreage, the irrigated area in acres, and the annual water usage at existing, planned, and proposed parks in COH. The annual demand (acre-feet/year) was calculated in the *AWRS (2000)* assuming that 50 percent of the total park is turf and that the turf requires 6.3 acre-feet/year/acre of irrigation.

Table 6-13

Existing Golf Courses
Within COH
Water Usage Summary

Golf Course	No. of Holes	Irrigated Area (acres)	Annual Water Usage (acre-feet/year)					Annual Average (mgd)	Rate (acre-feet/acre/ year)
			Potable	Untreated Lake Mead	Wells	Reuse	Total		
City of Henderson									
Anthem Country Club	18	127	0	0	0	1,308	1,308	1.17	10.3
Black Mountain Golf Club	18	116	0	0	0	331	331	0.30	2.9
Lake Las Vegas Reflection Bay Golf Club	18	112	0	706[a]	0	0	706	0.63	6.3[a]
Lake Las Vegas South Shore Golf Club	18	79[a]	0	498[a]	0	0	498	0.44	6.3[a]
Legacy Golf Club	18	187	0	0	0	1,137	1,137	1.02	6.1
DragonRidge Golf Club	18	100	0	0	0	630[a]	630	0.56	6.3[a]
Tuscany Golf Club[b]	18	107	0	0	0	674	674	0.60	6.3[a]
Rio Secco	18	116	0	0	0	596	596	0.53	5.1
Revere at Anthem	18	121	0	0	0	1,107	1,107	0.99	9.1
Sun City MacDonald Ranch Desert Willow Golf Course	18	92	0	0	0	760	760	0.68	8.3
Wildhorse Golf Club	18	133	0	0	0	493	493	0.44	3.7
Subtotal COH (Rate is Average)	**198**	**1,290**	**0**	**1,203**	**0**	**7,036**	**8,240**	**7.36**	**6.4**

Notes:

[a] Estimated
[b] Formerly known as Palm City
Average Golf Course Irrigated Area per Hole = 6.9 acres
Average Irrigation Application Rate = 6.3 acre-feet/acre/year

Table 6-14

Proposed and Future Golf Courses Within COH Water Usage Summary

Golf Course	Irrigated Area (acres)[a]	Annual Water Usage (acre-feet/year)					Annual Average (mgd)	Rate (acre-feet/acre/year)[b]
		Potable	Untreated Lake Mead	Wells	Reuse	Total		
Proposed Golf Courses								
Annex No. 1	100	0	0	0	630	630	0.56	6.3
Annex No. 2	100	0	0	0	630	630	0.56	6.3
BMI-1	100	0	0	0	630	630	0.56	6.3
BMI-2	100	0	0	0	630	630	0.56	6.3
BMI-3	100	0	0	0	630	630	0.56	6.3
COH No. 1	100	0	0	0	630	630	0.56	6.3
COH No. 2	100	0	0	0	630	630	0.56	6.3
Proposed Golf Course	100	0	0	0	630	630	0.56	6.3
Proposed Golf Course	100	0	0	0	630	630	0.56	6.3
Lake Las Vegas No. 3	100	0	630	0	0	630	0.56	6.3
Lake Las Vegas No. 4	100	0	630	0	0	630	0.56	6.3
Sun City Anthem No. 2	100	0	0	0	630	630	0.56	6.3
Sun City Anthem No. 3	100	0	0	0	630	630	0.56	6.3
Sun City Anthem No. 4	100	0	0	0	630	630	0.56	6.3
Village IV Golf Course	100	0	0	0	630	630	0.56	6.3
Subtotal (Rate is Average)	**1,500**	**0**	**1,260**	**0**	**8,190**	**9,450**	**8.40**	**6.3**
Future Golf Courses								
Annex No. 3	100	0	0	0	630	630	0.56	6.3
Annex No. 4	100	0	0	0	630	630	0.56	6.3
BLM-1	100	0	630	0	0	630	0.56	6.3
BLM-2	100	0	630	0	0	630	0.56	6.3
River Mountains	100	0	0	0	630	630	0.56	6.3
Three Kids Mine Golf Course	100	0	0	0	630	630	0.56	6.3
Subtotal (Rate is Average)	**600**	**0**	**1,260**	**0**	**2,520**	**3,780**	**3.36**	**6.3**
Total (Rate is Average)	**2,100**	**0**	**2,520**	**0**	**10,710**	**13,230**	**11.76**	**6.3**

Notes:

[a] Turf at proposed golf courses restricted to 100 acres per 18 holes.
[b] Average Irrigation Application Rate = 6.3 acre-feet/acre/year

Table 6-15

Summary of
COH Parks Water Usage

Facility	Area (acres)	Irrigated Area (acres)	Annual Demand (acre-feet/year)
Existing Parks	511.5	293	1,760
Planned Parks	335	152	1,156
Proposed Parks	82	25	283
Total	**928.5**	**470**	**3,199**

Reclaimed water is being used at the COH WRF and potential reclaimed water users include the industrial facilities at Black Mountain Industries (BMI), formerly known as Basic Management, Incorporated. **Table 6-16** shows a summary of the annual water usage at these facilities.

Table 6-16

Summary of
COH Industrial Reclaimed Water Demand

Facility	Annual demand (acre-feet/year)
BMI	0
COH WRF	560 [a]
Total	**560**

Note:

[a] Estimated in Facility Plan

6.5.5.5 City of Las Vegas

The CLV has three facilities that provide reclaimed water for irrigation and industrial uses, the WPCF Bonanza/Mojave WRC and the Durango Hills WRC. According to the average of the monthly flows included in the *SWAC 2006 Year End Summary*, in 2006, the average wastewater flows for CLV were approximately 69 mgd.

6.5.5.5.1 Existing Water Reuse Systems

The WPCF is located in the southeastern portion of the CLV and is designed to discharge to the Las Vegas Wash, or to supply reclaimed water to three 18-hole golf courses and one power plant. The reuse facilities served by the WPCF include:

- Royal Links Golf Course
- Stallion Mountain Golf Course
- Desert Rose Golf Course
- Sunrise Power Plant

The WPCF supplies reclaimed water to the Royal Links Golf Course directly by pumps and storage facilities located at the WPCF site. For the Stallion Mountain Golf Course, reclaimed water is supplied to the various lakes on the course, which provide irrigation water. The WPCF has the capability of serving the Desert Rose Golf Course and the Sunrise Power Plant, which can also receive reclaimed water from the Clark Station Power Plant.

The Bonanza/Mojave WRC is owned and operated by the CLV. The Bonanza/Mojave WRC provides reclaimed water to the Desert Pines Golf Club. As indicated in the *AWRS (2000)*, this facility was designed only to treat wastewater required to meet its own reclaimed water demand.

The Durango Hills WRC is owned and operated by the CLV and delivers recycled water to the LVVWD. The RWDS is owned and operated by the LVVWD and consists of a reservoir, three main pipelines, three pumping stations, and four recharge/recovery wells. The Durango Hills WRC is capable of treating 10 mgd, more than 11,200 acre-feet/ year of reclaimed water for golf courses, schools and parks. The RWDS is capable of delivering over 19.0 mgd of recycled water to these customers.

6.5.5.5.2 Future Reuse Opportunities

The Deer Springs WRC is a potential satellite treatment facility to be located at the corner of Decatur Boulevard and Deer Springs Way. The facility would have 10-mgd of capacity; however, the facility plan update will determine the feasibility and final capacity.

The *AWRS (2000)* includes plans for future effluent disposal options. The *AWRS (2000)* states that the CLV uses two methods for disposal of plant effluent (1) turf irrigation and industrial reuse, and (2) surface discharge to Las Vegas Wash. In the future, management of the effluent at CLV will be based on two criteria; first, contracted reclaimed water demands will be met using WPCF or WRC effluent. If there is not enough effluent to meet the

demands, then potable water will be used as a supplemental source. Secondly, excess flow will be discharged to Las Vegas Wash.

Information on annual water usage for the existing, proposed, and future golf courses in CLV were provided in the *AWRS (2000)*, and the tabulated information has been included in this section. **Table 6-17** shows a summary of the annual water usage at existing golf courses in CLV. **Table 6-18** shows a summary of the annual water usage at proposed and future golf courses in CLV.

According to the *AWRS (2000)*, parks represent significant potential demands for reclaimed water irrigation. Information on annual water usage for the existing planned, and proposed parks in CLV was provided in the *AWRS (2000)*, and the tabulated information has been included in this section. **Table 6-19** shows a summary of the total acreage, the irrigated area in acres, and the annual water usage at existing, planned, and proposed parks in CLV. The annual demand (acre-feet/year) was calculated in the *AWRS (2000)* assuming that 50 percent of the total park is turf and that the turf requires 6.3 acre-feet/acre/year of irrigation.

In CLV, reclaimed water is being used at the CLV WPCF. **Table 6-20** shows a summary of the annual water usage at these existing facilities, as indicated in the *AWRS (2000)*. No planned or proposed industrial facilities in CLV were identified in the *AWRS (2000)* as potential reclaimed water users.

Table 6-17

Existing Golf Courses in CLV
Water Usage Summary

Golf Course	No. of Holes	Irrigated Area (acres)	Annual Water Usage (acre-feet/year)					Annual Average (mgd)	Rate (acre-feet/ acre/year)
			Potable	Untreated Lake Mead	Wells	Reuse	Total		
Angel Park Golf Club Palm	18	257	0	0	0	1,906	1,906	1.70	7.4
Angel Park Golf Club Mountain	18	0	0	0	0	0	0	0	0
Angel Park Golf Club Cloud Nine	12	0	0	0	0	0	0	0	0
Badlands Golf Club	18	119	0	0	392	593	985	0.88	8.3
Badlands Golf Club Outlaw Nine	9	0	0	0	0	0	0	0	0
Canyon Gate Country Club	18	151	925	0	0	0	925	0.83	6.1
Desert Pines Golf Club	18	66	0	0	0	553	553	0.49	8.4
Durango Hills Golf Course	18	62	0	0	0	391	391	0.35	6.3
Las Vegas Golf Club (Municipal)	18	139	683	0	815	0	1,498	1.34	10.8
Los Prados Country Club	18	101	636	0	0	0	636	0.57	6.3
Mountain Spa	18	100[a]	630	0	0	0	630	0.56	6.3[a]
Painted Desert Golf Club	18	87	828	0	0	0	828	0.74	9.5
Sun City Summerlin Eagle Crest Golf Club	18	102	0	0	0	761	761	0.68	7.5
Sun City Summerlin Highland Falls Golf Club	18	179	0	0	0	1,233	1,233	1.10	6.9
Sun City Summerlin Palm Valley Golf Club	18	189	0	0	0	1,324	1,324	1.18	7.0
TPC at Summerlin	18	174	0	0	0	1,215	1,215	1.08	7.0
TPC at the Canyons	18	107	0	0	0	980	980	0.88	9.2
Subtotal CLV (Rate is Average)	**291**	**1,833**	**3,702**	**0**	**1,207**	**8,956**	**13,865**	**12.38**	**7.6**

Notes:

[a] Estimated
Average Golf Course Irrigated Area per Hole = 6.9 acres
Average Irrigation Application Rate = 6.3 acre-feet/acre/year

Table 6-18

Proposed and Future Golf Courses CLV – Water Usage Estimates

Golf Course	Irrigated Area (acres)[a]	Annual Water Usage (acre-feet/year)					Annual Average (mgd)	Rate (acre-feet/ acre/year)[b]
		Potable	Untreated Lake Mead	Wells	Reuse	Total		
Proposed Golf Courses								
Silver Creek	100	0	0	0	630	630	0.56	6.3
Summerlin Village 23	100	630	0	0	0	630	0.56	6.3
Summerlin Village 29	100	630	0	0	0	630	0.56	6.3
Summerlin Village 30	100	630	0	0	0	630	0.56	6.3
Subtotal (Rate is Average)	**400**	**1,890**	**0**	**0**	**630**	**2,520**	**2.24**	**6.3**
Future Golf Courses								
Floyd Lamb Golf Course	100	0	0	0	630	630	0.56	6.3
Subtotal (Rate is Average)	**100**	**0**	**0**	**0**	**630**	**630**	**0.56**	**6.3**
Total (Rate is Average)	**500**	**1,890**	**0**	**0**	**1,260**	**3,150**	**2.80**	**6.3**

Notes:

[a] Turf at proposed golf courses restricted to 100 acres per 18 holes.
[b] Average Irrigation Application Rate = 6.3 acre-feet/acre/year

Table 6-19

Summary of
CLV Parks Water Usage

Facility	Area (acres)	Irrigated Area (acres)	Annual demand (acre-feet/year)
Existing Parks	739.6	338.03	2,553
Planned Parks	332.23	100	1,146
Proposed Parks	1,973.81	N/A	6,810 [a]
Total	**3,045.64**	**438.03**	**10,509**

Notes:

[a] Value Provided in *AWRS (2000)*
N/A – Not Available

Table 6-20

Summary of CLV Industrial
Reclaimed Water Demand

Facility	Annual demand (acre-feet/year)
CLV WPCF	560 [a]
Total	**560**

Note:

[a] Estimated in Facility Plan

6.5.5.6 City of North Las Vegas

CNLV wastewater flows are either treated at the CLV WPCF or by the CCWRD. According to the *CNLV WRF Amendment (2005),* CNLV plans are to develop a new WRF that treats all wastewater generated within the city limits. Phase I treatment capacity is 25 mgd and ultimate buildout capacity is 50 mgd. According to the *SWAC 2006 Year End Summary*, in 2006, the average wastewater flows for CNLV were 15.9 mgd.

According to the *CNLV WRF Amendment (2005)*, prior studies have been conducted for CNLV to identify potential reuse sites that could use reclaimed water for irrigation (such as golf courses and parks) or industrial purposes (commercial laundries). Alternative uses for reclaimed water that could be considered include use for dust control at constructions sites and fire suppression.

Information on annual water usage for the golf courses in CNLV was provided in the *CNLV WRF Amendment (2005)*, and the tabulated information has been included in this section. **Table 6-21** summarizes the annual water usage (maximum month use in mgd) at golf courses in CNLV from the *CNLV WRF Amendment (2005)*, and **Figure 6-3** shows the location of the golf courses. The annual water demand in acre-feet/year was calculated by converting the annual use (millions of gallons) to average daily use (mgd) and converting to acre-feet/year.

Table 6-21

Golf Courses in CNLV
Water Usage Summary

Reuse Sites	Annual Use (millions of gallons)	Average Month (millions of gallons)	Maximum Month Use (mgd)	Annual Water Usage, (acre-feet/year)[a]
CNLV Golf Course	30.1	2.5	0.139	92
Shadow Creek Golf Course	257.5	21.5	1.290	791
Aliante (BLM #1)	301.4	25.1	1.352	925
BLM #2	224.3	18.7	1.054	689
BLM #3	146.3	12.2	0.687	449
Total	**959.6**	**80**	**4.522**	**2,946**

Note:

[a] Calculated: Annual use (millions of gallons) converted to acre-feet/year

Information on annual water usage for the parks in CNLV was provided in the *CNLV WRF Amendment (2005)*, and the tabulated information has been included in this section. **Table 6-22** lists the parks included in the *CNLV WRF Amendment (2005)* where the extension of the reclaimed water distribution system is considered economically viable, and **Figure 6-3** shows the location of the parks. The annual water demand in acre-feet/year was calculated by converting the annual use (millions of gallons) to average daily use (mgd) and converting to acre-feet/year.

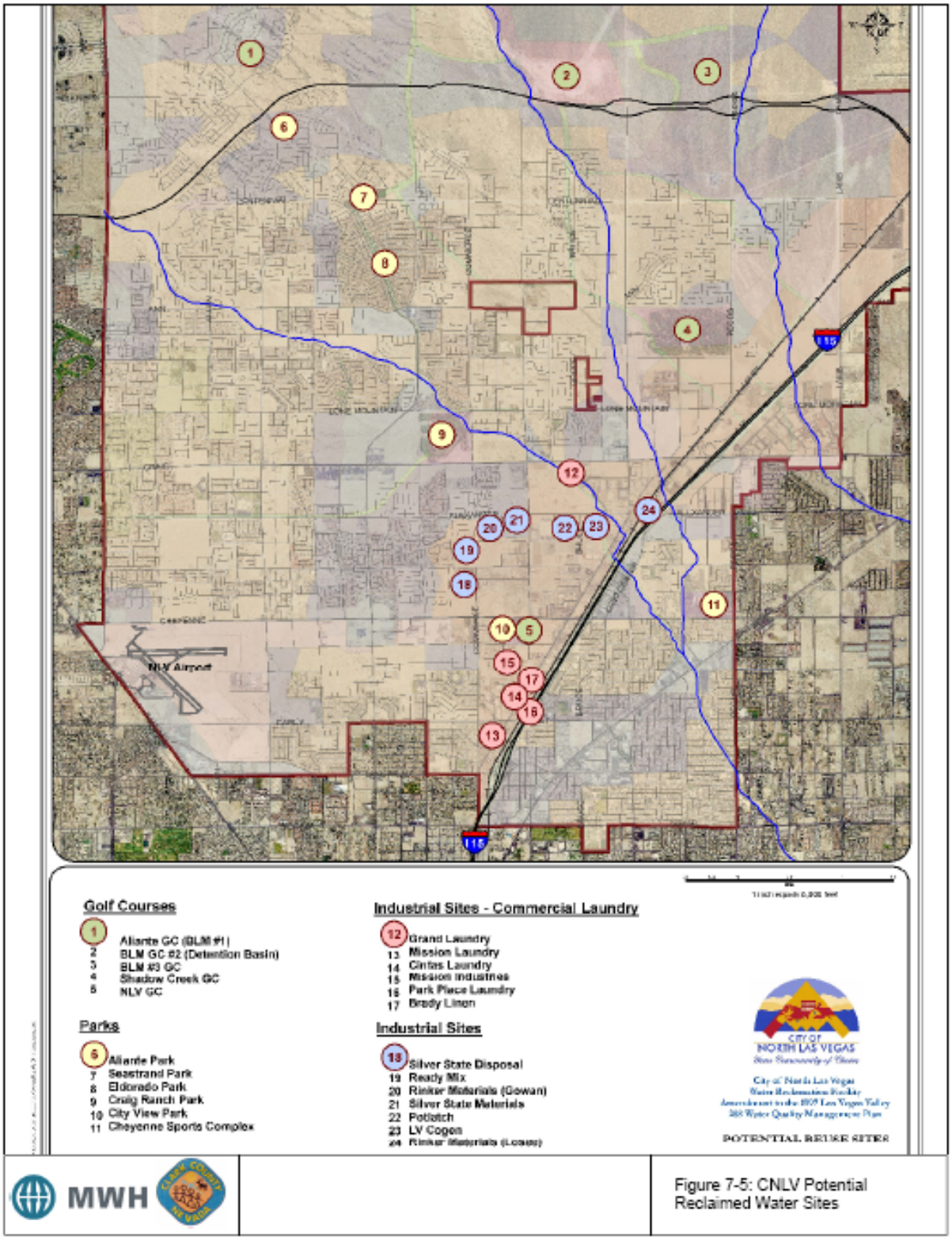


Figure 7-5: CNLV Potential Reclaimed Water Sites

Table 6-22

Summary of CNLV Parks Water Usage

Reuse Sites	Annual Use (millions of gallons)	Average Month (millions of gallons)	Maximum Month Use (mgd)	Annual Water Usage, (acre-feet/year)[a]
Aliante Nature Park	7.6	0.7	0.059	23
Cheyenne Sports Complex	26.0	2.2	0.170	80
Craig Ranch Park	162.5	13.6	0.856	499
City View	43.6	3.6	0.281	134
Eldorado	14.8	1.2	0.102	45
Seastrand	54.0	4.5	0.383	166
Total	**308.5**	**25.8**	**1.851**	**947**

Note:

[a] Calculated: Annual use (millions of gallons) converted to acre-feet/year

In CNLV, potential reclaimed water users are predominantly commercial laundries and construction-related plants. In addition a co-generation plant in the area could use reclaimed water as cooling water. Potential industrial users of reclaimed water are shown in **Table 6-23** and **Figure 6-3**. The annual water demand in acre-feet/year was calculated by converting the annual use (millions of gallons) to average daily use (mgd) and converting to acre-feet/year.

Table 6-23

CNLV Industrial Facilities
Water Usage Summary

Reuse Sites	Annual Use (millions of gallons)	Average Month (millions of gallons)	Maximum Month Use (mgd)	Annual Water Usage, (acre-feet/ year)[a]
Commercial Laundry Sites[b]				
Mission Industries (Mayflower)	304.0	25.4	1.165	933
Mission Linen (Commerce)	117.7	9.8	0.402	361
Cintas Laundry	27.4	2.3	0.089	84
Grand Laundry	45.9	3.8	0.182	141
Park Place Laundry	113.6	9.5	0.413	349
Brady Linen	76.5	6.4	0.272	235
Commercial Laundry Subtotal	**685.1**	**57.2**	**2.523**	**2,103**
Industrial Sites[c]				
Las Vegas Co-generation Plant[b]	451.1	37.6	3.077	1,385
Republic Silver State Disposal	15.0	1.3	0.221	46
Rinker Materials (Losee)	16.5	1.4	0.074	51
Rinker Materials (Gowan)	8.9	0.7	0.059	27
Ready Mix, Inc.	12.3	1.0	0.069	38
Silver State Materials	16.5	1.4	0.072	51
Potlatch	128.5	10.7	0.700	394
Industrial Subtotal	648.8	54.1	**4.272**	**1,992**
Total	**1,333.9**	**111.3**	**6.795**	**4,095**

Notes:

[a] Calculated: Annual use (millions of gallons) converted to acre-feet/year
[b] Requires RO treated reuse water
[c] Requires Class A reuse water

6.5.5.7 Blue Diamond

The average daily design flow rate for the Blue Diamond Wastewater Treatment Facility system is 44,000 gpd (0.044 mgd).

The CCRWD *Facilities Master Plan (2004*) reports that the natural treatment of wastewater in Blue Diamond does not provide a high-quality effluent suitable for reuse applications. A higher degree of treatment will be needed to use this resource. In the future, the Blue Diamond collection system will be extended to connect into the future Enterprise WRC, and the Blue Diamond WWTF will be abandoned. It is possible that reuse opportunities will expand with the connection to the Enterprise WRC system.

6.5.5.8 Sloan

As discussed in Section 5, if Las Vegas development moves south, demand for utilities could increase in Sloan and change the wastewater facilities from septic systems to wastewater collection and treatment systems.

6.5.5.9 Summary of Planning Area 5

Table 6-24 displays the WWTFs within Planning Area 5. The annual average flows (mgd) and the amount of reclaimed water used (mgd) shown in **Table 6-24** were provided in the *SWAC 2006 Year End Summary*.

Table 6-24

Planning Area 5
Wastewater Treatment Facilities and 2006 Reclaimed Water Use

Treatment Facility	Capacity (mgd)	2006 Annual Average Flows (mgd)	2006 Reclaimed Water Use (mgd)	2006 Reclaimed Water Use (acre-feet/ year)
CCWRD Main Plant	150 [a]	N/A	7.88	8,828
Desert Breeze WRC	N/A	N/A	3.04	3,406
CCWRD Total	150	98	10.92	12,234
CLV WPCF	91	62.5	1.47	1,647
Bonanza/Mojave WRC	1	N/A	0.10	112
Durango Hills WRC	10	N/A	2.85	3,193
CLV Total	102	62.5	4.41[b]	4,941
COH	27	20.3	7.13	7,988
Blue Diamond Treatment Facility	0.044	N/A	0	0
Total Planning Area 5	**279**	**180.8**	**22.46**	**25,163**

Notes:

[a] Permitted Discharge from the Central Plant and the AWT
[b] CLV total is the value included in the *SWAC 2006 Year End Summary*
N/A – Not Available

Table 6-25 includes the information in the Potential Reclaimed Water Demand Summary table from the *AWRS (2000)* and the *CNLV WRF Amendment (2005)*. Apex was added to **Table 6-25** as a placeholder to address the potential reclaimed water demand, although the quantity is not available. In future updates to the *Clark County Area-Wide WQMP* and when the *Southern Nevada Regional Water Reuse Study* is completed, information on the water demand estimates for Apex should be added to **Table 6-25** or Apex should be removed. Although water demand for future landscaped urban areas, toilet flushing, impoundments, and graywater were not discussed in this section, they were included in the summary table to indicate potential reclaimed water demand in Planning Area 5. A discussion about these uses for reclaimed water is included in the *AWRS (2000)*. **Table 6-25** lists potential reclaimed water demand by type, and the average reclaimed water demands in mgd and acre-feet/year in Planning Area 5.

Table 6-25

Potential Reclaimed Water Demand in Planning Area 5

Reclaimed Water Use	Potential Reclaimed Water Demand (acre-feet/year)	Potential Reclaimed Water Demand (mgd)
Golf Courses	68,178	60.9
Parks	8,606	7.7
Industrial	19,337	17.3
Future Landscaped Urban Areas	54,000	48.2
Toilet Flushing	7,840	7.0
Impoundments	20,100	18.0
Apex	N/A	N/A
Total	**178,061**	**159.0**

In comparing information in **Table 6-24** with the reuse thresholds listed in **Table 6-8**, the SNWA reuse thresholds within the Las Vegas Valley were exceeded in 2006. In addition, **Table 6-25** shows that the potential reclaimed water demand within Planning Area 5 exceeds the SNWA reuse threshold. Both of these situations, however, are not an issue if the increase in reclaimed water consumption does not cause a negative impact to the Colorado River Water return flow credits, as discussed previously in this section.

6.5.6 Planning Area 6 – Ivanpah-Pahrump Valleys

The primary opportunities for water reclamation in Planning Area 6 are in Boulder City and at power generation facility projects located in the Clark County communities of Goodsprings, Jean, Primm, and Sandy Valley.

6.5.6.1 Boulder City

According to the *SWAC 2006 Year End Summary*, the 2006 average wastewater influent flow for Boulder City (excluding flow data for the months of November and December) was 1.09 mgd.

6.5.6.1.1 Existing Water Reuse System

Boulder City owns and operates its water and wastewater facilities and the Boulder City WWTP is designed for an average daily flow rate of 1.8 mgd. Treated effluent is pumped to aggregate producers in the Eldorado Valley, the Impact Sand and Gravel Quarry mining operations. The quarry, located approximately 3 miles west of the Boulder City WWTP, uses treated effluent for dust control and sand/gravel washing. This use would likely continue in the area. There is no short-range plan for water reuse for treated water. A percentage of the irrigation in Boulder City is by untreated Colorado River water. According to the *SWAC 2006 Year End Summary*, the 2006 average reclaimed water flow for Boulder City (excluding flow data for November and December) was 0.39 mgd.

6.5.6.1.2 Future Reuse Opportunities

Boulder City plans to increase the reuse of effluent by the aggregate industry to more than 95 percent of treated flow, and is planning installation of a larger pipeline to convey reclaimed water to all three aggregate producers south and west of Boulder City.

Several of Boulder City's large irrigation water consumers are relatively close to the treatment plant's evaporative ponds. With upgraded treatment processes at the Boulder City WWTP, the plant could be a source of reclaimed water and conveyed by a piping system to these high-use sites: the golf course, Veterans Ball Field Complex, and the Veterans Soccer and Fishing Complex. Boulder City's wastewater, as reclaimed water to replace potable or untreated Colorado River water, would have to conform to the NAC 445A.275-445A.292 before it could be applied by these consumers. These uses may be considered as alternative allocations that would still allow the majority of the treated effluent to be used by the local aggregate producers.

6.5.6.2 Jean

The Jean WWTF is a package plant with a design capacity of 0.6 mgd and treats wastewater from the resorts in Jean and some of the effluent is reused as irrigation water. The effluent discharge to the RIBs earns the LVVWD recharge credit via the State Water Engineer.

Project plans include construction of a WWTF at SNCC that would supply treated effluent to the power plant via a new pipeline. Groundwater is considered only as a supplement to reclaimed water use. An existing LVVWD well located near the SNCC is proposed as a backup well for process water use if the flow of reclaimed water from SNCC is interrupted.

6.5.6.3 Primm

The WWTF in Primm is a package plant with a design capacity of 1 mgd. The Bighorn Power Plant is a combined-cycle, gas-fired 580-MW generating station. The Bighorn project was designed to require 255 acre-feet/year of water. The existing package WWTP at Primm has the capability to supply a maximum of 252 acre-feet/year of reclaimed water for the Bighorn project for cooling and fire suppression system water supply. An existing groundwater well provides 3 acre-feet/year of potable water.

6.5.6.4 Sandy Valley

As discussed in Section 5, the projected increase in wastewater flow indicates the potential need for a centralized wastewater treatment system and the development of a water reclamation program.

6.5.6.5 Proposed Ivanpah Airport

The proposed Ivanpah Airport may have the potential to use reclaimed water when the airport is operational, for approved uses.

6.5.6.6 Summary of Planning Area 6

Table 6-26 displays the WWTF within Planning Area 6. The annual average flows (mgd) and the amount of reclaimed water demand (mgd) for Boulder City were provided in the *SWAC 2006 Year End Summary*.

Table 6-26

Planning Area 6 Wastewater Treatment Facilities and 2006 Reclaimed Water Use

Treatment Facility	Capacity (mgd)	2006 Annual Average Flows (mgd)	2006 Reclaimed Water Use (mgd)	2006 Reclaimed Water Use (acre-feet/year)
Boulder City WWTP	1.8	1.09	0.39	437
Jean	0.6	N/A [a]	N/A [a]	N/A [a]
Primm	1	0.48 [b]	0.067 [c]	75

Notes:

[a] Information on 2006 annual average flow was Not Available (N/A).
[b] Source: Enco Southwest, Discharge Monitoring Reports
[c] Source: Reliant Energy, Reclaimed Water Usage Reports

Table 6-27 displays the potential reclaimed water customer and the average reclaimed water demands in mgd and acre-feet/year in Planning Area 6.

Table 6-27

Reclaimed Water Demands by Potential Land Use Customer in Planning Area 6

Community	Potential Land Use Customer	Average Reclaimed Water Demand	
		(mgd)	(acre-feet/year)
Primm	Bighorn Power Plant	0.22	252
Total for Planning Area 6		**0.22**	**252**

6.5.7 Planning Area 7 – Havasu-Mohave Lakes

The primary opportunity for water reclamation in Planning Area 7 is in Laughlin.

6.5.7.1 Laughlin

According to the SNWA *Water Resource Plan* 2008, reclaimed water is being used for dust control at a local landfill. A study would need to be conducted to evaluate the need for additional treatment and storage of reclaimed water and to evaluate a distribution network. There is little demand for reuse. Only one golf course exists and although some interest has been expressed, development of a reuse capability is probably not warranted at this time. As Laughlin develops, the feasibility of using reclaimed water should be reexamined. The Laughlin WRF serves the community's wastewater needs and has a design capacity of 8 mgd. According to the *SWAC 2006 Year End Summary*, the 2006 average wastewater flow for Laughlin was 2.38 mgd.

6.5.7.2 Summary of Planning Area 7

Table 6-28 displays the WWTF within Planning Area 7.

Table 6-28

Planning Area 7 Wastewater Treatment Facilities and 2006 Reclaimed Water Use

Treatment Facility	Capacity (mgd)	2006 Annual Average Flows (mgd)	2006 Reclaimed Water Use (mgd)	2006 Reclaimed Water Use (acre-feet/year)
Laughlin WRF	8	2.38	0	0

6.5.8 Planning Area 8 – Paiute Wash

The primary development in Planning Area 8 is the community of Searchlight and the small community of Cal-Nev-Ari.

6.5.8.1 Searchlight

The community of Searchlight has a WWTF, but the facility does not currently (2008) produce effluent for reuse purposes, and there are no plans for future reuse opportunities. The Searchlight WWTF has 90,000-gpd (0.09-mgd) design capacity. The CCRWD *Facilities Master Plan (2004)* reported that the natural treatment of wastewater from the aerated lagoons/facultative ponds will require a higher degree of treatment to produce effluent quality suitable for additional reuse applications.

6.5.8.2 Cal-Nev-Ari

Wastewater in Cal-Nev-Ari is handled using septic systems and no reuse opportunities exist in Cal-Nev-Ari at this time.

6.5.8.3 Summary of Planning Area 8

Table 6-29 shows the WWTF within Planning Area 8 and the reclaimed water use.

Table 6-29

Planning Area 8 Wastewater Treatment Facilities and 2006 Reclaimed Water Use

Treatment Facility	Capacity (mgd)	2006 Annual Average Flows (mgd)	2006 Reclaimed Water Use (mgd)	2006 Reclaimed Water Use (acre-feet/year)
Searchlight WRF	0.09	N/A [a]	0	0

Note:

[a] Information on 2006 annual average flow was Not Available (N/A)

6.6 EMERGING TRENDS IN RECLAIMED WATER APPLICATION

This section discusses the use of reclaimed water for construction sites, agricultural irrigation, golf course irrigation, park irrigation, and industrial processes. Depending on the

Reuse Category of the reclaimed water, as described in **Table 6-2**, other uses of reclaimed water that may be considered in the future include, but are not limited to:

- Providing reclaimed water (at a cost) to dust suppression tanker trucks
- Manufacturing purposes
- Landscape Nurseries
- Sports Complexes
- Street Median Landscaping
- Street Sweeping
- Fire Protection
- Residential Landscape
- Apartment Landscape

According to the U.S. Green Building Council, the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a nationally accepted benchmark for the design, construction and operation of high-performance green buildings. If an agency or public authority is considering LEED certification for a facility, limiting or eliminating potable water use or treating onsite wastewater flow can result in Water Efficiency credits for LEED certification.

6.7 RECOMMENDATIONS

The recommendations for water reclamation/reuse were compiled from previous 208 WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to water reclamation/reuse for the *Clark County Area-Wide WQMP*:

- CWC and SNWA are preparing the *Southern Nevada Regional Water Reuse Study*, which will update information provided in the *AWRS* (2000). Future updates to the *Clark County Area-Wide WQMP* should include reclaimed water and reuse opportunities from the updated *Southern Nevada Regional Water Reuse Study*. A basic definition of reuse vs. reclamation should be included in the *Southern Nevada Regional Water Reuse Study*, and this definition should be incorporated into future WQMPs.

- Expanded Use of Gray Water and Reclaimed Water for Irrigation await the findings of the Southern Nevada Regional Water Recycling Study to ensure that this plan is correctly aligned with its recommendations.

- The local agencies should evaluate existing and future public facilities to promote the use of reclaimed water, when and if available for future use.

- The CCWRD and the Moapa Valley Water District should work together to provide an EMP for the Overton Ponds (future Moapa Valley WRC) and evaluate potential opportunities for water reclamation in the Moapa Valley Township (Planning Area 2).

- Mesquite (Planning Area 3) should coordinate with the Mesquite Irrigation Company to address the City's needs when demand for reclaimed water exceeds supply.

- Mesquite (Planning Area 3) should coordinate with nearby unincorporated communities, such as Bunkerville, to determine their requirements for water reclamation when excess reclaimed water is available.

- Mesquite and CCWRD should each consider partnership arrangements with developers of large residential and commercial projects to build onsite satellite water reclamation facilities for public and multi-use landscape areas and for other water reuse projects in growing outlying areas.

- Evaluate/design new and existing public facilities and work with SNWA Conservation Department to add/retrofit irrigation systems to operate using reclaimed water.

- Develop a process to advise CCRFCD of any reclaimed water discharges to the storm sewer system for coordination with the Municipal Stormwater Management Committee's Stormwater Monitoring Program.

- It is recommended that any previously instituted maximum thresholds for delivery and use of reuse/reclaimed water be reassessed to be consistent with the projected reuse demands in this *Clark County Area-Wide WQMP*.

- Agencies in Planning Area 5 (COH, CLV, CNLV, Clark County, SNWA) landscape and design manuals be consistent in policy recommendations regarding plant material, irrigation methods, and use of available reclaimed water.

- Review effluent reuse or water reclamation regulations that can benefit local end uses such as the aggregate industry, dust control, landscape irrigation, or other uses, as deemed appropriate to maximize water conservation. This should be performed at existing wastewater treatment facilities and included in future plans for new wastewater treatment facilities.

- Explore the potential for obtaining groundwater allotment credit for rapid infiltration of treated wastewater as a means to increase available groundwater resources.

- Boulder City has hired a consultant to complete a wastewater disposal/reuse study. Naturally, reuse alternatives will be far more expensive than the current disposal system. A collaborative effort among stakeholders should be employed to help fund reuse alternatives.

- Assist the Clark County wastewater agencies with discussions with NDEP on addressing the issue of reuse water for aggregate industry process water, power generation process water, construction dust control, landscape irrigation, or other uses, as deemed appropriate.

- Request that plans for future modifications or upgrades of existing POTWs and package wastewater treatment systems include water reclamation and effluent reuse.

- Evaluate whether the aerated lagoons/evaporation ponds used for treatment at Searchlight and other locations in Planning Areas 6, 7, and 8 (with the exception of the Mar-Wood treatment plant at Jean) require upgrade or additional discharge polishing to produce treated effluent suitable for additional reuse applications.

- Additional opportunities for greater regional coordination among agencies in Southern Nevada where opportunities to more effectively manage or optimize water resources exist, such as Mesquite and CCWRD, should continue to be explored.

6.8 REFERENCES

Black & Veatch, *Area Wide Reuse Study (AWRS), Las Vegas Valley Study Area*, July 2000.

City of Henderson, *Southwest Water Reclamation Facility, March 2007*. Accessed at: http://www.cityofhenderson.com/utilities/SWRF/php/swrf1.php

City of Henderson, City of Las Vegas, City of North Las Vegas, Clark County Water Reclamation District, and the Las Vegas Valley Water District, *2000 Area Wide Reuse Study, Las Vegas Valley Study Area*. Prepared by Black & Veatch, 2000.

City of Mesquite, *Mesquite Effluent Management Plan*, 1995.

----- *Wastewater Facilities Planning Study*, Prepared by Forsgren Associates Inc., December 2005.

City of North Las Vegas, *City of North Las Vegas Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 Water Quality Management Plan*, Prepared by MWH, October 2005.

Clark County, *Desert Breeze Water Resource Center in Operation, June 2003*. Accessed at: http://www.accessclarkcounty.com/Public_Communications/0603so/dbwater.html

Clark County Department of Air Quality and Environmental Management, *Amendment to Northeast Clark County 208 Water Quality Management Plan*, February 2007.

Clark County Department of Comprehensive Planning. *Clark County Utilities Element Report*. December 5, 2006. Accessed at: http://www.accessclarkcounty.com/Comprehensive_planning/CompPlanElements/UtilityElement/UtilitiesElementReport.pdf

----- *Las Vegas Valley 208 WQMP Amendment*, Prepared by MWH, July 1997.

----- *Northeast Clark County 208 Water Quality Management Plan Amendment*, Prepared by MWH, June 2000.

----- *South County Water Quality Management Plan Amendment*, Prepared by CH2MHill, June 2004.

Clark County Water Reclamation District, *Facilities Master Plan*, Prepared by Stanley, 2004.

----- *Annual Operating Budget Fiscal Year 2006-07, 2006*. Accessed at: http://www.cleanwaterteam.com/pdf/facility/main/om_budget_2007_rev.pdf

----- *Bunkerville Wastewater Collection and Water Reclamation System Feasibility Evaluation*, Prepared by B&V, October 2006.

Clark County Sewage and Wastewater Advisory Committee (SWAC), *2006 Year End Summary*, January 2007.

Enco Southwest, *Discharge Monitoring Reports*, January-December 2006.

Las Vegas Valley Water District, *Water Budgeted Golf Courses*. Accessed at: http://www.lvvwd.com/html/ws_drought_restrictions_golf.html

Nevada Division of Environmental Protection, *Coyote Springs Water Resources General Improvement District, July 2007*. Accessed at: http://ndep.nv.gov/docs_07/nev2007501_f07.pdf

Reliant Energy, *Reclaimed Water Usage Reports*, January-December 2006.

Southern Nevada Plumbing Code Amendments, 1997

Southern Nevada Water Authority, *Water Resource Plan*, 2006. Accessed at: http://www.snwa.com/html/wr_resource_plan.html

----- *In-state Resources*, 2006. Accessed at: http://www.snwa.com/html/wr_instate.html

U.S. Green Building Council, *LEED*, Accessed January 2008 at: http://www.usgbc.org/DisplayPage.aspx?CategoryID=19

Section 7

Section 7
Point Sources

7.1 INTRODUCTION

Point sources are pollution sources that can be traced back to a single, discrete location such as a particular pipe or WWTP. Nonpoint sources are sources of pollution that cannot be defined as point sources, and typically include distributed sources across an area such as pollution in stormwater runoff or deposition of a pollutant from the air to the water. Regulation of point sources is discussed in the following categories:

- Surface water discharge permits
- Mining fluid management
- Groundwater discharge permits
- Leaking underground storage tanks (LUSTs) and chemical spills

Nonpoint sources are discussed in Section 8 of this report. Section 8 includes a discussion of salinity and TDS.

7.2 SURFACE WATER DISCHARGE PERMITS

The NDEP BWPC maintains a list of NPDES permits that authorize discharges to surface waters. According to NDEP, 46 municipal and industrial facilities have active discharge permits within the study area. Of these, 44 are in Planning Area 5, one is in Planning Area 4, and one is in Planning Area 7. Of the seven major discharges, four are municipal WWTPs and three are industries (see **Table 7-1**). All the major discharges are in Planning Area 5, except the CCWRD Laughlin WRF discharge, which is in Planning Area 7.

Table 7-1

Major NPDES Discharge Permits in Clark County

Permit Number	Facility	Planning Area
NV0020133	City of Las Vegas WPCF	5
NV0021261	CCWRD - Advanced WWTP	5
NV0022098	City of Henderson WRF	5
NV0021563	CCWRD Laughlin WRF	7
NV0000060	Titanium Metals Corp.	5
NV0000078	TRONOX LLC - Kerr McGee Corporation	5
NV0020923	Pioneer Americas LLC	5

Effluent limits are assigned to permitted discharges, either according to standard limits for that type of discharge or at levels that will result in receiving water concentrations that attain water quality objectives that protect established beneficial uses (see Section 6). NDEP provided the current list of surface water discharge permits within Clark County on June 11, 2007. The EPA distinguishes major from minor discharges. Major NPDES dischargers are defined as those facilities that contribute a larger share of pollutants discharged to surface waters (EPA, 2007).

Figure 7-1 shows the geographical distribution of permitted surface water discharges within Clark County. A list of all surface water discharge permits by planning area is provided in **Table 7-2**.

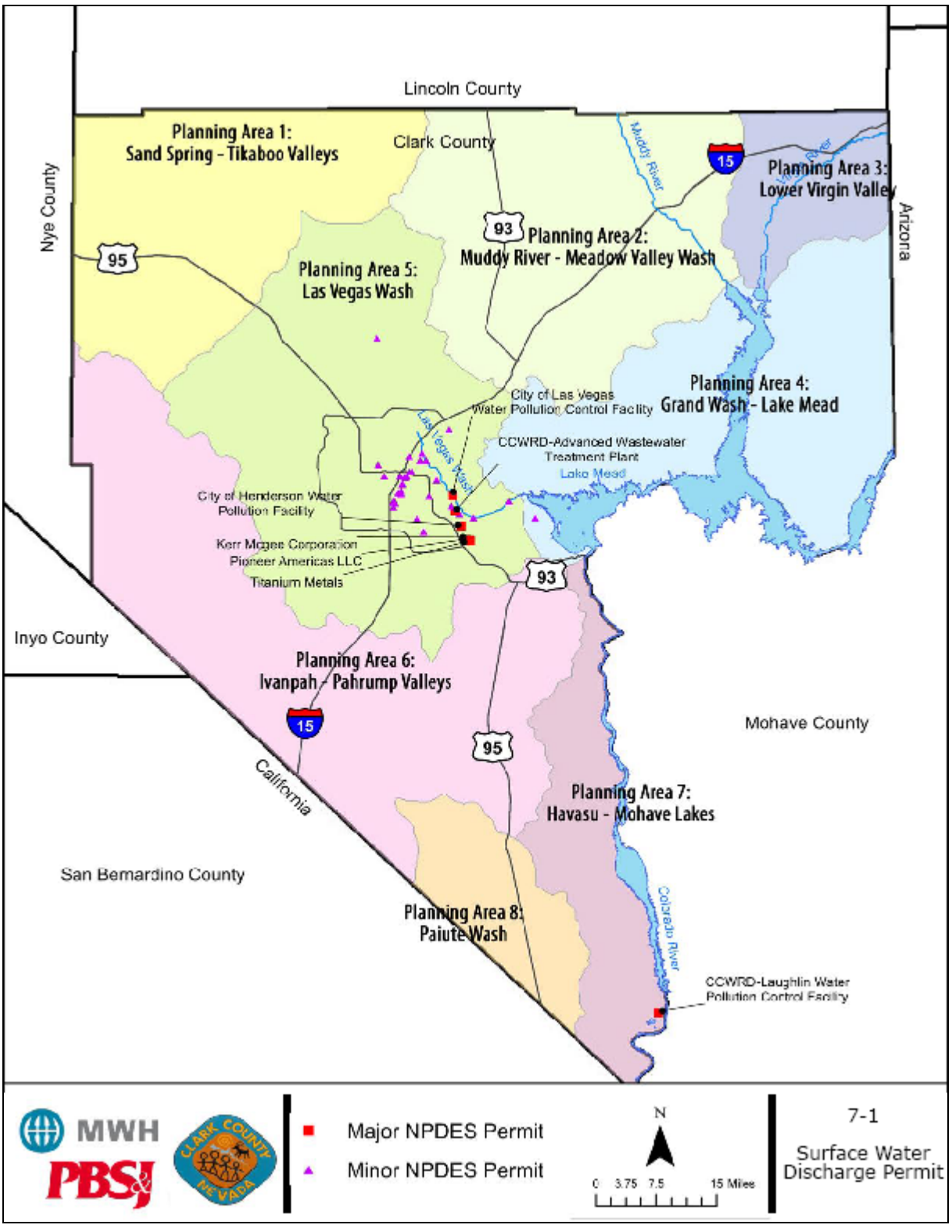

Lincoln County
Clark County
Nye County
Arizona
Inyo County
Mohave County
San Bernardino County
California
Planning Area 1:
Sand Spring - Tikaboo Valleys
Planning Area 2:
Muddy River - Meadow Valley Wash
Planning Area 3:
Lower Virgin Valley
Planning Area 4:
Grand Wash - Lake Mead
Planning Area 5:
Las Vegas Wash
Planning Area 6:
Ivanpah - Pahrump Valleys
Planning Area 7:
Havasu - Mohave Lakes
Planning Area 8:
Paiute Wash
Muddy River
Las Vegas Wash
Lake Mead
Colorado River
City of Las Vegas
Water Pollution Control Facility
CCWRD-Advanced Wastewater
Treatment Plant
City of Henderson Water
Pollution Facility
Kerr Magee Corporation
Pioneer Americas LLC
Titanium Metals
CCWRD-Laughlin Water
Pollution Control Facility
15
93
95
MWH
PBS&J
Major NPDES Permit
Minor NPDES Permit
N
0 3.75 7.5 15 Miles
7-1
Surface Water
Discharge Permit

Table 7-2

Surface Water Discharge Permits Within Clark County

Planning Area	Permit No.	Project Name	Permit Type	Street Location	City/ Town
4	NV0020192	Nevada Department of Wildlife - Lake Mead	Minor NPDES	Lake Mead	Las Vegas
5	NV0000060	Titanium Metals Corp.	Major NPDES	Lake Mead and Atlantis Avenue	Henderson
	NV0000078	TRONOX LLC - Kerr McGee Corporation	Major NPDES	8000 Lake Mead Drive	Henderson
	NV0020133	City of Las Vegas WPCF	Major NPDES	6005 East Vegas Valley Drive	Las Vegas
	NV0020923	Pioneer Americas LLC	Major NPDES	8000 Lake Mead Drive	Henderson
	NV0021261	CCWRD - Advanced Water Treatment Plant	Major NPDES	4060 Hollywood Boulevard	Las Vegas
	NV0021750	Hilton, Las Vegas	Minor NPDES	3000 Paradise Road	Las Vegas
	NV0022098	City of Henderson	Major NPDES	200 Athens Avenue	Henderson
	NV0022195	Valley Hospital	Minor NPDES	620 Shadow Lane	Las Vegas
	NV0022420	Union Oil Company	Minor NPDES	101 North Decatur Boulevard.	Las Vegas
	NV0022691	Lake Las Vegas Resort	Minor NPDES	Lake Las Vegas	Henderson
	NV0022748	Bonneville Ave Underpass	Minor NPDES	Bonneville Ave Underpass @ UPRR	Las Vegas
	NV0022772	Sterling/Squire/Crescendo HOAs (formerly Saxton)	Minor NPDES	Broadbent Boulevard.	Las Vegas
	NV0022781	Residence at 7030 Tomiyasu Lane	Minor NPDES	7030 Tomiyasu Lane	Las Vegas
	NV0022837	Circle K Stores Inc.	Minor NPDES	428 South Valley View Boulevard	Las Vegas
	NV0022845	Harrah's Las Vegas Hotel/Casino	Minor NPDES	3575 Las Vegas Boulevard South	Las Vegas
	NV0022870	7 Eleven Inc. Store No. 19653	Minor NPDES	2725 North Las Vegas Boulevard.	Las Vegas
	NV0022888	Venetian Hotel Casino	Minor NPDES	3355 Las Vegas Boulevard South	Las Vegas
	NV0022942	U.S. General Services Administration	Minor NPDES	401 South Las Vegas Boulevard	Las Vegas
	NV0022985	Aladdin Resort & Casino (soon Planet Hollywood)	Minor NPDES	3667 Las Vegas Boulevard South	Las Vegas
	NV0022993	Golden Nugget Hotel & Casino	Minor NPDES	129 East Fremont Street	Las Vegas
	NV0023035	City of Las Vegas Neonopolis	Minor NPDES	Southwest Corner of Las Vegas Boulevard and Ogden	Las Vegas
	NV0023043	Maryland Villas	Minor NPDES	Northeast Corner of Maryland Parkway and Wilson	Las Vegas
	NV0023060	TRONOX-Kerr McGee Perchlorate	Minor NPDES	8000 Lake Mead Drive	Henderson
	NV0023078	7 Eleven Store No. 21850	Minor NPDES	3575 East Lake Mead Boulevard	North Las Vegas
	NV0023086	Conoco Phillips Co. Union 76 No. 5558	Minor NPDES	3798 East Desert Inn Road	Las Vegas

Table 7-2 (Continued)

Surface Water Discharge Permits Within Clark County

Planning Area	Permit No.	Project Name	Permit Type	Street Location	City/ Town
5 (Continued)	NV0023094	Union 76 Service Station No. 4616	Minor NPDES	530 North Las Vegas Boulevard	Las Vegas
	NV0023141	Gordon Gaming - Sahara Hotel	Minor NPDES	2535 South Las Vegas Boulevard	Las Vegas
	NV0023159	Clark County Regional Justice Center	Minor NPDES	Downtown Las Vegas Blocks 11, 12, 23	Las Vegas
	NV0023183	City Center Place	Minor NPDES	400 Fourth Street	Las Vegas
	NV0023191	Caesars Palace Hotel & Casino	Minor NPDES	3750 Las Vegas Boulevard	Las Vegas
	NV0023221	7-Eleven Store No. 27607	Minor NPDES	600 North Las Vegas Boulevard.	Las Vegas
	NV0023230	Kinder Morgan Energy Partners (Sloan Lane)	Minor NPDES	5049 North Sloan Lane	Las Vegas
	NV0023248	Riviera Hotel and Casino	Minor NPDES	2901 Las Vegas Boulevard South	Las Vegas
	NV0023256	Turnberry Place - The Stirling Club	Minor NPDES	2857 and 2777 Paradise Road	Las Vegas
	NV0023264	7-Eleven Store No. 29644	Minor NPDES	2716 East Lake Mead Boulevard	North Las Vegas
	NV0023282	Chevron Station No. 9-75537	Minor NPDES	5722 South Eastern Avenue	Las Vegas
	NV0023311	7-Eleven Store No. 25586	Minor NPDES	1705 Las Vegas Boulevard South	Las Vegas
	NV0023353	Former Chevron Station No. 9-7753	Minor NPDES	2450 East Bonanza Road	Las Vegas
	NV0023361	Former Chevron Station No. 9-2567	Minor NPDES	2341 North Las Vegas Boulevard	Las Vegas
	NV0023396	7-Eleven Store No. 20826	Minor NPDES	1600 North Decatur Drive	Las Vegas
	NV0023477	Sky Las Vegas Condominiums	Minor NPDES	2780 South Las Vegas Boulevard Street C	Las Vegas
	NV0023485	Las Vegas Academy	Minor NPDES	315 7th Street	Las Vegas
	NV0023507	National Nuclear Security Administration / Nevada Site Office	Minor NPDES	2621 Losee Road	North Las Vegas
	NV0023523	Terribles Hotel & Casino	Minor NPDES	4100 Paradise Road	Las Vegas
7	NV0021563	CCWRD Laughlin	Major NPDES	450 Bruce Woodbury Drive	Laughlin

The wastewater discharges are described in more detail in Section 5. The major industrial permits are described below.

The Titanium Metals, Tronox, and Pioneer Americas discharges are all related to the contamination at the Basic Management, Inc. site in COH. Industrial and military activities have been conducted at the site since 1942. Historically, industrial effluents were disposed of at the site in unlined evaporation ponds or transported to the Las Vegas Wash via ditches. Now the three permittees have various permitted water treatment facilities. These permits generally require monitoring of constituents, rather than setting effluent limits (EPA, 2008).

Tronox, formerly Kerr-McGee Chemical, produces industrial chemicals including manganese dioxide, boron trichloride, and elemental boron. Since the 1980s, Tronox has been investigating soil and groundwater contamination at the site in cooperation with NDEP and in compliance with the federal Resource Conservation and Recovery Act (RCRA). In 1999, Tronox began remediation for perchlorate in the Las Vegas Wash vicinity including groundwater extraction, surface water collection, and a permanent treatment process that removes chromium and perchlorate (NDEP, 2007b). The treated water is discharged to a ditch and then to the Las Vegas Wash in accordance with the NDPES permit described above. Along with typical NPDES-monitored constituents, the permit requires monitoring of perchlorate, manganese, and chemical oxygen demand.

Titanium Metals produces titanium products for aerospace, industrial, and consumer applications. Groundwater on the northern end of the site is contaminated from historical activities. Environmental investigations at Titanium Metals have been ongoing since 1983. A groundwater remediation method has not been selected. The plant includes a water conservation facility for treating the plant's effluent (NDEP, 2007c). The NPDES permit regulates discharges of magnesium, titanium, and chloride, as well as more typical water quality constituents.

The Pioneer Americas site includes a former chemical manufacturing plant operated by Montrose Chemical Company. Soil and groundwater at the site were found to be contaminated. The site now includes a soil vapor extraction system for treating contaminated soils and a groundwater treatment system for treating groundwater and to keep the contaminated groundwater plume from migrating off the site (NDEP, 2007c). The NPDES permit requires monitoring for typical water quality constituents as well as chemicals including dichlorodiphenyltrichloroethane (DDT), Endrin aldehyde, polychlorinated biphenyls (PCBs), chlordanes, heptachlor, and others.

Many of the minor discharge permits are for hotels and casinos that need to dewater groundwater in low-lying areas, such as parking garages. These permittees typically discharge to the storm drain and have little likelihood of causing impairment, as long as the groundwater is not impaired. With selenium impairment noted in some Clark County

surface waters, these discharges may receive additional scrutiny in the near future. These permits do not have associated limits, although their operations are regularly monitored by NDEP staff (EPA, 2008).

7.3 MINING FLUID MANAGEMENT

The NDEP BMRR regulates mining in Nevada under the authority of the NRS, Sections 445A.300 to NRS 445A.730 and the NAC 445A.350 to NAC 445A.447. The BMRR's mission is to ensure that Nevada's waters are not degraded by mining operations and that disturbed land is reclaimed to safe and stable conditions for productive post-mining land use. The Regulation Branch is responsible for protecting Nevada waters under federal water pollution control regulations. It issues Water Pollution Control Permits (WPCPs) to operators before construction of any mining, milling, or other beneficiation process activity that uses water from any source or quality that is biologically, chemically, or physically altered because of the use (NDEP, 2007a). Facilities using hazardous chemicals for processing ores are generally required to meet a zero discharge performance standard. A separate permit may be issued for certain activities at a specific facility, or a permit may be issued for all activities at a facility.

The only major mining operations in Clark County are the following three industrial minerals mines:

- Apex Lime Plant (20 miles northeast of Las Vegas) high calcium quicklime, dolomitic lime, hydrated high-calcium lime.
- PABCO Gypsum (northeast of Las Vegas) gypsum used for wallboard.
- Simplot Silica Products (Overton) sand open pit mining, washing, screening, and bagging (Nevada Bureau of Mines and Geology (NBMG), 2006).

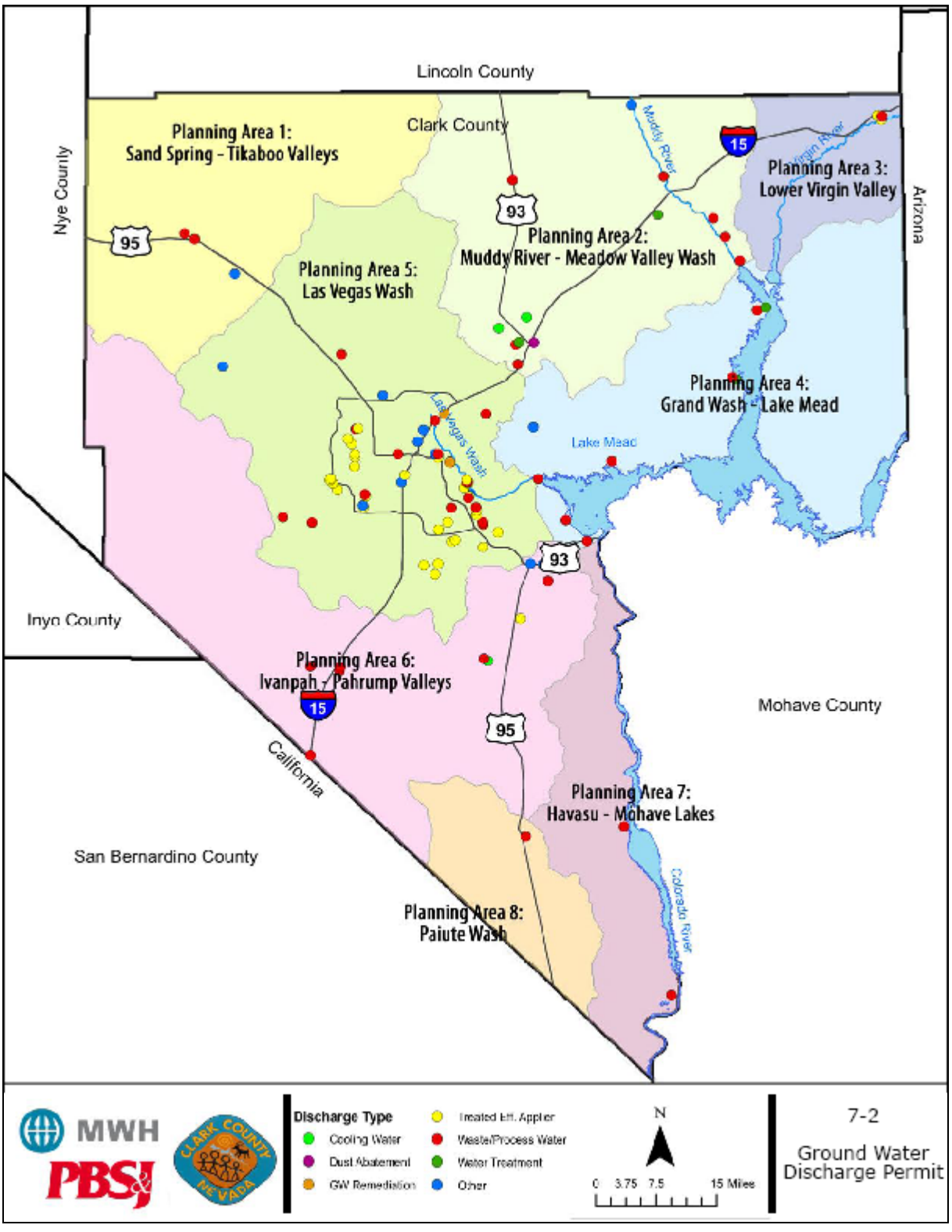
Table 7-3 summarizes major and minor mining and milling operations in Clark County. Sand, rock, limestone, and zeolite are produced. There are no listings of precious metals mining. There are no major oil fields or geothermal power plants in Clark County (NBMG, 2006).

Table 7-3

Clark County Mining and Milling Operations

Mine / Plant Name	Operator	Commodity	Type	Process / Activity
American Sand and Gravel Pit No. 1 (Salt Lake Highway Pit)	American Sand and Gravel, LLC	Sand, Gravel	Open-Pit, Mill	Mining Gravity
American Sand and Gravel Pit No. 2 (Lone Mountain)	American Sand and Gravel, LLC	Sand, Gravel	Open-Pit, Mill	Mining Gravity
Apex Landfill Pit	Las Vegas Paving Corp.	Sand Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Apex Quarry and Plant	Chemical Lime Co.	Limestone	Open-Pit, Mill	Mining, Calcining, Crushing, Screening
Apex Quarry	Granite Construction Co.	Aggregate, Sand	Open-Pit, Mill	Mining, Crushing, Screening, Washing
Blue Diamond (Jones) Pit	Las Vegas Paving Corp.	Sand Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Blue Diamond Mine and Plant	BPB Gypsum, Inc.	Gypsum	Open-Pit, Mill	Mining, Calcining, Grinding
Bootleg Pit	Boulder Sand and Gravel, Inc.	Sand, Gravel	Open-Pit, Mill	Mining, Crushing,
Charlie Brown Construction No. 2	Charlie Brown Construction	Gravel	Open-Pit, Mill	Mining, Crushing
East Pit	Various (BLM manages pit)	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
El Dorado Canyon (Railroad Pass) Quarry	Rinker Materials Corp	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Gornowich Pit	Impact Sand and Gravel	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Henderson Plant	Chemical Lime Co.	Lime	Mill	Calcining
Infiniton	Infiniton, LLC	Sand, Gravel	Open-Pit	Mining
Jean Pit	Various (BLM manages pit)	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Jetco Enterprises	Jetco Enterprises, Inc.	Decorative Rock	Open-Pit	Mining
KMI Zeolite Plant	KMI Zeolite, Inc.	Zeolite	Mill	Processing
Lone Mountain	Diamond Const.	Sand, Gravel	Open-Pit, Mill	Mining Gravity
Lone Mountain	Hollywood Gravel, Inc.	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Lone Mountain	Nevada Ready Mix Corp	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Lone Mountain Stocks Pit	Southern Nevada Paving	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Lone Mountain Community Pit	Various (BLM manages pit)	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Moapa Pit	Ready Mix, Inc.	Aggregate, Decorative Rock	Open-Pit, Mill	Mining, Milling
Money Pit	Southern Nevada Liteweight, Inc.	Sand	Open-Pit, Mill	Mining, Milling
PABCO Gypsum – Apex Pit	Pacific Coast Building Products, Inc.	Gypsum	Open-Pit, Mill	Mining, Crushing, Washing
Pioneer Gypsum Mine	D.L. Denman Construction Co.	Gypsum	Open-Pit	Mining
Pipes Pit	Pipes Paving	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Racetrack Pit	Las Vegas Paving Corp.	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Rainbow Quarries	Las Vegas Rock, Inc.	Gravel, Stone	Open-Pit, Mill	Mining, Crushing
Salt Lake Highway Pit	Various (BLM manages pit)	Sand, Gravel	Open-Pit	Mining
Simplot Silica Products Pit	Simplot Silica Products	Silica Sand	Open-Pit, Mill	Mining, Dying, Floatation, Screening
Sloan Quarry & Mill	Bardon Materials	Sand, Gravel	Open-Pit, Other Surface, Mill	Mining, Crushing, Screening
Spanish Trails Pit	Hollywood Gravel, LP	Sand, Gravel	Open-Pit, Mill	Mining, Crushing, Screening
Springs Mountain Pit and Mill	Wells Cargo, Inc.	Sand, Gravel	Other Surface, Mill	Mining, gravity

Source: NDMG (2006)


Lincoln County
Clark County
Nye County
Arizona
Planning Area 1:
Sand Spring - Tikaboo Valleys
Planning Area 2:
Muddy River - Meadow Valley Wash
Planning Area 3:
Lower Virgin Valley
Planning Area 4:
Grand Wash - Lake Mead
Planning Area 5:
Las Vegas Wash
Planning Area 6:
Ivanpah - Pahrump Valleys
Planning Area 7:
Havasu - Mohave Lakes
Planning Area 8:
Paiute Wash
Muddy River
Virgin River
Las Vegas Wash
Lake Mead
Colorado River
Inyo County
California
San Bernardino County
Mohave County
93
95
15
MWH
PBS&J
Discharge Type
Cooling Water
Dust Abatement
GW Remediation
Treated Eff. Applied
Waste/Process Water
Water Treatment
Other
N
0 3.75 7.5 15 Miles
7-2
Ground Water
Discharge Permit

Sand and gravel mining that occurs outside stream channels is expected to have minimal water quality impacts (Washington Department of Fish and Wildlife, Washington Department of Ecology, and Washington Department of Transportation, 2001). These mines are required to implement stormwater pollution prevention plans to keep sediments from migrating to surface waters. In addition, mining process water discharges that involves chemicals must obtain a surface or groundwater discharge permit. Comparison of the mining and milling operations listed in **Table 7-3** with the lists of surface and groundwater discharge permits shows that discharge permits are not common for the type of mining conducted in Clark County.

Without precious minerals mining, concerns regarding typical mining pollution such as acid mine drainage with its heavy metals and pH affects on streams are minimal. Acid mine drainage can be a concern with abandoned mines, these are described in more detail in the Nonpoint Sources Section.

7.4 GROUNDWATER DISCHARGE PERMITS

The BWPC issues groundwater discharge permits for activities like surface disposal, commercial septic systems, unlined ponds, and irrigation with reclaimed wastewater. "Zero discharge permits" are also issued in cases where a potential to discharge exists but is not likely, e.g., lined ponds and tanks. The June 11, 2007, NPDES permit holder list contains 98 groundwater discharge permits for municipal and industrial facilities in Clark County, all for discharge of treated effluent into the ground. Each permittee is required to monitor water use and meet effluent requirements indicated in the permit. **Figure 7-2** shows the geographical distribution of groundwater discharge permits within Clark County. A list of all groundwater water discharge permits, organized by planning area, are provided in **Table 7-4**.

Table 7-4

Groundwater Discharge Permits in Clark County

Planning Area	Permit No.	Project Name	Permit Type	Street Location	City/ Town
1	NEV00025	Nevada Department of Corrections - Southern Desert Correctional Center	NEV Groundwater	Cold Creek Road	Indian Springs
	NEV50040	CCWRD - Indian Springs	NEV Groundwater	165 Boulder Lane	Indian Springs
	NEV60030	U.S. Air Force - Indian Springs	NEV Groundwater	Indian Springs Auxiliary Field	Indian Springs
2	NEV2001517	Nevada Power Company – Chuck Lenzie Facility	NEV Groundwater	11405 U.S. Highway 93	near Apex
	NEV2001518	Valley Heights LLC.	NEV Groundwater	3719 River Heights Lane	Logandale
	NEV2003501	Nevada Power Company (formerly Silverhawk Power Plant)	NEV Groundwater	1511 Apex Power Parkway	North Las Vegas
	NEV2004516	Georgia-Pacific Gypsum Corporation	NEV Groundwater	11401 North U.S. Highway 91	Apex
	NEV2007501[a]	Coyote Springs Water Reclamation Facility (CSWRF)	NEV Groundwater	11502 State Route 168	Coyote Springs
	NEV40018	Hidden Valley Ranch (aka Moapa Dairy)	NEV Groundwater	I-15 Mile Marker 88	Moapa
	NEV50025	CCWRD - Overton	NEV Groundwater	2 miles East of Town of Overton	Overton
	NEV60044	Crafty's Featherworks Inc.	NEV Zero Discharge	480 West Pat Avenue	Overton
	NEV89052	Kapex LLC	NEV Groundwater	11101 U.S. Highway 93 North (Junction at I-15)	Apex
	NEV90049	Nevada Co - Gen/Garnet Valley	NEV Zero Discharge	11401 U.S. Highway 93 and I-15	Las Vegas
	NEV91022	Reid Gardner Station	NEV Groundwater	Exit 88, I-15	Moapa
	NEV93011	Republic Environmental Technologies	NEV Zero Discharge	Apex Landfill	Apex
	NEV94000	Nevada Power Company - Harry Allen Station	NEV Zero Discharge	14601 North Las Vegas Boulevard	Apex
	NEV95010	Apex Maintenance Building and Scale House	NEV Groundwater	13550 North Highway 93	Las Vegas

Note:

[a] Application for a groundwater discharge permit filed with NDEP

Table 7-4 (Continued)

Groundwater Discharge Permits in Clark County

Planning Area	Permit No.	Project Name	Permit Type	Street Location	City/ Town
3	NEV2000512	Falcon Ridge Investment, LLC	NEV Groundwater	North of I-15	Mesquite
	NEV40011	City of Mesquite	NEV Groundwater	600 Riverside Road	Mesquite
	NEV96016	Oasis Golf Club aka Mesquite Vistas, LLC	NEV Groundwater	100 Palmer Lane	Mesquite
4	NEV10007	Hacienda Hotel and Casino (Former Gold Strike)	NEV Groundwater	U.S. Highway 93	Boulder City
	NEV2004513	NPS Echo Bay Water Treatment Plant	NEV Groundwater	670 Runaway Hill Road	Overton
	NEV2004514	NPS - Overton Beach Water Treatment Plant	NEV Groundwater	767 Lost City Lane	Overton
	NEV50011	NPS - Boulder Beach	NEV Groundwater	Boulder Beach	Boulder City
	NEV50012	NPS - Callville Bay	NEV Groundwater	Callville Bay	Boulder City
	NEV50014	NPS - Echo Bay	NEV Groundwater	Echo Bay Area	Boulder City
	NEV50015	NPS - Las Vegas Wash	NEV Groundwater	601 Boulder Highway	Boulder City
	NEV50016	NPS - Overton Beach	NEV Groundwater	Overton Bay	Boulder City
	NEV90050	Nevada Co - Gen/Black Mountain	NEV Zero Discharge	East Lake Mead Boulevard	Las Vegas
5	NEV2000505	Palm Mortuary	NEV Groundwater	800 South Boulder Highway	Henderson
	NEV2000510	TIMET Zero Discharge Project	NEV Groundwater	8000 West Lake Mead Boulevard	Henderson
	NEV2000513	City of Henderson	NEV Groundwater	Boulder Highway medians and sides	Henderson
	NEV2000515	Pioneer Americas LLC	NEV Groundwater	800 West Lake Mead Drive	Henderson
	NEV2001503	Tuscany Hills Golf Club	NEV Groundwater	1103 Olsen Street	Henderson
	NEV2001508	H20 Environmental Inc.	NEV Groundwater	4280 North Pecos Road	Las Vegas
	NEV2001509	CCWRD - Desert Breeze	NEV Groundwater	Desert Breeze Water Resource Center	Las Vegas
	NEV2001511	Troon Revere Holdings, LLC	NEV Groundwater	2665 Olivia Heights Avenue	Henderson
	NEV2001514	Durango Hills Golf Club	NEV Groundwater	3217 North Durango Drive	Las Vegas
	NEV2001515	TRONOX LLC	NEV Zero Discharge	BMI Complex	Henderson
	NEV2001516	TRONOX LLC	NEV Zero Discharge	8000 West Lake Mead Boulevard	Henderson
	NEV2002512	Spanish Trail Golf Course	NEV Groundwater	Spanish Trail Golf Club	Las Vegas
	NEV2002515	Bear's Best Las Vegas	NEV Groundwater	1111 Flamingo Road	Las Vegas
	NEV2002517	Red Rock Country Club	NEV Groundwater	2250-A Red Springs Drive	Las Vegas
	NEV2002518	Wildhorse Golf Club	NEV Groundwater	2100 West Warm Springs Road	Henderson
	NEV2002519	Siena Golf Club	NEV Groundwater	10575 Siena Monte Avenue	Las Vegas
	NEV2003504	Clark County Parks and Recreation	NEV Groundwater	Clark County Wetlands Park Nature Pres	Las Vegas
	NEV2003507	Las Vegas Springs Preserve Desert Living Center	NEV Groundwater	1001 South Valley View Boulevard	Las Vegas

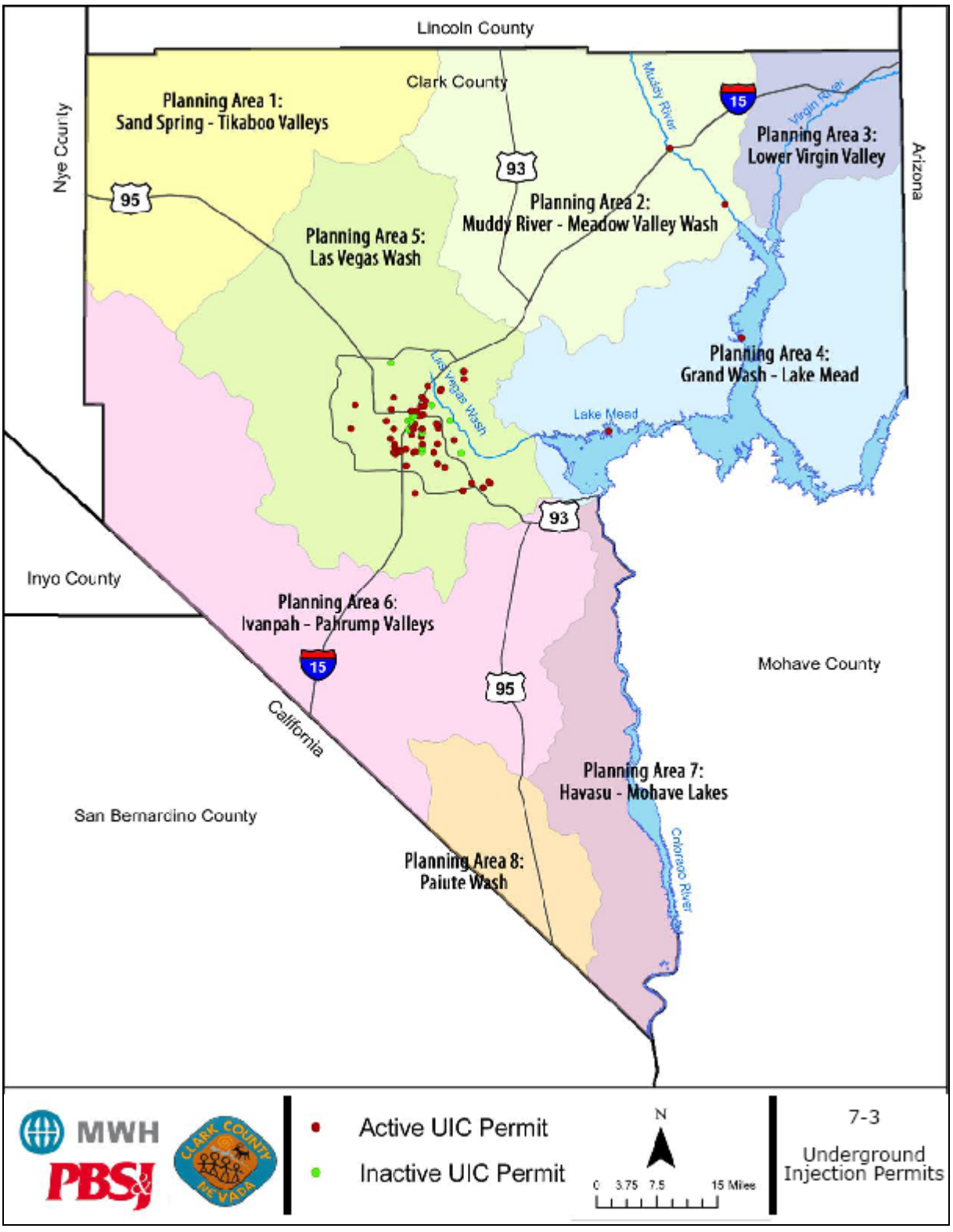
Table 7-4 (Continued)

Groundwater Discharge Permits in Clark County

Planning Area	Permit No.	Project Name	Permit Type	Street Location	City/ Town
5 (Continued)	NEV2003514	Clark County Park and Community Service	NEV Groundwater	5857 East Flamingo Road	Las Vegas
	NEV2003510	Spring Mountain Youth Camp	NEV Groundwater	Angel Peak Road east of SR 158	Spring Mountain
	NEV2004500	Rhodes Ranch Golf Course	NEV Groundwater	20 Rhodes Ranch Parkway	Las Vegas
	NEV2004515	NPS - Callville Bay Water Treatment Plant	NEV Groundwater	560 Screech Owl Road	Las Vegas
	NEV2004527	Regional Animal Campus	NEV Zero Discharge	655 North Mojave Road	Las Vegas
	NEV2004533	Silver Bowl Sports Complex Park	NEV Groundwater	6800 East Russell Road	Las Vegas
	NEV2005501	Desert Inn Master Plan Project	NEV Groundwater	3372 Theme Road	Las Vegas
	NEV2005507	Rhodes homes 28-Acre Park	NEV Groundwater	El Capitan and Arby Avenue	Las Vegas
	NEV2007504	Stallion Mountain Country Club	NEV Groundwater	5500 East Flamingo Road	Las Vegas
	NEV40034	Nevada Power Company - Sunrise Station	NEV Groundwater	6300 Vegas Valley Drive	Las Vegas
	NEV40035	Nevada Power Company - Clark Generating Station	NEV Zero Discharge	5640 Stephanie Street	Las Vegas
	NEV50050	CCWRD - Blue Diamond	NEV Groundwater	East of Blue Diamond	Blue Diamond
	NEV60031	Bonnie Springs Ranch	NEV Groundwater	Bonnie Springs Ranch	Old Nevada
	NEV60033	Paiute Tribe - Las Vegas	NEV Groundwater	3 Nuvaki Way	Las Vegas
	NEV80003	Henderson, City of	NEV Groundwater	240 Water Street	Henderson
	NEV87073	Desert Rose Golf Course	NEV Groundwater	5483 Club House Drive	Las Vegas
	NEV88005	KC Asphalt, LLC	NEV Zero Discharge	3901 West Ponderosa Way	Las Vegas
	NEV90034	Las Vegas Paving Company	NEV Groundwater	3401 North 5th Street	North Las Vegas
	NEV91055	Mirage Casino Hotel	NEV Groundwater	3400 Las Vegas Boulevard South	Las Vegas
	NEV92024	The Legacy Golf Club	NEV Groundwater	130 Par Excellence Drive	Henderson
	NEV92040	Treasure Island Corporation	NEV Groundwater	3400 Las Vegas Boulevard South	Las Vegas
	NEV94006	U.S. Air Force - Nellis AFB Site No. 27	NEV Groundwater	4743 Range Road	Nellis AFB
	NEV95038	Sun City MacDonald Ranch Communities Assc. Inc.	NEV Groundwater	2048 High Mesa	Henderson
	NEV96010	Rio Secco G.C. (Seven Hills)	NEV Groundwater	2851 Grand Hills Drive	Henderson
	NEV96014	Ethel M. Chocolates	NEV Groundwater	#1 Sunset Way	Henderson
	NEV96017	Black Mountain G&C Club	NEV Groundwater	500 Greenway Road	Henderson
	NEV96019	Desert Pines Golf Course	NEV Groundwater	3415 East Bonanza Avenue	Las Vegas
	NEV96020	Bonanza Mojave Water Resource Center	NEV Groundwater	650 North Mojave Road	Las Vegas
	NEV97007	Dragon Ridge Country Club	NEV Groundwater	Foothill Village Drive	Henderson
	NEV98000	Links of Las Vegas Golf Course	NEV Groundwater	East Vegas Valley Drive and Stephanie	Las Vegas

Table 7-4 (Continued)
Groundwater Discharge Permits in Clark County

Planning Area	Permit No.	Project Name	Permit Type	Street Location	City/ Town
5 (Continued)	NEV98005	Durango Hills (from Northwest) Water Resource Center	NEV Groundwater	Durango and Cheyenne	Las Vegas
	NEV98015	City of Las Vegas WPCF	NEV Groundwater	6005 E. Vegas Valley Drive	Las Vegas
	NEV98019	Troon Revere Holdings, LLC Troon Golf LLC	NEV Groundwater	2901 Hampton Road	Henderson
	NEV98023	Anthem Country Club Golf Course	NEV Groundwater	1 Club Side Drive	Henderson
	NEV99001	TPC Summerlin Golf Course	NEV Groundwater	1750 Rampart Boulevard.	Las Vegas
	NEV99002	TPC The Canyons Golf Course	NEV Groundwater	9851 Canyon Run Drive	Las Vegas
	NEV99003	Angel Park Golf Course	NEV Groundwater	100 South Rampart	Las Vegas
	NEV99004	Badlands Golf Course	NEV Groundwater	9115 Alta Drive	Las Vegas
	NEV99005	Canyon Gate Golf Course	NEV Groundwater	2001 Canyon Gate Drive	Las Vegas
	NEV99009	Ev-Con Recycling	NEV Groundwater	4560 East Hammer Lane	Las Vegas
	NEV99015	Sun City Summerlin Community Association	NEV Groundwater	9350 Sundial Drive	Las Vegas
6	NEV2001512	Copper Mountain Power LLC	NEV Groundwater	Eldorado Valley Drive	Boulder City
	NEV2002500	Reliant Energy Bighorn Generating Station	NEV Groundwater	1275 East Primm Boulevard.	Primm
	NEV80002	NDOC - Southern Nevada Correctional Center	NEV Groundwater	I-15, 45 miles South of Las Vegas	Jean
	NEV87006	Jean Development Company dba Gold Strike Hotel	NEV Groundwater	Jean Prison Road	Jean
	NEV90001	The Primadonna Corp. LLC (Whiskey Pete's)	NEV Groundwater	California-Nevada State Line	Primm
	NEV93013	Boulder Ranch Quarry	NEV Groundwater	2 Searchlight Road	Boulder City
	NEV97022	Boulder City WWTP	NEV Groundwater	2000 Buchanan Boulevard	Boulder City
	NEV98011	El Dorado Energy LLC	NEV Zero Discharge	16 miles Southwest Boulder City	El Dorado Valley
7	NEV30007	Southern California Edison (Mohave)	NEV Zero Discharge	2700 Edison Way	Laughlin
	NEV50013	NPS - Cottonwood Cove	NEV Groundwater	Cottonwood Cove	Boulder City
8	NEV40038	CCWRD - Searchlight	NEV Groundwater	Southeast of Searchlight	Searchlight


Lincoln County
Clark County
Nye County
Arizona
Planning Area 1:
Sand Spring - Tikaboo Valleys
Planning Area 2:
Muddy River - Meadow Valley Wash
Planning Area 3:
Lower Virgin Valley
Planning Area 4:
Grand Wash - Lake Mead
Planning Area 5:
Las Vegas Wash
Planning Area 6:
Ivanpah - Pahrump Valleys
Planning Area 7:
Havasu - Mohave Lakes
Planning Area 8:
Paiute Wash
Muddy River
Virgin River
Las Vegas Wash
Lake Mead
Colorado River
Inyo County
Mohave County
San Bernardino County
California
15
93
95
MWH
PBS&J
Active UIC Permit
Inactive UIC Permit
N
0 3.75 7.5 15 Miles
7-3
Underground Injection Permits

Coyote Springs Water Resource General Improvement District, located in Planning Area 2, filed an application for a groundwater discharge permit for Phase I and Phase II of the proposed Coyote Springs WRF. Although the application for a discharge permit has not been approved by NDEP at the time of issue of this WQMP, the Coyote Springs WRF was added to **Figure 7-2** and **Table 7-4** as an application for a discharge permit.

7.4.1 Underground Injection Control Discharge Permits

The purpose of the UIC program is to protect underground sources of drinking water (USDW) by regulating the fluids injected through a well. In Chapter 40 of the CFR, UIC wells are classified by EPA as Class I, II, III, IV, or V, according to the type of fluids injected and how the point of injection relates to an underground source of drinking water. Class I and IV wells are prohibited in any form in Nevada due to the risk to the USDW associated with the potential failure of the wells and/or improperly completed or plugged wells (EPA, 2001).

According to NDEP, there are 77 facilities that have UIC discharge permits[1]. **Figure 7-3** shows the distribution of UIC permits within Clark County. A list of all UIC permits, organized by planning area, is provided in **Table 7-5**. The UIC permits are concentration in Planning Area 5.

The following subsections provide a description of each UIC well class.

[1] The NDEP Bureau of Administrative Services maintains GIS files of NPDES permits and provided the most current GIS files, based on the 2005 NDEP database, for UIC permits within Clark County. The type of well for each permit was not available.

Table 7-5

UIC Permits Within Clark County

Planning Area	Permit No.	Project Name	Street Location	City/ Town
2	UNEV92206	Nevada Department of Transportation Glendale Maintenance Station		Glendale
	UNEV99203	Glendale Service Inc.	2300 East Glendale Boulevard	Glendale
	UNEV2004200	The Waterhole	475 North Moapa Valley Boulevard	Overton
3	UNEV2002212	Former Peppermill Service Station/Truck Stop	897 West Mesquite Boulevard	Mesquite
4	UNEV2002210	Callville Bay Marina	P. O. Box 100 HCR-30	Las Vegas
	UNEV99205	Echo Bay Resort		South of Overton
5	UNEV2000200	7-Eleven, Inc. Store No. 23129	4581 East Charleston Boulevard	Las Vegas
	UNEV2000201	CALNEV Carey site	Carey Avenue and I-15	North Las Vegas
	UNEV2000202	7-Eleven, Inc. Store No. 27361	2910 South Maryland Parkway	Las Vegas
	UNEV2000203	Tosco Marketing	2550 South Highland Drive	Las Vegas
	UNEV2000204	Longley Construction Co Inc	421 West Bonanza	Las Vegas
	UNEV2000208	ARCO Station No. 5319	2320 East Freemont Street	Las Vegas
	UNEV2000209	Rebel Station No. 65	1720 West Charleston Boulevard	Las Vegas
	UNEV2000210	Payless/Allstate Car Rental	5175 Rent-A-Car Road	Las Vegas
	UNEV2000212	Terrible Herbst No. 126	1195 East Sahara Avenue	Las Vegas
	UNEV2000213	Terrible Herbst No. 144	220 North Boulder Highway	Henderson
	UNEV2000215	Terrible Herbst No. 129	4895 West Spring Mountain Road	Las Vegas
	UNEV2000216	Clark County Department of Aviation	4811 South Paradise Road	Las Vegas
	UNEV2001200	Rossmore Development/JIffy Smog	1501 North Decatur Boulevard	Las Vegas
	UNEV2001201	AT Systems Inc.	1685 South Palm Street	Las Vegas
	UNEV2001202	Gagne Coach Maintenance	Travel Ways 1305 North Main Street	Las Vegas
	UNEV2001203	ARCO Station No. 5328	ARCO Station 5328	Las Vegas
	UNEV2001205	Former Red Rock Mini Mart	5525 West Charleston Boulevard	Las Vegas
	UNEV2001206	Union 76 Station No. 5257	4401 West Sahara Avenue	Las Vegas
	UNEV2001207	Union 76 Service Station No. 4370	Union 76 Service Station No. 4370	Las Vegas
	UNEV2001208	Seven-Eleven Store No. 25785	7-Eleven Store No. 25785	Las Vegas
	UNEV2001210	Site ST-44 and SS-46, Nellis AFB	Environmental Restoration Program	Nellis AFB
	UNEV2001211	RC White Transportation Center	RC White Transportation Arville Bus	Las Vegas
	UNEV2001212	Circle K No.1366	450 North Water Street	Henderson

Table 7-5 (Continued)

UIC Permits Within Clark County

Planning Area	Permit No.	Project Name	Permit Type	Street Location	City/ Town
5 (Continued)	UNEV2001213	Union 76 Station No. 3846	Temporary	Union 76 Station No. 3846	Las Vegas
	UNEV2001214	Union 76 Station No. 5522	Temporary	3401 Boulder Highway	Las Vegas
	UNEV2002200	American Pacific	Injection	American Pacific Corporation	Henderson
	UNEV2002201	City of Las Vegas Fire Station No. 1	Injection	500 Casino Center Boulevard	Las Vegas
	UNEV2002205	Gateway Remediation	Injection	4th Street and Las Vegas Boulevard	Las Vegas
	UNEV2002207	Former Dry Clean Facility	Injection	1195 East Desert Inn Road	Las Vegas
	UNEV2002208	Former CALNEV Texaco Terminal	Injection	5049 North Sloan Lane	North Las Vegas
	UNEV2002209	Champ Station (Former Conoco Station No. 28003)	Injection	1420 West Bonanza Road	Las Vegas
	UNEV2003201	Haycock Petroleum Company	Injection	9th Street and Stewart Avenue	Las Vegas
	UNEV2003203	Terrible Herbst No. 118	Injection	3650 West Sahara Avenue	Las Vegas
	UNEV2003204	Terrible Herbst No. 106	Injection	2718 East Tropicana Avenue	Las Vegas
	UNEV2003205	Southern Wine & Spirits of Nevada	Injection	4500 Wynn Road	Las Vegas
	UNEV2003211	Standard Wholesale Supply Co.	Injection	855 West Bonanza Road	Las Vegas
	UNEV2004201	Terrible Herbst No. 159	Injection	6484 Annie Oakley Drive	Henderson
	UNEV2004202	Terrible Herbst No. 136	Injection	3710 South Nellis Boulevard	Las Vegas
	UNEV2004203	Terrible Herbst No. 133	Injection	3415 West Tropicana Avenue	Las Vegas
	UNEV2004204	Terrible Herbst No. 152	Injection	4070 South Arville Street	Las Vegas
	UNEV2004205	Former GES Facility	Injection	1624 Mojave Road	Las Vegas
	UNEV2004206	Magic Wand Truck Stop	Injection	1110 East Colton Avenue	Las Vegas
	UNEV2004207	Wild Wild West Truck Plaza	Injection	4830 South Procyon Avenue	Las Vegas
	UNEV2004209	Pecos Station Texaco	Injection	6115 Pecos Road	Las Vegas
	UNEV2005200	Regency Dry Cleaning and Laundry	Injection	4575 South Procyon	Las Vegas
	UNEV2005204	V & V Automotive	Injection	2401 North Rancho Drive	Las Vegas
	UNEV2005205	Terrible Herbst	Injection	4910 South Maryland Parkway	Las Vegas
	UNEV2005206	Terrible Herbst Gas Service Station	Injection	1500 West Charleston	Las Vegas
	UNEV2005208	Nick's Market	Injection	2233 Paradise Road	Las Vegas

Table 7-5 (Continued)

UIC Permits Within Clark County

Planning Area	Permit No.	Project Name	Permit Type	Street Location	City/ Town
5 (Continued)	UNEV2005209	7-Eleven Store No. 29661	Injection	1201 East Sahara Avenue	Las Vegas
	UNEV2005210	Kinder Morgan Las Vegas Terminal Off-Site Remediation	Temporary	5049 North Sloan Lane	Las Vegas
	UNEV2005212	Las Vegas Laundry	Temporary	701 South First Street	Las Vegas
	UNEV2005213	AMPAC Athens Road Mitigation System	Injection	Athens Road and Boulder Hwy	(near) Henderson
	UNEV91052	ARCO Station No. 6068	Injection	850 North Decatur Boulevard	Las Vegas
	UNEV92210	CALNEV Union Pacific Railroad Yard	Injection	Alta Drive and Discovery Drive	Las Vegas
	UNEV93211	Anderson Dairy Products	Injection	801 Searles Avenue	Las Vegas
	UNEV93215	Rebel Station No. 8	Injection	3225 North Las Vegas Boulevard	Las Vegas
	UNEV93218	Terrible Herbst Station No. 124	Injection	4090 South Maryland Parkway	Las Vegas
	UNEV94213	USA Petroleum Station No. 100	Injection	3395 East Tropicana Avenue	Las Vegas
	UNEV94216	ARCO Station No. 5310	Injection	2784 Las Vegas Boulevard South	Las Vegas
	UNEV94218	Kerr McGee Chemical	Injection	8000 West Lake Mead Drive	Henderson
	UNEV95200	Sun Express	Injection	North Eastern Boulevard	Las Vegas
	UNEV95203	Sportsman Bait	Injection	5660 Boulder Highway	Las Vegas
	UNEV95211	Fayeghi Texaco	Injection	3283 North Las Vegas Boulevard.	Las Vegas
	UNEV96204	ARCO Station No. 1903	Injection	209 East Flamingo Road	Las Vegas
	UNEV96208	Avis Rent-a-Car	Injection	5164 Rent-A-Car Road	Las Vegas
	UNEV97202	Falconi's Tropicana Honda	Injection	4645 West Tropicana Avenue	Las Vegas
	UNEV97206	Former Redman Petroleum	Injection	2039 North Las Vegas Boulevard	Las Vegas
	UNEV98200	ARCO Station No. 5314	Injection	1615 North Decatur Boulevard	Las Vegas
	UNEV99200	Rebel Oil Property	Injection	444 South Martin Luther King Boulevard	Las Vegas
	UNEV99206	Terrible Herbst No. 255	Injection	6176 Las Vegas Boulevard South	Las Vegas

7.4.1.1 Underground Injection Control Well Class I (Prohibited in Nevada)

Class I wells are technologically sophisticated wells that inject large volumes of hazardous or nonhazardous wastes into deep, isolated rock formations that are separated from the lowermost USDW by layers of impermeable clay and rock. "Class I wells are mainly used in petroleum refining, metal production, chemical production, pharmaceutical production, commercial disposal, municipal disposal, and food production. Class I injection wells are sited such that they inject below the lowermost USDW with a confining zone above an injection zone. Injection zone reservoirs typically range in depth from 1,700 to more than 10,000 feet below the surface." Chemical plants and municipal waste water treatment plants often times use this type of injection to isolate their hazardous waste from all possible USDW through deep injection (EPA, 2007).

7.4.1.2 Underground Injection Control Well Class II

Typically, when oil and gas are extracted, large amounts of salt water (brine) are also brought to the surface. Discharge of the produced salt water to surface waters can be damaging to the environment. Class II wells are typically injection wells for disposal of the brine produced in oil and gas extraction. Sometimes Class II wells are used as enhanced oil recovery wells, where the produced brine is reinjected into the same formation as it was extracted from in order to drive oil into pumping wells, resulting in recovery of additional oil (Ground Water Protection Council (GWPC), No Date).

Class II wells have strict construction and monitoring requirements. The site of a Class II well is evaluated to make sure that formations will keep fluids out of drinking water sources. The wells must be constructed so that injected fluids are confined to only the intended formation. Steel pipe (casing) is cemented in place to protect migration of fluids into USDWs. The well is tested for leaks and there are limits on the pressure allowed for the injected fluid.

7.4.1.3 Underground Injection Control Well Class III

Class III wells inject hot steam, water, or other fluids into mineral formations to dissolve or loosen minerals so that they can be pumped to the surface and extracted. Class III wells are most commonly used to recover salt, sulfur, and uranium, and less frequently copper and gold (GWPC, 2007).

"EPA protects drinking water from contamination from mining wells by implementing regulations that set minimum standards. These regulations require mining well operators to:

- Case and cement their wells to prevent the migration of fluids into an USDW
- Never inject fluid between the outermost casing and the well bore
- Test the well casing for leaks at least once every 5 years (EPA, 2007)"

7.4.1.4 Underground Injection Control Well Class IV (Prohibited in Nevada)

Class IV wells are used for injection of hazardous and radioactive wastewater into or above USDWs. These types of wells have been banned so as to prevent any further UDWS contamination (EPA, 2007). The one case where Class IV wells are allowed is when they are used to clean up existing contamination. Some cleanup technologies involve extracting the contaminated water, treating it at the surface, and reinjecting the treated water. The treated water may still have contamination levels higher than applicable standards.

7.4.1.5 Underground Injection Control Well Class V

"Class V wells are injection wells that are not included in Classes I through IV. Class V wells inject nonhazardous fluids into or above an aquifer. They are typically shallow, onsite disposal systems, such as floor and sink drains that discharge into dry wells, septic systems, leach fields, and similar types of drainage wells. However, some Class V wells are deep." In short, Class V wells are like Class IV wells, but inject nonhazardous waste into the ground instead of hazardous waste (EPA, 2007).

The main types and the majority of permitted Class V wells in Nevada are: injection of geothermal fluids at commercial facilities, groundwater remediation projects, and aquifer storage and recovery (NDEP, 2004). For instance, during winter months SNWA injects treated water from Lake Mead to augment groundwater supplies (USGS, 1997). Because groundwater is used for drinking water supply in Nevada, injection wells must be constructed and operated in a manner that protects that water source. If businesses or individuals were to dispose of organic chemicals such as degreasing solvents and metals in their waste streams into injection wells, it could contaminate the water supply.

Two types of Class V wells have special regulations:

- Large capacity cesspools for disposal of untreated sewage, which represent a risk of pathogens contaminating drinking water sources. EPA banned new large capacity cesspools and required to closure of new cesspools by 2005.

- Automotive waste disposal wells used by car maintenance shops, which can expose drinking water supplies to toxic fluids. New motor vehicle waste disposal wells are banned and existing wells must either be closed or permitted by the state.

7.5 LEAKING UNDERGROUND STORAGE TANKS AND CHEMICAL SPILLS

Clark County has 143 active cases of LUSTs. Although some have only contaminated soil, 99 have contaminated at least the local groundwater (NDEP, 2008). The majority is related to gasoline or diesel storage and documented contaminants include methyl tertiary-butyl ether (MTBE) and benzene. Nearly all of the LUSTs are located in the Las Vegas Valley, although a few were found in Mesquite. NDEP, which regulates underground storage tanks (USTs), has adopted Title 40, Part 280 of the Code of Federal Regulations [40 CFR 280], the federal UST regulations. The regulations require the following:

- Proper installation including leak detection, spill, overfill, and corrosion protection.

- Tank owners take corrective action in response to leaks.

- Tank owners follow prescribed closure requirements.

- Demonstrate financial ability to clean up a leak and compensate others for bodily injury and property damage (EPA, 1995).

Permits from the Southern Nevada Health District (SNHD) are required for USTs, and their installation, repair and/or upgrade, and removal must be supervised by state-certified tank handlers.

In Clark County, there are 43 active cases of confirmed chemical spills contacting either surface or groundwaters. These spills are typically solvents or related to gasoline spills. The locations range from airports and Air Force bases to dry cleaners, casinos, and shopping centers.

Although LUSTs and chemical spills can contaminate shallow groundwater, groundwater used for drinking water supply in the Las Vegas Valley comes from deep groundwater that is replenished from precipitation in the Spring Mountains and injection of Lake Mead water (USGS, 1997). In the Las Vegas Valley, there is a clay layer, up to 200 feet thick, between the shallow aquifer and the deep aquifer. This clay layer is thought to protect the deep aquifer from the influences of urban recharge, which is a major source of water in the shallow aquifer (USGS, 2006). However, in the southeast part of the Las Vegas Valley, the shallow groundwater can recharge surface waters, including Lake Mead.

7.6 RECOMMENDATIONS

The recommendations for point sources were compiled from previous 208 WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to point sources for the *Clark County Area-Wide WQMP*:

- Support the NDEP in writing and enforcing NPDES permits for surface water discharges that are protective of beneficial uses and water quality objectives.

- In areas where municipal water and sewer service is not currently available, require developers to provide those services by requiring treatment plants for development approval.

- The CCRFCD should offer assistance to Clark County communities that will have to obtain and comply with National Pollutant Discharge Elimination System municipal stormwater discharge permits to be issued by NDEP.

- CCRFCD and other agencies should proceed with implementation of master plans and other projects to mitigate channel erosion on Muddy River in lower Moapa Valley and Hidden Valley (Planning Area 2), and on major tributaries in Mesquite and Moapa Valley.

- Public right-of-way, either in fee title or through conservation easements, should be obtained along the major watercourses in Clark County to allow for implementation of future projects and programs to mitigate erosion problems and preserve healthy riparian corridors.

- In Planning Area 5, SNWA's Las Vegas Wash Capital Improvement Plan, CCRFCD's Las Vegas Valley Flood Control Master Plan, the wastewater dischargers' future facility plans, and the Clark County Wetlands Park Plan should be coordinated to address the need to decrease the sediment load to the Las Vegas Bay and Lake Mead through the combined use of flood control facilities and erosion control structures.

- Clark County should work with CCRFCD to arrive at a method of determining the location and nature of impervious surfaces in the Valley, and to develop a map and database documenting this information.

- NDEP should provide a map and database to the CCDCP documenting dewatering NPDES permits issued in Planning Area 5, and that this be updated on a regular basis.

- Continue to implement Clark County Solid Waste Management Plan recommendations. Measures relevant to water quality protection include: control of littering and illegal dumping; increased public education on waste stream separation and recovery; and identification and analysis of biosolids management alternatives.

- Continue DAQEM staff participation with the Sewage and Wastewater Advisory Committee, CCRFCD, Municipal Stormwater Management Committee, and the Lake Mead Water Quality Forum. Specific coordination issues include: stormwater pollution abatement; management of local groundwater and surface water resources; air quality; and habitat protection through the Multiple Species Habitat Conservation Plan.

- The Clark County wastewater agencies should continue to implement water quality trading among the point sources which discharge to Las Vegas Wash.

7.7 REFERENCES

Clark County Department of Comprehensive Planning, *Clark County Comprehensive Plan*, 2007.

Clark County Department of Air Quality and Environmental Management, *Amendment to Northeast Clark County 208 Waster Quality Management Plan*, 2007 (the Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County).

Clark County *GISMO*, 2007. Accessed August 15, 2007, at: http://gisgate.co.clark.nv.us/gismo/freedata.htm

Environmental Protection Agency, *Musts for USTs – A Summary of Federal Regulations for Underground Storage Tank Systems.* EPA document 510-K-95-002, 1995.

----- Class I Underground Injection Control Program: *Study of the Risks Associated with Class I Underground.* EPA Document No: EPA 816-R-007, 2001.

----- *EPA Classes of Injection Wells* website. Accessed June 12, 2007, at: http: //www.epa.gov/safewater/uic/classes.html

----- *EPA Envirofacts Warehouse PCS – Water Discharge Permits*, 2008. Accessed January 4, 2008, at: http: //www.epa.gov/enviro/html/pcs/pcs_query_java.html

Ground Water Protection Council, *About Class III Injection Wells*, 2007. Accessed January 4, 2008, at: http://www.gwpc.org/e-library/e-library_documents/e-library_documents_general/classiii.htm

----- Injection Wells, *An Introduction to Their Use, Operation, and Regulation*, No Date.

Nevada Bureau of Mines and Geology, *The Nevada Mineral Industry 2005, Special Publication MI-2005*, 2006.

----- Bureau of Water Pollution Control, *Underground Injection Control Program, Program Description*, December 2004.

----- Bureau of Water Quality Planning, *Nevada's 2004 303(d) Impaired Waters List*, November 2005.

----- Bureau of Mining Regulation & Reclamation, *BMRR – Regulation Home Page, 2007a*, Accessed November 16, 2007, at: http://ndep.nv.gov/bmrr/reghome.htm

----- Bureau of Corrective Actions, *Tronox LLC Henderson Facility Fact Sheet, 2007b*, Accessed November 16, 2007, at: <http://ndep.nv.gov/bmi/index.htm>

----- Bureau of Corrective Actions, *Fact Sheet – Former Montrose Chemical Facility, 2007c.* Accessed November 16, 2007, at: <http://ndep.nv.gov/bmi/index.htm>

----- Bureau of Corrective Actions, *Data Downloads, Leaky Underground Storage Tanks*, 2008. Accessed November 16, 2007, at: <http://ndep.nv.gov/BCA/data.htm>

U.S. Geological Survey, *Quality of Ground Water Beneath Urban and Agricultural Lands in Las Vegas Valley and the Carson and Truckee River Basins, Nevada – Implications for Water Supply. USGS Water-Resources Investigations Report 97-4259*, M.S. Lico, 1997.

Washington Department of Fish and Wildlife, Washington Department of Ecology, Washington Department of Transportation, *Freshwater Gravel Mining and Dredging Issues*, Prepared by G.M. Kondolf, M. Smeltzer, L. Kimball, 2001.

Section 8

Section 8
Nonpoint Sources

8.1 INTRODUCTION

This section describes nonpoint pollution sources and management strategies for the surface and groundwater of Clark County. Nonpoint sources are defined as diffuse sources of pollution that are distributed throughout the watershed and contribute to receiving waters at multiple locations. They are contrasted with point sources, discussed in Sections 5 and 7, which contribute pollutants to receiving waters at a single definable point. In Clark County, the primary nonpoint sources are stormwater runoff, groundwater exfiltration, agricultural return flows, erosion, and contributions from miscellaneous urban activities (e.g., excess irrigation, wash water, illicit discharges to streets and, drainage facilities). **Table 8-1** summarizes the sources, mechanisms, pollutants, flows, and water quality of nonpoint discharges in Clark County.

Table 8-1

Nonpoint Source Contributions

Stormwater – Urban	Mechanism	• Pollutants build up on urban surfaces (streets, parking lots, landscaped areas) during dry weather, and then are washed into stormwater system by rainfall-runoff. • Urbanization (buildings, pavement, storm drains, and improved channels) shortens response time, increases rates and volumes of runoff and eliminates natural attenuation mechanisms.
	Typical sources	• Vehicle operation and maintenance • Garden chemicals (fertilizers, pesticides) • Airborne particulates • Household hazardous wastes • Surface disturbance from construction activities • Pet waste • Industrial activities (chemical handling and storage, equipment usage) • Illegal dumping
	Typical flow rates	Varies by storm event
	Primary pollutants	Suspended solids, dissolved solids, oil and grease, nutrients, heavy metals, bacteria, and other incidental compounds

Table 8-1 (Continued)

Nonpoint Source Contributions

Stormwater – Agricultural	Mechanism	Pollutants build up on agricultural areas (crop fields, grazing areas, dairies) during dry weather, and then are washed into the stormwater system by rainfall-runoff.
	Typical sources	• Applied fertilizers and pesticides/herbicides • Animal waste • Agricultural byproducts • Surface disturbance from plowing/harvesting/grazing activities
	Typical flow rates	Varies by storm event
	Primary pollutants	Suspended solids, dissolved solids, nutrients, bacteria, BOD
Irrigation Return Flows	Mechanism	Irrigation water applied to crops in excess of consumptive use requirements returns to stream system.
	Typical sources	Irrigated areas and grazing lands
	Typical flow rates	Less than 5 cubic feet per second (cfs)
	Primary pollutants	Dissolved solids (salts), bacteria, nutrients, pesticides/herbicides, naturally occurring soluble chemicals (e.g., boron, selenium)
Groundwater exfiltration	Mechanism	• High water table creates natural exfiltration to stream channels. • Dewatering operations for construction projects pump groundwater into stormwater system.
	Typical sources	• Shallow groundwater • Springs • Flood plains and irrigated areas
	Typical flow rates	Up to 75 gallons per minute (gpm) from springs
	Primary pollutants	Dissolved solids, minerals, selenium

Table 8-1 (Continued)

Nonpoint Source Contributions

Septic Systems	Mechanism	Outflows from septic tanks or leach fields contaminate shallow groundwater, which eventually exfiltrates to surface water system.
	Typical sources	Low-density development without centralized wastewater treatment
	Typical flow rates	200 gallons per day per unit
	Primary pollutants	Bacteria, BOD, nitrate
Mining Activities	Mechanism	• Excess process water from mining activities runs off site. • Stormwater contacts ore and disturbed areas and washes pollutants off site.
	Typical sources	• Sand and gravel mines • Gypsum mine • Hard rock mining
	Typical flow rates	Stormwater runoff varies by storm event.
	Primary pollutants	Suspended solids, metals, various minerals, low pH
Miscellaneous Urban Activities	Mechanism	Urban activities involving water use generate excess flows that enter the drainage system and create dry-weather base flows.
	Typical sources	• Landscape irrigation return flows. • Excess water from washing vehicles, driveways, parking lots, equipment, etc. • Swimming pool maintenance • Illicit discharges of industrial wastewater
	Typical flow rates	Less than 1 cfs (0.5 mgd) from individual sources
	Primary pollutants	Varies by discharge source

Table 8-1 (Continued)

Nonpoint Source Contributions

Channel erosion	Mechanism	• High velocities in improved, unlined channels and unvegetated natural washes create channel erosion. • Urban development increases peak runoff rates further increasing erosion • Regional detention basins extend runoff duration in downstream channels by releasing stored volume over 24 to 48 hours
	Typical sources	• Improved unlined channels and unvegetated natural washes. Most erosion occurs during a few high-flow events each year. • Bottom sediments with attached pollutants are resuspended by erosive velocities.
	Typical flow rates	Flow rates and erosion vary by storm
	Primary pollutants	Suspended solids, particulates and heavy metals

Clark County is not plagued by two nonpoint sources that are significant sources in many older U.S. metropolitan areas: combined sewer overflows and cross-connections between the sanitary sewer and storm sewer systems. Clark County has always had and will continue to have separate storm and sewer lines.

8.2 GENERAL NONPOINT SOURCE CONDITIONS IN CLARK COUNTY

Clark County Regional Flood Control District (CCRFCD), USGS and SNWA conduct water quality monitoring for nonpoint sources. Both dry weather and wet weather monitoring is conducted to characterize various nonpoint sources as well as within channels and culverts to characterize overall runoff.

8.2.1 Clark County Dry Weather Water Quality

Dry weather water quality monitoring is conducted in the Las Vegas Valley to define the quality of a combination of all nonpoint sources except stormwater. SNWA conducts quarterly dry weather monitoring, analysis, and data tabulation under a cooperative agreement with CCRFCD. This sampling program satisfies requirements of the MS4 permit issued to the Las Vegas Valley entities by NDEP. Over the collection period, dry weather sampling has been conducted at the following locations:

- Western Tributary at Cheyenne
- Flamingo Wash at Swenson
- Flamingo Wash at Nellis
- Duck Creek at Russell, or Patrick, or Sunset
- Duck Creek at Callahan or Broadbent
- Las Vegas Creek
- Las Vegas Wash at Desert Rose
- Sloan Channel
- Meadows Detention Basin
- Monson Channel
- Burns Street Channel

Water quality results for all dry weather data collected from 1991 to 2007 for the MS4 permit are summarized in **Table 8-2**. No temporal trends have been observed over the recording period and data collected in 2006-2007 are substantially similar to monitoring conducted in previous years. Additional information about the sampling program is available from the CCRFCD (2007).

It is assumed that dry weather runoff water quality in Las Vegas Valley is representative of all urban areas in Clark County, although areas with less dense development may have lower concentrations of individual constituents.

The Clark County Drought Ordinance stipulates measures to reduce turf and imposes watering restrictions. These efforts to reduce outdoor water use should impact dry weather flows and associated pollutants throughout Clark County (CCRFCD, 2008).

Table 8-2

Summary of Las Vegas Valley Dry Weather Water Quality for 1991 to 2007

Constituent	Median (1991 – 2007)	Range (2006-2007)
TDS	3,100 mg/L	500 – 5,800 mg/L
Zinc	<20 µg/L	<5.0 – 100.0 µg/L
Lead	<1.0 µg/L	<0.5 – 1.1 µg/L
Copper	<10 µg/L	<1.0 – 18.0 µg/L
Nitrite	<0.08 mg/L	<0.08 – 0.21 mg/L
Nitrate	4.10 mg/L	<0.08 – 8.35 mg/L
Orthophosphate – P	<0.020 mg/L	<0.002 – 0.044 mg/L
Total Phosphorus	0.04 mg/L	<0.01 – 0.089 mg/L
Conductance	3.70 mmhos	1.81 – 5.98 mmhos
Temperature	20.3 Deg C	0.4 – 31.1 Deg C
pH	8.3	7.7 – 9.4
NH3-N	<0.08 mg/L	<0.08 – 0.15 mg/L
Chromium	<2.4 µg/L	0.5 – 30.0 µg/L
Nickel	0.010 mg/L	<0.0008– 0.014 mg/L
Selenium	0.010 mg/L	0.0013 – 0.132 mg/L
Arsenic	<0.009 mg/L	0.0028 – 0.059 mg/L
Turbidity	1.90 NTU	0.33 – 13.9 NTU
Fecal Coliform	650 MPN/100mL	<10 – 80,000 MPN/100mL

Source: CCRFCD (2007)

Note:

The complete record of wet and dry water quality data are available at: http://breccia.ccrfcd.org/pdf_arch1/NPDES/06-07npdes.pdf

8.2.2 Clark County Rainfall, Runoff, and Wet Weather Water Quality

Southern Nevada generally experiences two types of storm events: general frontal storms and thunderstorms. General frontal storms occur in the fall and winter, and are characterized by moderate sustained rainfall of relatively long duration (i.e., several hours) that generate relatively little runoff. Thunderstorms are common in spring and summer, and are characterized by high-intensity rainfall, short durations (less than 3 hours), and localized area coverage. In a typical year there are 29 days with measurable rainfall, but only 12 days with rainfall exceeding 0.10 inches, the approximate threshold for producing runoff (Gorelow, 2005). Therefore, the stormwater contribution to nonpoint runoff can be high in magnitude, but is generally infrequent and of short duration.

Runoff magnitude is closely related to land use and land management practices. In undeveloped watersheds and in agricultural and grazing areas with excellent land management practices, annual runoff volume may be as little as 10 percent of precipitation volume. In highly developed urban areas, annual runoff can be more than 90 percent of precipitation volume. Higher densities of development lead to increased contributions of pollutants in stormwater runoff due to a number of factors including:

- Increased runoff peaks and volumes from impervious surfaces
- Increased generation of buildup of anthropogenic pollutants on land surfaces
- Increased pollutant wash off from impervious surfaces

Wet weather stormwater quality analysis is performed in the Las Vegas Valley by MWH and the USGS to comply with the MS4 permit. In 2006-2007, samples were obtained from:

- Las Vegas Wash at the Desert Rose Golf Course
- Las Vegas Wash below Lake Las Vegas

In previous years, sampling was also conducted at:

- Western Tributary at Civic Center
- Las Vegas Creek at Pecos or Lena
- Duck Creek at Boulder Highway
- Flamingo Wash at Nellis
- C-1 Channel at Warm Springs
- Sloan Channel (Range Wash) at Charleston)
- Monson Channel
- Meadows Detention Basin
- Las Vegas Wash at Pabco Road

Stormwater quality results for 2006-2007 and for the period of record in the Las Vegas Valley are shown in **Table 8-3**. The 2006-2007 wet weather data were consistent with data collected between 1992 and 2006. It is assumed that the measured quality in the Las Vegas Valley is representative of all urban areas in Clark County, although areas with less dense development may have lower concentrations of constituents.

Table 8-3

NPDES Constituents Measured in Las Vegas Valley During Wet Weather

Constituent	Units	Median or # Detects (2006-2007)	Median or # Detects (1992-2007)
Oil and Grease	mg/L	ND	<3
Total Dissolved Solid (TDS)	mg/L	1,250	580
Total Suspended Solids (TSS)	mg/L	1,839	950
Total phosphorus-P	mg/L	0.75	0.96
Orthophosphate-P	mg/L	0.15	0.19
Nitrite, Nitrogen	mg/L	0.62	0.20
Nitrate, Nitrogen	mg/L	3.4	1.76
Kjeldahl Nitrogen	mg/L	2.0	4.9
Ammonia Nitrogen	mg/L	NA	0.60
Copper, Total	mg/L	0.150	0.044
Lead, Total	mg/L	0.02	0.076
Zinc, Total	mg/L	0.450	0.230
Copper, Dissolved	mg/L	0.011	0.010
Lead, Dissolved	mg/L	0.001	<0.100
Zinc, Dissolved	mg/L	0.03	0.022
Boron, Total	mg/L	0.37	0.24
Turbidity	NTU	NA	235
Fecal Coliform Bacteria	MPN/100mL	220,000	24,000
Fecal Streptococci	MPN/100mL	50,000	50,000
SOCs	# of Detects	0	0
Volatile Organic Compounds	# of Detects	12	1
Pesticides	# of Detects	0	0
Herbicides	# of Detects	1	0

Source: CCRFCD (2007)

Note:

The complete record of wet and dry water quality data are available at: http://breccia.ccrfcd.org/pdf_arch1/NPDES/06-07npdes.pdf

Wet weather monitoring results from the 1992-2007 storms were compared to dry weather sampling data from 1991-2007 at the same locations. **Table 8-4** compares median dry weather concentrations, median wet weather concentrations, and provides a calculated wet weather versus dry weather factor or ratio. The following observations were drawn from this analysis:

1. Storm water runoff in the Las Vegas Wash contribute higher pollutant concentrations than dry weather runoff for most constituents.

2. Bacteria counts are 10 to 100 times greater in stormwater.

3. Total suspended solids (TSS) concentrations are 10 to 100 times higher and turbidity is over 100 times higher in stormwater than dry weather runoff. This is due to sediment transport during storm events.

4. Dry weather concentrations of TDS are substantially higher than wet weather concentrations.

5. Surfactants are an order of magnitude higher in stormwater.

6. Nutrient concentrations (total nitrogen, total phosphorus, and orthophosphate-P) are higher in wet weather runoff than dry weather.

7. Most metals concentrations were below detection limits in dry weather flows. Mercury, cadmium, and silver were below the detection limits in most samples of wet and dry weather flows. Nickel, chromium, copper, arsenic, and zinc concentrations were higher in wet weather than dry weather flows.

8. The median wet weather selenium concentration is less than the median dry weather concentration. This suggests that higher flows during storm events may dilute selenium in surface waters.

9. BOD and chemical oxygen demand (COD) are about an order of magnitude higher in wet weather flows.

10. Wet weather pH remains within an acceptable range of 7.6 to 8.3. It is slightly higher in dry weather runoff, compared to a typical wet weather measurement of 7.6.

The COH and USGS also collect water quality data in Las Vegas Wash. However, both entities collect samples at regular intervals, so that dry weather flow water quality data is combined with wet weather water quality data.

Table 8-4

Comparison of Wet Weather and Dry Weather Pollutant Concentrations in Las Vegas Valley (1991 – 2007)

Constituent	Median Dry Weather Concentration	Median Wet Weather Concentration	Wet/Dry
Biochemical Oxygen Demand (mg/L)	<6	35	>6
Chemical Oxygen Demand (mg/L)	16	230	14
Total Suspended Solids (mg/L)	13	950	73
Total Dissolved Solids (mg/L)	3,100	580	0.19
Oil and Grease (mg/L)	<3.0	<3.0	1.0
Total Petroleum Hydrocarbons (mg/L)	<1.0	<1.0	1.0
Total Kjeldahl Nitrogen (mg/L)	0.90	4.9	5.4
Nitrate-N (mg/L)	4.10	1.76	0.4
Ammonia-N (mg/L)	<0.08	0.60	>7.5
Total Nitrogen (mg/L)	4.3	7.2	1.7
Orthophosphate - P (mg/L)	<0.020	0.19	>9.5
Total Phosphorus (mg/L)	0.04	0.96	24.0
Cadmium, total (mg/L)	<0.005	<0.005	1.0
Chromium, total (µg/L)	<2.4	18	>7.5
Copper (mg/L)	<0.01	0.044	>4.4
Lead (mg/L)	<0.001	0.076	>76
Nickel, total (mg/L)	0.010	0.026	2.6
Mercury, total (mg/L)	<0.0002	<0.0002	1.0
Silver, total (mg/L)	<0.010	<0.010	1.0
Zinc (mg/L)	<0.02	0.23	>11.5
Arsenic (mg/L)	<0.009	0.014	>1.56
Boron (mg/L)	0.96	0.24	0.25
Cyanide (mg/L)	<0.005	<0.005	>1.0
Turbidity (NTU)	1.90	235	124
pH	8.3	7.6	0.9
Surfactants (mg/L)	<0.06	0.50	>8.3
Phenol (mg/L)	<0.01	0	>0
Total Chlorine (mg/L)	<0.10	<0.10	1.0
Color (ACU)	15	100	6.7
Selenium (mg/L)	0.010	<0.010	<1.0
Fecal Coliform (MPN/100mL)	650	24,000	37
Salmonella (MPN/100mL)	<2.2	<2.0	0.9

Source: CCRFCD (2007)

8.2.3 Individual Sewage Disposal Systems (Septic Systems)

In areas of Clark County where sanitary sewers are not currently available to convey wastewater to treatment plants, septic systems are installed to provide the sewage collection and treatment. The *Clark County Comprehensive Plan* includes the following policies regarding septic systems:

- Identify the use of septic tanks within the Las Vegas Valley.
- Discourage the use of septic tanks within the Las Vegas Valley.
- Do not approve residential conversions, changes in the type of approved land use, that utilize existing septic systems in sewer serviced areas.
- Prohibit the use of septic tanks or sewage lagoons where soils are subject to seepage, poor filters or in flood prone areas. This will minimize health hazards associated with slow absorption, surfacing of effluent, hillside seepage or groundwater contamination.
- Promote existing development served by septic systems to connect to municipal sewers if within 400 feet of the sewer line.
- Where appropriate, require abandonment of septic systems and connection to the municipal sewer system during the property zone change process (CCDCP, 2007).

The SNHD issues permits for residential and commercial septic systems; however, if a property requires septic tank capacity of 5,000 gallons or more, NDEP must review and approve the application. The SNHD and NDEP requires sewer connections for new developments according to the following (SNHD, 2007; NDEP, 2008a):

- If the nearest community sewer collection line is less than 400 feet away from the site boundary.
- If the density of the development is greater than two lots per acre, and the nearest available sewer is closer than a distance in feet calculated by multiplying the number of lots in the subdivision by 100 (e.g., 20 lots in 5 acres, 100 x 20 = 2,000 feet).

Nevada has rules regarding allowable septic system densities based on lot size and numbers of systems per square mile as determined by the Nevada Department of Conservation and Natural Resources (DCNR) and set forth in its Septic Density Policy. The policy imposes density per square mile limits regionally by drainage basin. Minimum lot sizes eligible for

septic systems include 0.25 acre, 0.5 acre, and 1 acre with the specifications shown in **Table 8-5**.

Table 8-5

Minimum Lot Size Requirements for Septic Systems in Nevada

Minimum Lot Size	Drinking Water Supply Source	Lot Type	Date applicable
0.25 acre	Must be offsite well or community supply	Parcel lot	N/A (current requirement)
		Subdivision lot	Before January 1, 2000
0.5 acre	Must be offsite well or community supply	Subdivision lot	On or after January 1, 2000 (current requirement)
1 acre	Well may be located on lot (well must be serving only that property)	Parcel lot or subdivision lot	N/A (current requirement)

Sources: CCDBH, 1994; NAC 444.790, NDEP 2007

The allowed septic density per square mile is calculated based on groundwater quality and soil types. **Table 8-6** shows the allowed number of septic systems per square mile in Clark County based on groundwater basin (**Figure 8-1**). Allowed densities in the Las Vegas Valley are 119 per square mile, but are greater in other areas such as Bunkerville and Moapa with densities of about 161 per square mile.

Table 8-6

Clark County Allowed Septic Density Per Square Mile

Basin	Allowed Septic Density per Square Mile	Area Name	Cities and Towns
160	87	Frenchman Flat	
161	148	Indian Springs Valley	Indian Springs
162	163	Pahrump Valley	Pahrump
163	154	Mesquite Valley	Sandy
164	133	Ivanpah Valley	Jean, Primm
165	171	Jean Lake Valley	
166	120	Hidden Valley	
167	136	Eldorado Valley	
211	151	Three Lakes Valley	
212	119	Las Vegas Valley	Las Vegas, Henderson
213	100	Colorado Valley	Laughlin
214	183	Piute Valley	Searchlight
215	122	Black Mountains Area	Boulder City
216	165	Garnet Valley	
217	98	Hidden Valley	
218	161	California Wash	Moapa
219	141	Muddy River Springs Area	
220	162	Lower Moapa Valley	
222	165	Virgin River Valley	Mesquite
223	97	Gold Butte Area	
224	97	Greasewood Basin	

Source: NDEP (2008a)

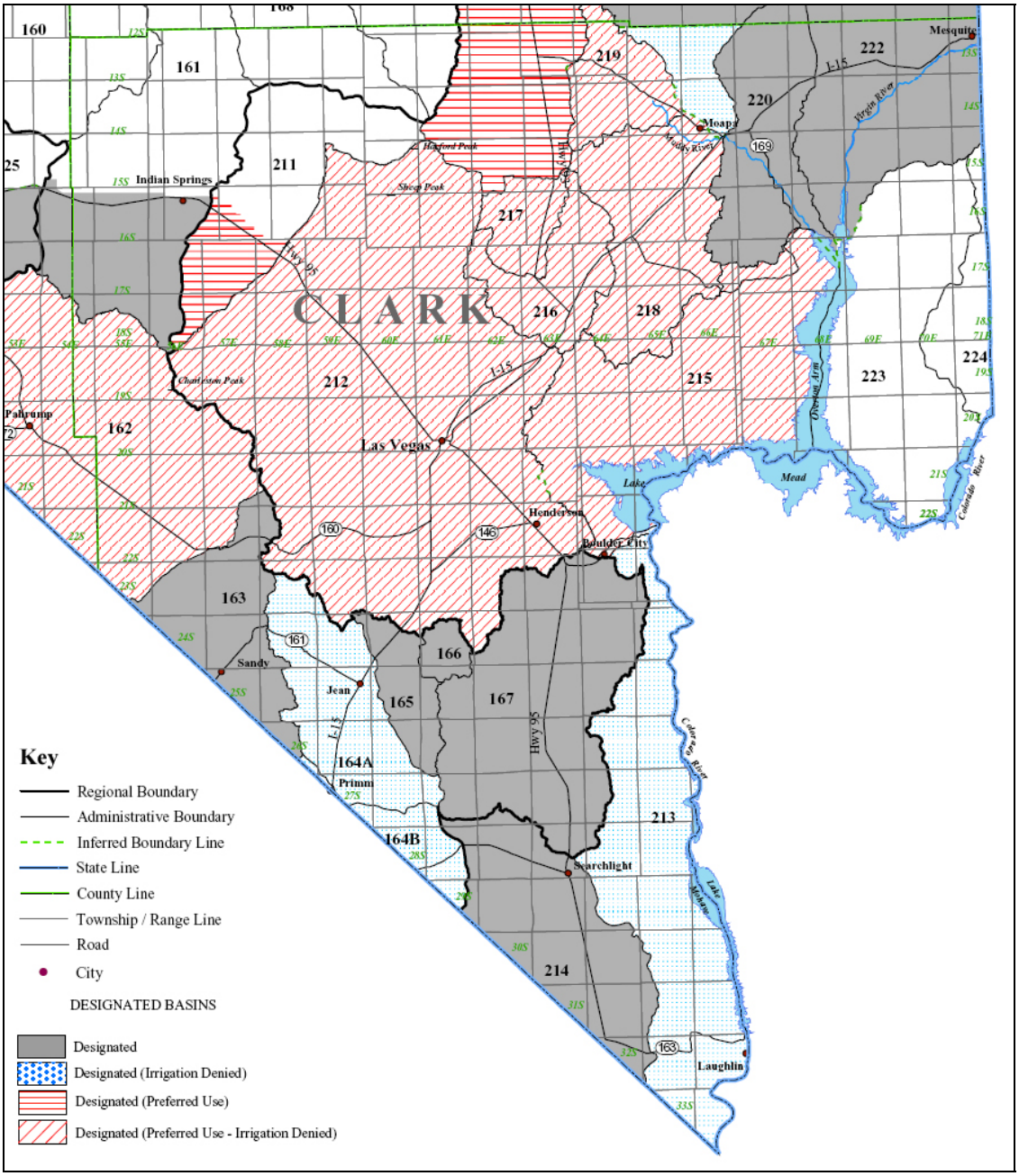


Figure 8-1
Designated Groundwater Basins of Clark County

Modified From: Nevada Division of Water Resources (2005)

GIS files containing septic system permits within Clark County (with a modification date of July 14, 2007) were downloaded from the Clark County GISMO website, which shows the geographical distribution of septic system permits within Clark County, see **Figure 8-2**. The number of septic system permits for each planning area within Clark County is summarized in **Table 8-7**.

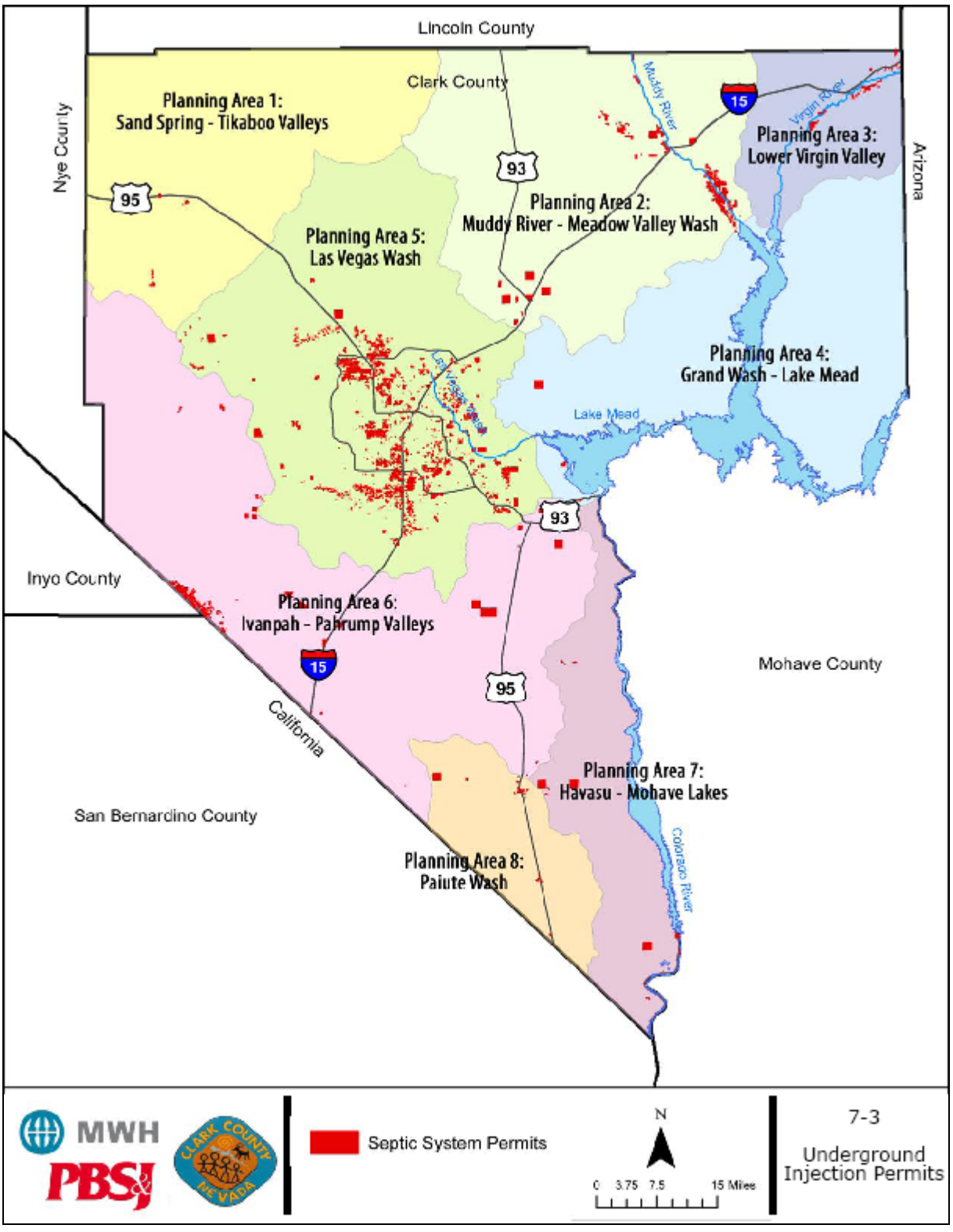
Table 8-7

Septic System Permits Within Clark County

Planning Area	Number of Septic System Permits
1	171
2	1,749
3	338
4	12
5	16,739
6	1,005
7	27
8	245
Total	**20,286**

With the exception of the incorporated Mesquite and portions of the unincorporated Moapa Valley community of Overton, there are no centralized public or private sewer systems serving northeast Clark County. Individual septic systems are employed and will continue to be used where centralized systems are not available. The densities being proposed in the recent land use applications received by the CCDCP for the Moapa Valley, Moapa/Warm Springs, and Bunkerville areas, and those applications anticipated to be received from the other northeast communities require Clark County to consider other treatment options. To mitigate this situation, several land-use applications that have been submitted to the CCDCP by the developers have included proposed package treatment plants, generally as a temporary measure, as the means to manage the wastewater flows projected for these new neighborhoods.

In south Clark County, there are package WWTPs in Primm and Jean, a treatment plant at Cottonwood Cove through the NPS at Lake Mead NRA, and municipal WWTPs in Searchlight, and Boulder City (CCDCP, 2004). In northwest Clark County, the Indian Springs WWTF is operated by CCWRD. The remainder of Clark County is served by septic systems.


Lincoln County
Clark County
Nye County
Arizona
Planning Area 1:
Sand Spring - Tikaboo Valleys
Planning Area 2:
Muddy River - Meadow Valley Wash
Planning Area 3:
Lower Virgin Valley
Planning Area 4:
Grand Wash - Lake Mead
Planning Area 5:
Las Vegas Wash
Planning Area 6:
Ivanpah - Pahrump Valleys
Planning Area 7:
Havasu - Mohave Lakes
Planning Area 8:
Paiute Wash
Muddy River
Virgin River
Las Vegas Wash
Lake Mead
Colorado River
Inyo County
Mohave County
San Bernardino County
California
15
93
95
MWH
PBS&J
Septic System Permits
N
0 3.75 7.5 15 Miles
7-3
Underground Injection Permits

Although major problems with septic tank groundwater contamination have not been reported in Clark County, elevated shallow groundwater nitrate concentrations are found near population centers in the Clark County, as shown in **Figure 8-3**. Septic tanks could contribute to the elevated nitrate concentrations in some of these locations.

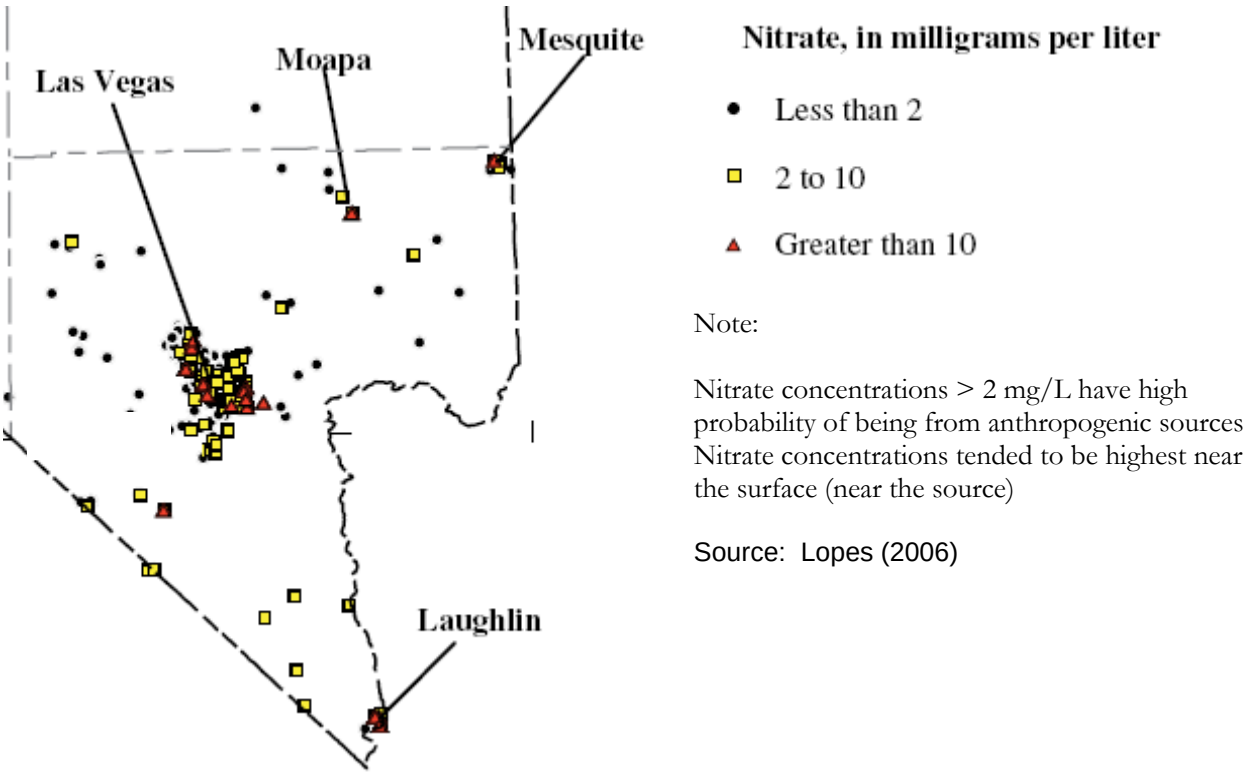


Figure 8-3
Concentrations of Nitrate in Groundwater in Clark County

As increases in the applications for residential subdivisions begin to meet or exceed the maximum allowable number of septic systems as established by the NDEP Septic Density Policy, it is reasonable to expect that the concentrations of nitrates in the local groundwater could become elevated above the maximum contaminant level of 10 parts per million as set forth in the Safe Drinking Water Act (SDWA). Once the densities have reached this level, subdivisions should either be connected to interim package plants, permanent package plants, or POTWs.

8.2.4 Erosion

Erosion of watershed surfaces and stream channels can contribute large amounts of suspended solids to stream flows, particularly during periods of high runoff. Eroded soils transported in the water column lead to high concentrations of suspended solids and turbidity, but also contribute other pollutants adsorbed to sediments including minerals,

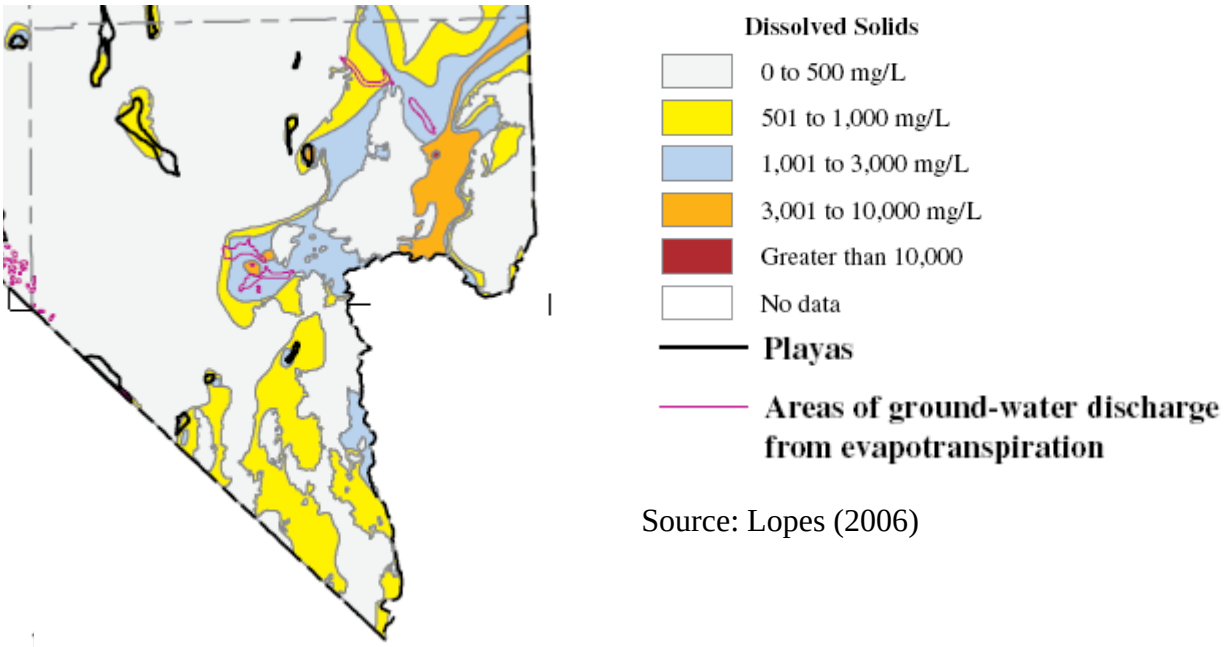
metals, and nutrients. In addition, lateral bank erosion results in loss of usable land and degradation of riparian habitat.

Erosion from watershed surfaces is a significant natural process throughout Clark County due to the lack of stabilizing vegetation in the desert environment. Erosion in particular areas of Clark County is discussed in more detail in Planning Area 5. Overgrazing and poor agricultural practices can aggravate land erosion. Urban development can increase channel erosion by increasing peak runoff rates. Concrete lining, and straightening and steepening of channels increases velocities. High velocities in improved unlined channels and unvegetated natural washes increases channel erosion. Bottom sediments with attached pollutants can be resuspended by erosive velocities.

8.2.5 Groundwater Exfiltration

Dewatering operations for construction projects pump groundwater into the stormwater system. NDEP currently issues NPDES permits for dewatering activities, which are discussed in more detail in Section 7. Groundwater can seep from aquifers into surface waters in areas of a high groundwater table. Historically, in Clark County, the primary parameter of concern in groundwater was elevated levels of TDS. Selenium in groundwater is becoming an increasing concern. TDS concentrations in groundwater are elevated in much of Clark County, as shown in **Figure 8-4**. The drinking water secondary maximum contaminant level (MCL) for TDS, the level above which the taste of drinking water can be affected, is 500 mg/L. Agricultural uses of water can also be affected, depending on the sensitivity of the plant species, at levels above 500 mg/L. Groundwater TDS levels are particularly high in Planning Area 4.

As shown in **Figure 8-3**, nitrate concentrations exceeding the drinking water quality standards have also been found near the more highly developed areas of Clark County including the Las Vegas Valley, Moapa, Mesquite, and Laughlin.



Source: Lopes (2006)

Figure 8-4
Dissolved Solids Concentrations in Groundwater in Clark County

8.3 NEVADA GENERAL PERMITS APPLICABLE TO NONPOINT SOURCES

Permits are required for nonpoint source runoff within the County. EPA's stormwater regulations require NPDES permit coverage for stormwater runoff from municipal and industrial facilities and at construction sites. Nevada has implemented a general permit for each. The programs are briefly described below.

8.3.1 Nevada's Industrial Facility Stormwater Permit Program

Phase I of EPA's stormwater regulations requires NPDES permit coverage for stormwater runoff from not only "medium" and "large" MS4s, but also from 11 categories of industrial activity with a high potential for contributing nonpoint source pollution to surface waters (NDEP, 2002). The following is a partial list of industry categories requiring permits:

- Mining
- Food products
- Textile products
- Lumber and wood products
- Paper and allied products
- Chemicals and allied products
- Transportation industry
- Petroleum and coal products
- Metal industries
- Rubber and plastic products
- Industrial machinery
- Electronic equipment
- Trucking and warehousing
- Scrap and waste materials

Source: CCDCP (1997)

According to NDEP (2002), "Activities that take place at industrial facilities, such as material handling and storage, are often exposed to stormwater. The runoff from these activities discharges industrial pollutants into nearby storm sewer systems and water bodies. This may adversely impact water quality." NDEP (2002) estimated that 1,000 to 2,000 facilities in Nevada require a permit under the Industrial General permit.

Permits require development of a Stormwater Pollution Prevention Plan (SWPPP) to manage stormwater generated from areas directly related to manufacturing, processing, or raw material storage areas at an industrial plant.

Industrial sites can obtain a "No Exposure" waiver if the only site areas exposed to precipitation are roofs, parking lots, vegetation, and other nonindustrial areas and if all activities and industrial materials are protected by a shelter (Clark County, 2004).

8.3.2 Nevada's Stormwater Construction Site Permit Program

NDEP has a general permit (NVR100000) for stormwater discharge associated with construction activity. According to NDEP (2008b), "Uncontrolled runoff from construction sites is a water quality concern because of the devastating effects that sedimentation can have on local water bodies, particularly small streams. Numerous studies have shown that the amount of sediment transported by stormwater runoff from construction sites with no controls is significantly greater than from sites with controls."

Nevada's construction site program requires the following for construction sites greater than 1 acre:

- Develop a SWPPP.

- Submit a notice of intent (NOI) to NDEP at least 7 days before construction commences.

- Conduct regular inspections and report releases of "reportable quantities" of hazardous substances.

- Submit a notice of termination (NOT) when construction is completed (Clark County, 2004).

The NDEP construction site program focuses on implementing best management practices (BMPs) to control nonpoint sources of pollution from construction sites. These BMPs are described in more detail in Section 9. NDEP issues permits, collects fees associated with permit application and approval, and is responsible for permit monitoring and enforcement (CCDCP, 1997). It is possible for construction sites between 1 and 5 acres to obtain a SWPPP waiver if the site meets certain requirements (Clark County, 2004).

8.4 PLANNING AREA 5

Planning Area 5 is more developed than the rest of Clark County and therefore, has more urban nonpoint sources. Due to the concentrated population, nonpoint sources in this area have been regulated for a longer time than in the less-developed areas of Clark County. Therefore, efforts to control nonpoint sources of pollution are more developed in the Las Vegas Valley than in Planning Areas 2, 3, and 4.

8.4.1 Stormwater

In compliance with EPA regulations, NDEP issued NPDES permit number NV0021911 jointly to CCRFCD, CLV, CNLV, COH, and Clark County (Permittees) for their MS4. The permit authorizes agencies to discharge stormwater at outfalls on Las Vegas Wash and its tributaries subject to implementation of a comprehensive stormwater management plan. The permit designates CCRFCD as the Lead Agency for permit implementation. The following goals have been identified by CCRFCD:

STORMWATER

Stormwater discharges are generated by runoff from land and impervious areas such as paved streets, parking lots, and building rooftops. During rainfall events the runoff may contain pollutants in quantities that could adversely affect water quality. Most stormwater discharges are considered nonpoint sources and require coverage by an NPDES permit. The primary method to address stormwater discharges is through the use of BMPs.

GOAL: MEET FEDERAL, STATE AND LOCAL STORMWATER REGULATIONS (CWA; Permit NV0021911 (Las Vegas Valley MS4 Permit); and local ordinances)

STRATEGIES:

I. Restrict discharge of pollutants to storm drains to the maximum extent practicable (MEP). MEP is defined for this application in the MS4 Storm Water Management Plan outlined in item IV.

II. Limit or eliminate to the MEP discharges to the Las Vegas Wash that cause or contribute to in-stream exceedances of water quality standards.

III. Limit or eliminate to the MEP stormwater discharges from any part of the MS4 that significantly contribute directly or indirectly to the listing of a water body on the 303(d) list (i.e., impaired water body).

IV. Storm Water Management Program (SWMP): Develop, implement, and enforce a SWMP designed to reduce the discharge of pollutants from the MS4 to the MEP to protect water quality, and to satisfy the appropriate water quality requirements of the CWA and the MS4 Permit issued to the Las Vegas entities by NDEP.

a. Identify BMPs appropriate for Las Vegas Valley

b. Identify measurable goals and timelines

c. Identify staff and resources needed to implement SWMP

d. Implement the following programs:

i. Public Outreach and Education Program

ii. Illicit Discharge Detection and Elimination Program (cross connections, spills)

iii. Industrial Facility Monitoring and Control Program

iv. Construction Site Program

v. Post Construction Program (to reduce the discharge of pollutants from areas of new development and significant redevelopment)

vi. Source Control Program (street sweeping, storm drain system maintenance, detention basin maintenance)

vii. Complaint response, inspection and resolution

viii. Characterization and monitoring of stormwater

V. Establish legal authority at local level (statute, ordinance or series of contracts) to:

a. Prohibit illegal discharges of pollutants to MS4

b. Allow inspection, surveillance, enforcement and monitoring procedures necessary to determine compliance and noncompliance

Components of the MS4 program include the following:

- **Source Identification** – Regional maps of the storm drain system were prepared by the Permittees to determine where potential stormwater quality problems may exist or originate.

- **Monitoring** – Dry weather and wet weather water quality monitoring. The dry weather sampling program has two primary objectives: target potential illegal or illicit discharges to the municipal storm sewer system (e.g., from industrial activity); and develop a baseline of dry weather surface water quality data against which future changes can be measured and which can be used to compute urban pollutant loading to receiving waters. Wet weather stormwater quality monitoring is performed to identify trends in stormwater quality.

- **Public Outreach and Education Program** – Public outreach and education is conducted to: inform the general public in the Las Vegas Valley about important water quality issues related to stormwater runoff; influence the general public to reduce activities that have a negative impact on stormwater runoff quality; increase activities that have a positive impact on stormwater runoff quality. The Permittees host community events, generate media materials such as public service announcements and educational DVDs, host a stormwater-focused website (www.lvstormwater.com), conduct an educational elementary school program, and specifically target construction and industrial activities for educational opportunities.

- **Structural and Source Control Measure Program** – This program was developed to mitigate the effects of urbanization on stormwater quality. It involves structural and nonstructural BMPs to reduce pollutant concentrations in stormwater. BMPs are discussed in more detail in Section 9.

- **Ongoing Revision of the SWMP** - The Permittees complete an annual review of the SWMP as part of their annual MS4 permit report. The SWMP has been substantially revised over the years. The Permittees have recently been working with NDEP to respond to recommendations made in a 2005 EPA audit of the MS4 permit program.

The following nonpoint source components of the MS4 program are discussed in more detail in the subsections below:

- Industrial Facility Monitoring and Control Program
- Construction Site Program
- Illicit Discharge Detection Program

8.4.1.1 Las Vegas Valley Industrial Pretreatment, Facility Monitoring and Control

The MS4 permit specifically identifies four classes of industrial facilities for which a program to monitor and control pollutants must be developed. These classes of industrial facilities are:

- Industrial facilities that are subject to Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA)
- Municipal Landfills (there are no active municipal landfills in the Las Vegas Valley)
- Hazardous waste treatment, disposal, and recovery facilities
- Industrial facilities that the municipal permit applicant determines are contributing a substantial pollutant loading to the municipal storm sewer system

A list of 70 facilities subject to Section 313 for releasing certain amounts of regulated chemicals into the environment was tabulated for the 2006-2007 Las Vegas Valley MS4 Permit Report. There are nine hazardous waste treatment, disposal, and recovery facilities covered by the MS4 permit or that have a written determination on file in Clark County, and all are within the Las Vegas Valley (CCRFCD, 2007a).

The MS4 Permittees have not identified any facilities other than those already identified in the above categories that are contributing a substantial pollutant loading to the municipal storm sewer system. The Permittees will develop criteria for determining whether other industrial sites are contributing a substantial pollutant load to the MS4.

The Las Vegas Valley MS4 Co-Permittees have an Industrial Facility Monitoring and Control Program that includes identifying industrial facilities that could be potential pollutant sources, conducting inspections of industrial facilities, and conducting an ongoing training program for local industrial site inspectors. This program is intended to complement the separate industrial site permitting program conducted by NDEP. The Industrial Pretreatment Programs of the CCWRD, CLV, CNLV, and COH have been very successful

in enforcing regulations that prohibit illicit discharges and illicit connections. Each city is using its industrial pretreatment program staff to conduct stormwater inspections during their regular site visits (CCRFCD, 2008).

- The CLV industrial waste/pretreatment program oversees about 1,000 industrial sites, 700 restaurants, and identified Section 313 facilities. The facilities are routinely inspected according to an established checklist.

- The CNLV industrial pretreatment program inspects more than 600 industrial site, 300 restaurants, and Section 313 facilities.

- Fire inspectors for the COH inspect about 300 facilities identified as having the potential to contribute substantial loading to the MS4.

- Clark County has been inspecting Section 313 facilities and has developed criteria to identify other industrial sites that could be contributing a substantial load to the MS4. Clark County has entered into an interlocal agreement with CCWRD to allow its industrial pretreatment program inspectors to inspect sites in unincorporated Clark County.

8.4.1.2 Las Vegas Valley Construction Site Runoff Management Program

A Construction Site Runoff Management Program is required by the Las Vegas Valley MS4 permit. The program consists of required elements to minimize the impacts of construction activities on the quality of downstream receiving waters. This local program complements, but is independent of, Nevada's construction site permitting program (described in Section 8.3.2).

The Permittees notify developers, engineers, and contractors of the requirements of Nevada's construction site permitting program. This is intended to improve compliance with the NDEP construction site program. Construction site BMP manuals were revised by the Las Vegas Valley MS4 Permittees to reflect local Clark County conditions. Construction site BMPs are described in more detail in Section 9.

A construction site inspection program is conducted by the MS4 permittees to assure that local ordinances are effectively prohibiting discharge of pollutants to the drainage system and are not being violated. During the 2004-2005 permit year, construction site inspection protocols were developed and an inspector training program was developed and implemented. During the 2005-2006 permit year, the field component of the construction site inspection program was initiated and has been ongoing since (CCRFCD, 2007a).

DAQEM conducts construction site inspections in CLV, CNLV, and unincorporated Clark County. City staff conduct inspections in COH.

In 2007, the Permittees agreed to enhance their Construction Site Runoff Management Program based on a request from NDEP. Key elements of these enhancements are:

- An ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under state or local law

- Requirements for construction site operators to implement appropriate erosion and sediment control BMPs

- Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality

- Procedures for site plan review that incorporate consideration of potential water quality impacts

- Procedures for receipt and consideration of information submitted by the public

- Procedures for site inspection and enforcement of control measures (CCRFCD, 2008)

A new Construction Program Working Group was formed by the Permittees to implement these enhancements in their respective program. Proposed changes to the construction site program will be made after a public process that involves local development stakeholders. Progress to date includes:

- Internal processes of each construction inspection program were modified to make them equivalent using the COH as a model.

- Current local ordinances were reviewed for authority to address the enhancements requested by NDEP.

- The Permittees have agreed that EPA's model stormwater ordinance is a good starting point for developing the legal authority to implement a stormwater quality program (CCRFCD, 2008).

The stakeholder process regarding changes to the Construction Site Runoff Management Program began in 2008.

8.4.1.3 Las Vegas Valley Illicit Discharge Detection and Control

In some communities, industries illegally tap into the storm sewer system to discharge water and waste products that should be collected by the sanitary sewer system and be treated by the WWTP before being discharged to the environment.

The Las Vegas Valley MS4 permit requires an illicit discharge program consisting of four components: field screening, field inspections, public reporting opportunities, and a spill response strategy. In addition, industrial pretreatment programs for several Las Vegas Valley utilities have been successful in enforcing regulations that prohibit illicit discharges. Illicit connections are an insignificant contribution to nonpoint source pollution in the Las Vegas Valley (CCDCP, 2000).

Field screening is conducted as part of the MS4 permit dry weather sampling program. Dry weather monitoring results (see **Table 8-2**) do not show any evidence of illegal nonstormwater discharge to the drainage system in Las Vegas Valley (CCRFCD, 2007a).

Field inspections are conducted regularly by the staffs of the MS4 Permittees. Inspections include visual observations of exposed storm channels and detention basins focusing on those where dry weather flow persists. Heavy sediment loads are also investigated as a potential sign of construction site runoff. Illicit discharge and dumping are referred to the proper local authorities for resolution. The Permittees actively train their staffs to look for evidence of nonstormwater discharges in the drainage system (CCRFCD, 2007a). The inspections result in several reports of potential illicit discharges or construction site runoff to agencies in Clark County and NDEP each year.

There are several avenues by which the public can and has reported potential illicit discharges to the MS4. These are described below:

- The Permittees' website, www.lvstormwater.com, has a link for reporting illicit discharges.

- SNHD has the authority to enforce ordinances prohibiting dumping of solid waste and sewage to the Las Vegas Valley stormwater conveyance systems. The public can call SNHD and report problems directly or though the website shown above.

- Clark County Public Response Office (CCPRO) receives public complaints related to illegal dumping and other ordinance violations, and is empowered to respond to the problems.

- Each of the Permittees receives direct calls from citizens reporting dumping, illegal discharges of nonstormwater to the drainage system, maintenance problems, and other activities that might affect water quality. Each of the calls is investigated by the responsible entity.

During 2005-2006, the Permittees prepared and submitted to NDEP a Spill Response Strategy to summarize their coordinated approach to responding to illegal spills. Key components of the Spill Response Strategy are:

- The state and county each have hazardous material emergency response plans that adequately outline field procedures, roles and responsibilities, training requirements, and notifications. Each local entity also has standard operating procedures for dealing with illegal dumping or accidental spills.

- The Clark County Local Emergency Planning Committee (LEPC) meets regularly to coordinate the activities of all emergency response agencies in Las Vegas Valley. The LEPC encourages use of common policies and procedures and passes on information related to regulations and spill response techniques.

- H2O Environmental is a private contractor that is used by all entities in Las Vegas Valley to respond to and clean up hazardous material spills greater than 25 gallons. Standing contracts with H2O Environmental allow the firm to respond to spills quickly (within 45 minutes anywhere in Las Vegas Valley).

- The hazardous material emergency response plans contain extensive notification lists, of individuals and agencies that should be contacted in the event of a hazardous material spill.

8.4.2 Groundwater Exfiltration

The high water table west of Las Vegas Wash creates natural exfiltration to stream channels (primarily Flamingo Wash and Duck Creek). The most important pollutants of concern in dewatering discharges to surface water are selenium and suspended and dissolved solids. Shallow groundwater is typically high in TDS in Las Vegas, particularly near Las Vegas

Wash. Groundwater can have TDS concentrations from 3,000 to 6,000 mg/L (CCDCP, 1997). Perchlorate has also been found in elevated concentrations in the southeast Las Vegas Valley. The point sources of perchlorate are discussed in Section 7.

Lopes (USGS, 2006) found that in southeastern Las Vegas Valley naturally occurring TDS concentrations were greater than 2,000 mg/L and attributed this elevated TDS to dissolution of gypsum and evaporates. According to Bevans et al. (USGS, 1998), evaporates are common in the Las Vegas Valley and may dissolve adding sodium, calcium, bicarbonate, and sulfate to surface and groundwater. Evaporation increases the TDS concentrations in shallow groundwater. In addition, naturally occurring high nitrate concentrations were found in southeastern and north-central Las Vegas Valley (more than 300 mg/L). They surmised that naturally occurring high nitrate concentrations can be attributed to dissolution of nitrogen-bearing minerals, evaporative concentration, and infiltration of water through organic material.

Bevans et al. (USGS, 1998) surmised that uranium dissolved from granitic rocks and sediment into the shallow groundwater was the most likely source of elevated uranium concentrations in Las Vegas Wash.

In the Las Vegas Valley, there is a clay layer, up to 200 feet thick, between the shallow aquifer and the deep aquifer. This clay layer is thought to protect the deep aquifer from the influences of urban recharge, which is a major source of water in the shallow aquifer (USGS, 2006). Concentrations of TDS and nitrates are about 10 times lower in the deep aquifer than in the shallow aquifer.

8.4.3 Miscellaneous Urban Activities

Urban activities involving water use can generate excess flows that enter the drainage system and create dry weather base flows such as landscape irrigation, washing vehicles, driveways, parking lots, equipment, and swimming pool maintenance. The total flow was estimated as less than 5 cfs to each major outfall channel to Las Vegas Wash (CCDCP, 1997).

Urban pesticide application during the growing season may result in pesticides reaching the groundwater. Monitoring of shallow groundwater in 1999 revealed that out of 19 wells in Las Vegas Valley sampled, none had detectable pesticide concentrations in the spring, whereas five of the wells tested positive for pesticides in the fall (Pennington et al., 2001). Similar testing in 2000 did not result in any positive pesticide results in Las Vegas Valley. During 1993 to 1995, 24 pesticides were found in Las Vegas Wash downstream of the urban area but upstream of the sewage discharge, indicating urban runoff as the source (USGS, 1998). Diazinon concentrations exceeded aquatic life criteria in 47 percent of the samples and malathion exceeded aquatic life criteria in 25 percent of the samples.

Bevans et al. (USGS, 1998) found that the shallow groundwater Las Vegas area tends to have elevated nitrate concentrations, with 12 percent of samples exceeding the nitrate MCL of 10 mg/L as N. Although there may be some natural sources of nitrate, Bevans et al. (USGS, 1998) identified fertilizers and sewage as the most likely sources.

8.4.4 Erosion

Erosion occurs in Planning Area 5, but the regional detention basins effectively capture the sediments. Stored sediments are removed with regular maintenance. The basins also reduce the peak flows and extend the runoff duration in downstream channels by storing peak volume for 24 to 48 hours.

8.4.5 Wellhead Protection

In Nevada, there is an EPA-approved wellhead protection program (WHPP) aimed at protecting the quality of the public drinking water supply by managing the area around a well. NDEP encourages local development of wellhead protection areas and wellhead protection plans. The LVVWD and SNWA manage the Municipal WHPP for Las Vegas Valley. Please refer to Section 10 for a more detailed discussion on WHPPs.

8.5 NONPOINT SOURCES OUTSIDE OF THE LAS VEGAS VALLEY

In areas outside of the Las Vegas Valley there are some of the same nonpoint sources related to urban development as in Planning Area 5, but other nonpoint sources of pollution are related to rural land uses such as agricultural return flows, and stormwater with particular concerns such as acid mine drainage, pesticides, herbicides and elevated bacteria due to livestock. The sections below describe nonpoint sources in northeast and south Clark County because there are limited nonpoint sources in northwest Clark County.

8.5.1 Agricultural Return Flows

Essentially all of the agricultural land use in Clark County is located in northeast Clark County. Agricultural areas are irrigated in upper Moapa Valley, lower Moapa Valley, and Virgin Valley. Return flows from these areas affect low flows in Muddy River, Meadow Valley Wash, and Virgin River. Historical and projected agricultural water use in Clark County has been summarized by the Nevada Division of Water Planning. **Table 8-8** summarizes historical and projected water use for irrigated agriculture and livestock operations in Clark County from 1974 to 2020. The table suggests that irrigated acreage and agricultural water use will remain fairly constant in Clark County over the planning horizon. However, the SNWA Board of Directors recently approved the acquisition of Muddy River Irrigation Company water rights to interested sellers. This water could be used for return

flow credits rather than agricultural uses. With increasing development, irrigation companies could chose to sell or lease their water rights, resulting in less irrigated agricultural land.

Table 8-8

Historical and Projected Agricultural Water Use for Clark County

Year	Total Irrigated Area (acres)	Total Irrigation Water Use (acre-feet/year)	Total Livestock Water Use (acre-feet/year)
1974	11,290	-	-
1978	10,116	-	-
1982	6,062	-	-
1987	7,594	-	-
1990	7,050	-	-
1995	7,775	40,292	280
2000	7,580	39,384	274
2005	7,566	39,312	273
2010	7,552	39,239	273
2015	7,539	39,167	272
2020	7,525	39,095	272

Source: CCDCP (2000)

Salinity is one of the most significant water quality problems for Colorado River Basin water users. High concentrations of salts adversely impact the beneficial use of water throughout the lower Colorado Basin by municipal, industrial, and agricultural users. The Colorado River Basin Salinity Control Program is directed by the U.S. Department of the Interior and U.S. Department of Agriculture to mitigate salinity problems. Key salinity sources are agricultural return flows and shallow groundwater. The program has also funded numerous research projects and salinity control demonstration projects throughout the basin (CCDCP, 2000). Irrigation return flows in northeast Clark County are characterized by elevated salt concentrations, contributing to high TDS concentrations in the lower Virgin River, Muddy River, and shallow groundwater.

Inefficient irrigation practices, such as over watering, are a major reason for relatively high salt contributions. Agricultural lands irrigated with water diverted from streams in Clark County lie on old floodplains where soils are affected by the local saline material comprising the Muddy Creek Formation. The salt load in irrigation return flows increases as it passes through this material. In addition, a large portion of applied irrigation water is lost to

evapotranspiration; the remaining return flows have lower water volume but the same load of salts, resulting in higher salt concentrations. Agricultural lands irrigated with groundwater are generally away from stream channels and have minimal effect on surface water quality.

Agricultural chemicals are used for pest control, weed control, and mosquito abatement in Clark County. These chemicals can migrate into surface and groundwater through various means, and can persist at toxic levels for long periods of time. Chemicals and products commonly used in the past include diquat, atrazine, diuron, dimethoate, Roundup, and Rodeo. The application of these chemicals can impact concentrations of organic compounds in the lower Virgin and Muddy Rivers. These organic compounds, alone or in combination, can prove toxic to aquatic species and also may disrupt development. The main issue to be addressed in minimizing pesticide and herbicide impacts on surface waters is managing on-farm application of these chemicals in conjunction with efficient water management (CCDCP, 2000).

Nutrients (nitrogen and phosphorus) are applied to agricultural fields in the form of fertilizer. Applications in excess of the uptake requirements of the crops results in residual nitrogen and phosphorus that can be transported to receiving waters via irrigation return flows or storm runoff. Manure at feedlots can also be sources of nutrients to receiving waters. Elevated concentrations of nitrogen and phosphorus in receiving waters result in degraded water quality, often characterized by eutrophication, excessive algae growth, and resulting low dissolved oxygen in reservoirs. Nutrient impacts can be addressed by managing on-farm application of fertilizers in conjunction with efficient water management (CCDCP, 2000).

The Natural Resources Conservation Service (NRCS) has various programs that can assist farmers and ranchers with reducing pollutant loads in their agricultural return flows. The NRCS Environmental Quality Incentives Program (EQIP), for example, can provide farmers and ranchers with technical and financial assistance to implement BMPs on their land.

Monitoring of shallow groundwater in 1999 revealed that neither of the two shallow wells in Moapa sampled had pesticides in the spring, whereas one of the wells tested positive for pesticides in the fall (USGS, 2001). This indicates that agricultural pesticide application during the growing season may have resulted in pesticides reaching the groundwater. A pattern of more positive pesticide results in the fall was found throughout Nevada. Similar testing in 2000 did not result in any positive pesticide results in Moapa.

Agricultural areas of Nevada typically have lower shallow groundwater nitrate concentrations than urban areas because alfalfa is the most common crop grown, and it does not require the application of fertilizers (USGS, 2006).

Soil erosion from agricultural lands can represent a significant source of nutrients and organic chemicals to receiving waters. Nutrients and chemicals can bond to soil particles, which are dislodged and carried to ditches and streams in association with either irrigation return flows or storm runoff.

8.5.2 Runoff from Livestock Land Uses

Nonpoint source water quality impacts associated with grazing activities primarily impact vegetation. Overgrazing leads to denuded vegetation conditions, which in turn causes soil erosion and excessive sediment deposition in receiving waters. Many constituents of concern are transported with sediments including nitrogen, phosphorus, and bacteria. Grazing in riparian areas can accelerate bank erosion and reduce stream stability. Livestock use of riparian areas also leads to potential pollution from constituents contributed by manure (nitrate, bacteria).

Much of Clark County is federal land under the authority of the BLM, Las Vegas District. The BLM approves grazing allotments based on land health requirements, such as the need to maintain or improve native plant communities and avoid unacceptable soil erosion. Grazing permits and leases establish the seasons of forage use and number and kind of livestock. Riparian areas in northeast Clark County are few in number, and tend to be grazed heavily at various times of the year (CCDCP, 2000).

Feedlots and dairies can be key contributors of BOD loading, nitrates, and bacteria to downstream receiving waters. Feedlots and dairies have high concentrations of cattle, resulting in high potential for water quality impacts. Feedlots and dairies that were once located in Clark County have either gone out of business or relocated outside of the county (Ryan, 2008). Abandoned feedlot and dairy sites continue to be nonpoint sources of pollution due to contaminated soils and shallow groundwater left behind.

8.5.3 Urban Stormwater Runoff

The Phase II MS4 regulations apply to MS4s not covered by Phase I rules and serving populations greater than 10,000 with a population density of at least 1,000 people per square mile. All of the towns in south and northwest Clark County are either small enough or have a low population density and therefore are not regulated under Phase II (Clark County, 2004). The median-density development areas in northeast Clark County, such as Mesquite and portions of lower Moapa Valley, may be regulated under Phase II in the near future, in fact, Coyote Springs is in the process of applying for an MS4 permit. The stormwater program components required for Phase II stormwater permits are similar to those for Phase I permits.

Except for a few hotel/casino properties, there are no high-density development land uses outside of the Las Vegas Valley. The rural towns and agricultural areas in Clark County support the mix of common industries found throughout the country. These industries can be nonpoint sources of pollution in stormwater runoff. Many of them, however, are likely to be regulated by Nevada's Industrial General Permit and would be required to have SWPPPs. This includes chemicals for urban landscaping and at commercial and industrial establishments.

With relatively low densities, urban stormwater contributions to pollutant loads are expected to be fairly minimal outside of the Las Vegas Valley. However, as development continues, particularly in Mesquite and lower Moapa Valley, urban impacts on nonpoint source water quality will become more significant. Urban use of pesticides, herbicides, and other chemicals is likely to increase as growth continues. Improper use, storage, and disposal of these chemicals can result in adverse impacts to stream water quality. There are no urban runoff quality data available for these communities. No stormwater quality BMPs are currently required in association with new development or new drainage improvements in these areas.

Management practices that can effectively mitigate the impacts of urban pesticide and herbicide application include public education and household hazardous waste collection programs. Potential impacts of commercial and industrial use can be mitigated through public education and the inspection and permitting efforts of the Clark County Water Reclamation District's Industrial Pretreatment Program. As development increases, there is a need to implement these practices.

8.5.4 Construction

Construction sites outside of the Las Vegas Valley must comply with Nevada's Construction Site Stormwater General Permit, but are not governed by additional regional or local regulations such as an MS4 permit. As described in Section 8.3.2, construction sites greater than 1 acre must have a permit under the General Permit, must complete SWPPPs, and use standard construction site BMPs to reduce erosion and pollution in stormwater.

8.5.5 Mining and Industrial Nonpoint Sources

Industrial sites outside of the Las Vegas valley must comply with Nevada's Industrial Stormwater General Permit (see Section 8.3.1) but are not governed by any additional local oversight. CCDCP shows planned or existing industrial land use in the following locations.

Northeast County

- Moapa – small industrial area, along the Muddy River
- Overton – small industrial area, located near transportation away from surface waters
- Bunkerville – small industrial area, located near transportation away from the Virgin River
- Apex – large areas of industrial and heavy industrial, located along Interstate 15 away from surface waters

Northwest County

- Blue Diamond – small industrial area, located away from surface waters

South County

- Boulder City – small heavy industrial area, located away from surface waters
- Jean – small industrial area, located away from surface waters
- Searchlight – small areas of industrial and heavy industrial land use, located away from surface waters (CCDCP, 2006).

When communities outside of the Las Vegas Valley obtain MS4 permits, Clark County should consider expanding the interlocal agreement with CCWRD to cover inspections of industrial sites in these communities.

Much of the original settlement of south Clark County was related to mining. Historic precious metals mining districts are located near Goodsprings, Nelson, Searchlight, and other locations. There are now many abandoned or inactive mine sites on public lands in south Clark County (CCDCP, 2004). Historic mining practices for extracting precious metals sometimes used cyanide and mercury, which can persist in the environment. Hard rock mines are associated with dissolved metals and low pH. Tailing piles expose contaminants to the environment, and can be eroded with stormwater or floodwaters. Runoff from mining sites can contain high loads of sediments, particulate minerals, dissolved minerals, and metals.

Abandoned mine sites can present particular water quality problems because there may not be an identified party responsible for maintaining water quality. Acid mine runoff and

erosion from tailings piles can severely impact groundwater and downstream receiving water quality. Federal government land management agencies with mine sites under their jurisdiction (BLM, NPS, U.S. Forest Service) prioritize mine cleanup efforts based on the estimate that a small percentage of abandoned mines present the greatest water quality risk (CCDCP, 2004). **Figure 8-5** shows BLM's inventory of abandoned mines (those already closed are shaded green). Most of the abandoned mines are clustered in west-central Clark County and south Clark County around Searchlight and are generally located away from major surface waters.

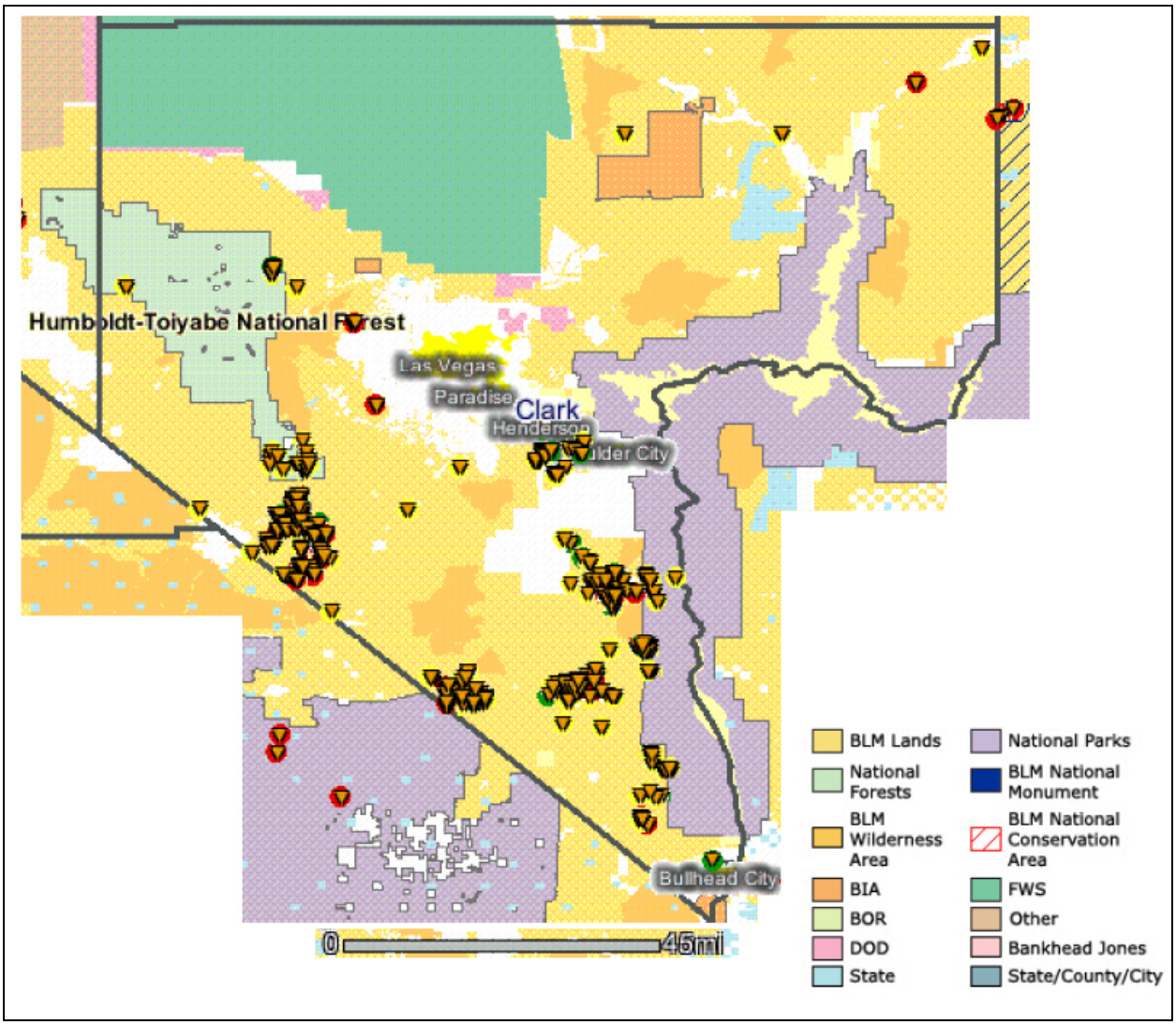


Figure 8-5
BLM Inventory of Abandoned Mines in Clark County

Source: Geocommunicator (2008)

As described in the Section 7, Point Sources, current mining operations in Clark County are generally limited to construction materials such as sand, rock, limestone, and zeolite. There are no active precious metals mines (NBMG, 2006). There are no major oil fields or geothermal power plants in Clark County. In northeast Clark County, there are several large industrial and mining sites outside of urbanizing areas, including the Gypsum Mine and Chemical Lime Plant in Apex and the Nevada Power Company Reid Gardner Coal-Fired Power Plant. Activities at these sites are governed by Nevada's Industrial General Stormwater Permit, which requires BMPs to reduce pollutant loading to receiving waters.

Most active mining sites in Clark County are on leased BLM land. **Figure 8-6** depicts active mining claims on BLM land as well as the small land area with authorized oil and gas leases. Mining activities on BLM land require a Plan of Operation, including management of site runoff. Active enforcement of these plans and other mining permits can effectively minimize nonpoint source water quality impacts of mining operations. There is no evidence that downstream beneficial uses of receiving waters have been impacted by mining activities in northeast Clark County (CCDCP, 2000).

8.5.6 Channel Erosion

Overgrazing and poor agricultural practices can aggravate land erosion. In northeast Clark County, significant stream channel erosion is occurring in the following locations:

- Muddy River and California Wash in Hidden Valley area
- Muddy River at Glendale
- Muddy River at several locations in lower Moapa Valley

In each case, it appears that channel bank and bottom erosion have been created by an increase in base flows due primarily to agricultural return flows that destabilize the channel invert, followed by high rates of down-cutting and lateral bank erosion during storm runoff.

The Virgin River is not currently subject to significant channel erosion. However, this is a sand-bed stream with a high sediment load, which makes it susceptible to erosion or deposition problems if hydrologic or sediment transport conditions change in the future.

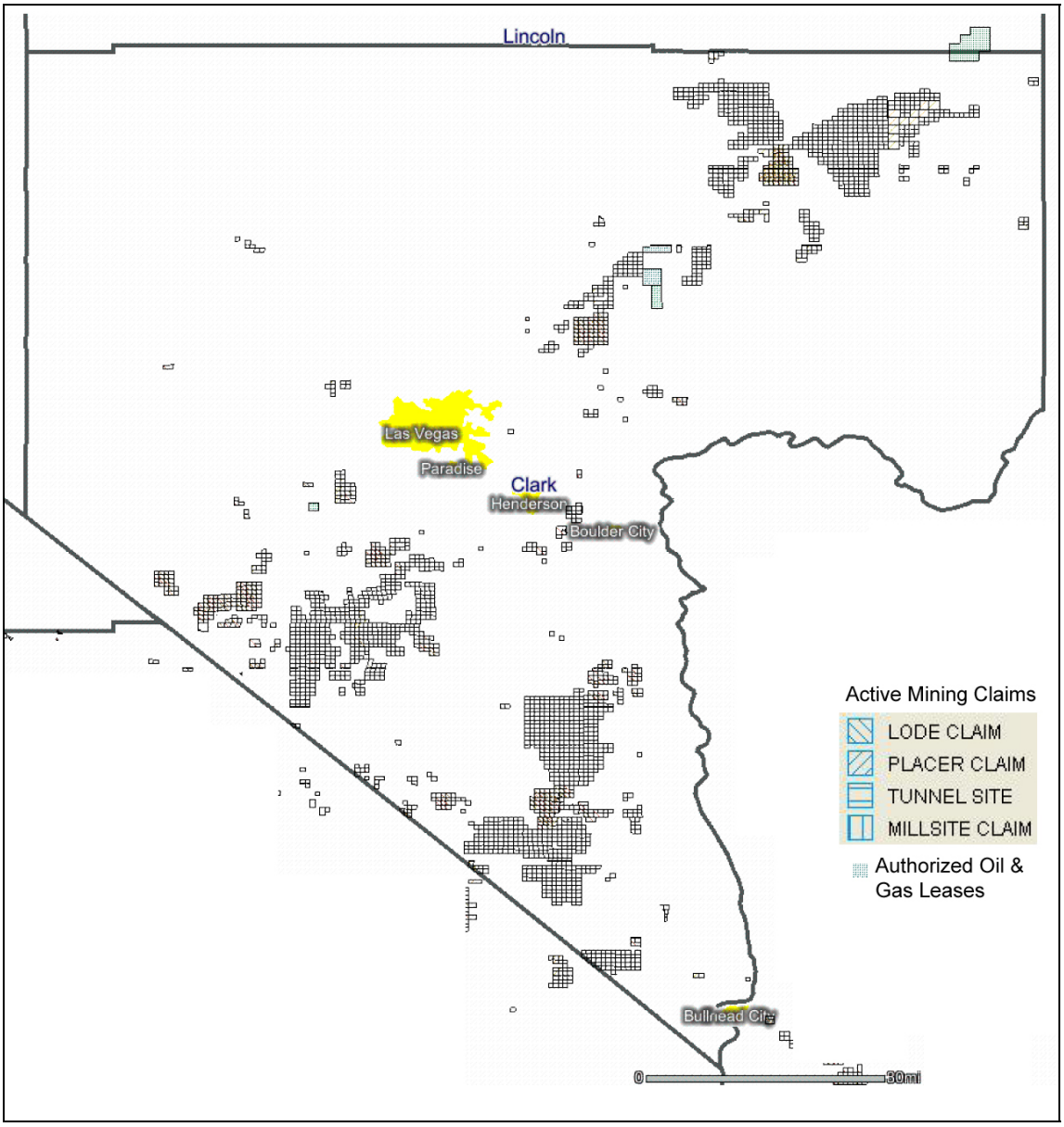


Figure 8-6
Active Mining, Oil and Gas Leases in Clark County

Source: Geocommunicator (2008)

Stream channel erosion problems can be mitigated in several ways, including preservation of existing riparian vegetation, re-establishment of lost riparian vegetation, and structural solutions such as channel lining and grade stabilization. CCRFCD has developed a flood control master plan for Moapa Valley that addresses erosion problems as well as flooding on Muddy River and its tributaries. Specific solutions include:

- Channel maintenance to maintain hydraulic capacity on Muddy River in upper Moapa Valley from about 1.5 miles downstream of the Interstate 15 bridge in Glendale to the Moapa Indian Reservation

- Floodplain mapping for Muddy River from the California Wash confluence upstream to Arrow Canyon

- Floodplain mapping for Meadow Valley Wash from Glendale upstream to the Civilian Conservation Corps levees

- Channel excavation and levee construction on Muddy River through lower Moapa Valley

- Construction of a new channel parallel to the Union Pacific Railroad on the west side of lower Moapa Valley to collect the washes (Logan Wash, Wieber Wash, minor washes) and convey their runoff to Muddy River via Overton Wash

Proposed channel maintenance in upper Moapa Valley should emphasize procedures that address long-term channel stability (erosion management), not just hydraulic capacity. Proposed improvements to Muddy River in lower Moapa Valley will address erosion problems, but may have adverse water quality impacts due to loss of riparian vegetation, decreased travel times and decreased groundwater recharge.

CCRFCD has a master plan for Mesquite that includes flood control and erosion control improvements for Town Wash, Abbott Wash, and Pulsipher Wash. Flooding on the Virgin River in 2005 resulted in some updates to the Mesquite Flood Control Master Plan Update including a Virgin River erosion control program (CCRFCD, 2007b).

The Clark County Regional Transportation Commission is active in local bank stabilization projects to protect existing roadways and bridges. Natural resource agencies such as NRCS have implemented erosion control projects in the past on the Muddy River and its tributaries. The Muddy River Regional Environmental Impact Alleviation Committee worked with The Nature Conservancy to develop the Muddy River Habitat Restoration Project. The project provides wetlands enhancement and restoration (and erosion management) along the river as mitigation for a proposed development project in COH.

The project includes tamarisk eradication and revegetation of native species such as willow, mesquite, cottonwood, shrubs, and grasses.

Urban development in the vicinities of Overton and Logandale is encroaching into the Muddy River floodplain, limiting options for future flood control and stream bank erosion solutions. CCRFCD, CDSN, and other agencies should attempt to acquire right-of-way along the Muddy River and California Wash riparian corridors to assure the feasibility of implementing management solutions and to provide protection for currently healthy riparian areas. Protection of stable channel sections through preservation of stream buffers and riparian vegetation should be pursued to prevent future erosion problems.

In south Clark County, channel erosion is common in the vicinity of Boulder City. With steep terrain, the natural washes and unlined channels are scoured by high-velocity flood flows. This results in transport of sediments and associated pollutants downstream.

8.6 RECOMMENDATIONS

The recommendations for nonpoint sources were compiled from previous WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to nonpoint sources for the *Clark County Area-Wide WQMP*:

- Establish a financial assistance program for existing property owners relatively close to sewer lines to convert from septic systems to municipal wastewater treatment per DAQEM's April 2008 *Clark County Individual Sewage Disposal System Conversion Study*.

- CCRFCD and other agencies should proceed with implementation of master plans and other projects to mitigate channel erosion.

- Agencies should implement a pollution prevention program or participate in a cooperative regional pollution prevention program to address nonpoint source pollution in cooperation with the SQMC.

- Monitor local groundwater for elevated nitrate concentrations in areas with septic system densities approaching NDEP's allowed densities. When elevated concentrations are found, identify the source and potentially repair malfunctioning septic systems or connect to a municipal sewer system.

- Clark County should continue to work with the USGS, SNWA and NDEP on their water quality sampling activities on the Virgin and Muddy Rivers (Planning Areas 2 and 3) to assess compliance with beneficial uses and identify potential sources of agricultural nonpoint source pollution.

- Existing programs by the Natural Resources Conservation Service, Nevada Cooperative Extension, and Nevada Department of Agriculture should be strengthened for soil erosion management, integrated pest management, minimization of agricultural chemical use, and nutrient (fertilizer) management.

- Affected local agencies should consider developing salt management plans to investigate salinity and TDS issues.

- Clark County, under the Multiple Species Habitat Conservation Plan, should assist ranchers in developing and implementing more aggressive grazing management plans, incorporating rangeland enhancements to improve watershed health and prolong the productivity of the range lands.

- Clark County should consider policies for excluding cattle grazing year-round from riparian zones and springs.

- Public education and outreach programs should be enhanced for agricultural application of pesticides and herbicides in accordance with accepted best management practices and State of Nevada guidelines.

- Future updates of the Clark County Improvement Standards, Clark County Area Uniform Standard Drawings, CCRFCD Hydrologic Criteria and Drainage Design Manual, and similar design manuals should incorporate new sections on design and maintenance of BMPs for stormwater quality management.

- Structural BMPs should be considered on a regional basis. Planning and implementation of regional structural BMPs should be coordinated with both the SQMC and SWAC.

- The present program of voluntary implementation of nonpoint source BMPs should continue to be encouraged.

- Air quality particulate matter BMPs should be coordinated with stormwater management BMPs.

- Agencies should be encouraged to formulate a plan to address unpaved roads within the respective jurisdictions relative to stormwater management.
- The lead agency for the Las Vegas Valley Municipal Stormwater Management Program (CCRFCD) should actively participate as a stormwater discharger in Valley water quality groups to assist with water quality concerns and solutions.

- Natural washes and unlined channels should be preserved to the extent practical and consistent with the need for flood protection and erosion control.

- Clark County and the other municipalities should continue to aggressively enforce their stormwater system protection ordinances.

- Implement flood plain management for the unincorporated Clark County area, led by CCRFCD in conjunction with Clark County.

- Expand education and programs related to NPDES compliance, including SWPPPs and BMPs, in accordance with potential growth in Clark County.

- Develop a management strategy to reduce runoff by promoting infiltration and decreasing the amount of impervious surfaces.

- Develop design standards for Low Impact Development (LID), which include preserving pre-development hydrology and reducing erosive runoff volumes and velocity.

- As applicable, encourage entities to adopt non-structural BMP strategies to address nonpoint source pollution, such as overirrigation, which is a major pollution contributor in developed areas.

8.7 REFERENCES

Clark County Department of Comprehensive Planning, *Las Vegas Valley 208 Water Quality Management Plan Amendment*, Prepared by MWH, July 1997.

----- *Northeast Clark County 208 Water Quality Management Plan Amendment*, Prepared by MWH, June 2000.

----- *South County Water Quality Management Plan Amendment*, Prepared by CH2M Hill, June 2004.

----- *Individual Rural Planning Area Maps*. June 10, 2006. Accessed March 31, 2008, at: http://gisgate.co.clark.nv.us/gismo/cpmapprod.htm

----- *South County Water Quality Management Plan Amendment*, Prepared by CH2M Hill, June 2004.

Clark County District Board of Health, *Regulations Governing Individual Sewage Disposal Systems and Liquid Waste Management*, Amended April 28, 1994.

Clark County Regional Flood Control District, Las Vegas Valley Stormwater Quality Management Committee, *Las Vegas Valley NPDES Municipal Stormwater Discharge Permit Annual Report 2006-2007*, 2007a. Accessed January 8, 2008, at: http://breccia.ccrfcd.org/pdf_arch1/NPDES/06-07npdes.pdf

----- *City of Mesquite Flood Control Master Plan Update.* Prepared by PBS&J. July, 2007b

----- Letter from Kevin Eubanks, CCRFCD, to Clifford Lawson, *NDEP, Subject: Municipal Separate Storm Sewer System Program NPDES Permit No. NV0021911 Proposed Program Revisions in Response to EPA Audit,* January 8, 2008.

Geocommunicator, *Sitemapper 2006* (sponsored by BLM and National Forest Service), 2008. Accessed March 31, 2008, at: http://www.geocommunicator.gov/SiteMapper6/map.jsp

Gorelow, A.S., *Climate of Las Vegas Nevada*, 2005. Accessed March 31, 2008, at: http://www.wrh.noaa.gov/vef/climate/Las%20Vegas%20Climate%20Book.pdf

Nevada Bureau of Mines and Geology, *The Nevada Mineral Industry 2005*, Special Publication MI-2005, 2006.

Nevada Division of Environmental Protection, *Fact Sheet pursuant to NAC 445A.236 (General Permit for Stormwater Discharges Associated with Industrial Activity)*, December 2002.

----- *Amendment to Northeast Clark County 208 Waster Quality Management Plan*. 2007

----- Bureau of Water Pollution Control, *Allowed Septic Tank Density, 2008a*. Accessed March 31, 2008, at: http://ndep.nv.gov/BWPC/subdivision.htm

----- *Why a Stormwater Permit is Needed, 2008b*. Accessed March 31, 2008, at: http://ndep.nv.gov/BWPC/renewable_water07.htm

Nevada Division of Water Resources, *Designated Groundwater Basins of Nevada*, September 2005.

Ryan, Tim, Nevada Department of Agriculture, 2008. *Conversation with Tracy Kosloff*, MWH, June 5, 2008.

Southern Nevada Health District, SNHD website, 2007. Accessed August 15, 2007, at: http://www.southernnevadahealthdistrict.org/environmental_health/isds/home.htm

U.S. Geological Survey, *Monitoring for Pesticides in Ground Water in Nevada, 2001, USGS Fact Sheet 094-01*, N. Pennington, P.A. Adams, C.W. Moses, H.E. Bevans, J. Carpenter, S. Cichowlaz, 2001.

----- *Quality of Nevada's Aquifers and Their Susceptibility to Contamination, 1990-2004, USGS Scientific Investigations Report 2006-5127*, T.J. Lopes, 2006.

----- *Water Quality in the Las Vegas Valley Area and the Carson and Truckee River Basins, Nevada and California, 1992-96*, USGS Survey Circular 1170 H.E. Bevans, M.S. Lico, S.J. Lawrence, 1998.

Section 9

Section 9
Best Management Practices and Alternative Treatment Methods and Disposal

9.1 INTRODUCTION

This section describes stormwater BMPs that are in use, and alternative wastewater treatment methods that have been investigated or implemented for Clark County. The alternative treatment methods discussion identifies alternative treatment methods for areas that may experience rapid transition from rural to urban.

9.2 BEST MANAGEMENT PRACTICES FOR NONPOINT SOURCES

Because of their diffuse nature, nonpoint sources are best managed through a combination of structural and non-structural BMPs. The objective of non-structural BMPs is to reduce the generation of pollutants at their source. Structural BMPs reduce the conveyance of pollutants from their source to receiving waters. BMPs are considered to be more cost-effective than traditional end-of-pipe treatment measures for nonpoint source pollution, due in part to the highly variable flow rates and pollutant loads characteristic of nonpoint source flows (CCDCP, 1997).

9.2.1 MS4 Permits and Best Management Practices

EPA's Phase I and Phase II Storm Water Regulations for MS4s (described in the Nonpoint Sources Section) require implementation of BMPs specifically for:

- Construction Site Runoff Control
- Post Construction Runoff Control
- Pollution Prevention/Good Housekeeping

9.2.2 Applicable Best Management Practices for Clark County

The State of Nevada has prepared a *Handbook of Best Management Practices* which provides selection and design criteria for BMPs for a variety of land uses ranging from construction sites, to agriculture, to mining and urban activities (Conservation Commission, 1994). The *Handbook of Best Management Practices* was prepared and is distributed by the State Conservation Commission, the Nevada Division of Conservation Districts, and NDEP.

Application of the design criteria in the *Handbook of Best Management Practices* is not currently mandated by any state or local agency.

The CCRFCD adopted the current *Hydrologic Criteria and Drainage Design Manual* in 1999 and revised it as recently as 2006. The *Hydrologic Criteria and Drainage Design Manual* provides information on the selection and design of BMPs for typical urban situations. The BMPs described are suggested for use in new developments and in retrofit situations, but are not currently required by any of the entities' development codes or design manuals.

The *BMP handbooks* described above do not contain specific design criteria nor standard plans tailored to the Clark County development environment and hydrologic conditions. Research and experience throughout the country have identified a range of BMPs appropriate for use in urban environments, but some may not be applicable to the arid conditions and sparse vegetation that is the natural environment in Clark County. Potential BMPs for reducing the impact of urban nonpoint source pollution in the Las Vegas Valley were identified by CCDCP (1997). These BMPs for urban development are considered applicable to conditions in Clark County:

- Dry detention basins for residential subdivisions
- Infiltration trenches around parking areas
- Oil/grit separator catch basins or manholes on commercial/industrial sites
- Turf management for residential and commercial landscaping
- Grassed swales, vegetative strips or other measures to intercept runoff prior to delivery to curb and gutter or storm drains
- Grading techniques or onsite retention for large turf areas such as golf courses to minimize migration of phosphorus to offsite stormwater systems
- Preservation of natural washes with grade control structures to control erosion
- Minimization of directly connected impervious areas (i.e., onsite impervious areas which drain directly to the stormwater system without encountering landscaping, undisturbed soil, or other pervious surfaces)

- Preservation and enhancement of sheltered vacant lots and semi-natural vegetated areas to provide erosion control, shading, and entrapment and attenuation of nutrients and other contaminants.

Source control BMPs, such as storm drain inlet marking, are applicable throughout Clark County. Plaques are affixed to storm drains throughout the valley by local government department staff or contractors.

9.2.3 Nevada General Stormwater Permits

The State of Nevada has a construction site permitting program that is applicable to all of Clark County. The objective of the program is to minimize the contribution of pollutants (e.g., sediment, concrete, paint, solvents, etc.) from construction sites to receiving waters. An operator must obtain a permit for all construction activities one (1) acre or greater. Construction sites between 1 and 5 acres can obtain a waiver from the permit if the site has low erosive potential. The permit requires the implementation of BMPs to reduce pollutant loadings into waters of the State. These BMPs are documented in the *Handbook of Best Management Practices* (Conservation Commission, 1994).

State of Nevada recommended construction BMPs include:

- Diversion structures designed to channel runoff away from disturbed surfaces
- Structures designed to collect, retain and/or treat any water that contacts disturbed surfaces
- Permanent stabilization of exposed surfaces once construction is complete
- Locating roads and access where the effect on water quality will be minimized
- The implementation of good housekeeping practices such as proper storage and spill prevention to prevent runoff from paints, solvents, fuels, etc.
- Minimization of earth movement
- Conduct grading, clearing, and excavation during the dry season in order to avoid erosion caused by rain on bare soils
- Sediment retention BMPs such as filter berms, silt fences, filter strips, sediment barriers, sediment basins

- Diversion and conveyance structures designed to reduce erosion including level spreaders, rock and grass lined channels

- Soil and slope stabilization methods such as rock riprap, seeding, windbreaks, mulches, and netting (Conservation Commission, 1994).

As described in the Nonpoint Sources Section, there is a statewide general permit for stormwater discharges associated with industrial activity. The permit requires SWPPPs detailing how and on what schedule, structural and non-structural BMPs will be implemented at an industrial site. The following is a general summary of BMPs required for industrial sites by the industrial general permit:

- Good housekeeping measures – areas of the facility that could potentially contribute pollutants to stormwater discharges must be maintained in an orderly fashion and clean. Garbage must not be exposed to precipitation or runoff.

- Spill prevention and response measures – identify areas where spills could contribute pollutants to stormwater discharges. Implement procedures to prevent stormwater contamination from spills such as leak inspections, secondary containment structures, and installation of overfill prevention devices.

- Erosion control measures – implement controls as necessary to reduce soil erosion in areas of the facility with ongoing erosion or potential for erosion. The following controls should be evaluated, at a minimum: vegetative cover, contouring slopes, paving, and installation of structural controls.

- Structural controls – install structural BMPs such as vegetated swales, oil/water separators, and settling ponds, as necessary to reduce pollutants in stormwater discharges.

- Maintenance program – inspect and clean structural controls on a regular basis based on documented schedules.

- Employee training program and employee education – training should be conducted at least once per year for all employees responsible for implementation and maintenance activities identified in the SWPPP.

- Monitoring – perform periodic inspections and quarterly visual monitoring for good housekeeping practices and structural controls (NDEP, 2003).

9.3 PLANNING AREA 5

As part of compliance with the Las Vegas Valley MS4 permit, a Structural and Source Control Measure Program was developed to mitigate the effects of urbanization on stormwater quality in the Las Vegas Valley. The source control and structural control aspects of this program are described below.

9.3.1 Source Control Program (Non-Structural Best Management Practices)

The Planning Area 5 source control program includes storm sewer and street maintenance. Each of the municipal entities in the Las Vegas Valley developed storm drain system maintenance, detention basin maintenance, and street sweeping objectives based on standard practice as well as the expected benefit to stormwater quality. To the extent possible, these objectives were made consistent for all the Permittees.

Table 9-1 summarizes the maintenance activity targets for each entity. Each entity tracks maintenance activities using internal tools and processes, and reports progress to NDEP annually. In most years, all of the entities are able to achieve or exceed their maintenance goals. As an example of performance, the annual maintenance activities for July 2006 through June 2007 are summarized in **Table 9-2**.

9.3.1.1 Additional Source Control Best Management Practices

Additional source control BMPs Planning Area 5 entities have adopted and are implementing are described below.

- Hazardous material disposal ordinances and household hazardous waste collection programs. NDEP has authority over hazardous waste within Clark County and has established various processes and programs to help our community to reduce the quantities of this waste stream. NDEP provides residents and businesses with the Southern Nevada Community Recycling Guide, which provides information on how to recycle hazardous waste including collection locations for various types of hazardous waste. Most of the hazardous waste collection facilities are located within Planning Area 5.

Table 9-1

Maintenance Goals for Municipal Permittees

Entity	Street Sweeping	Drop Inlet Cleaning	Detention Basin Maintenance
Clark County	Sweep curbed-and-paved public city streets in urban area once every 30 days[a]; as-needed in rural areas	Inspect/clean 20 percent of drop inlets a minimum of once per year; clean as appropriate[d]	Inspect during semi-annual channel inspections and after major storms[e]; clean as appropriate
City of Las Vegas	Sweep curbed-and-paved public city streets once every 30 days[b]	Inspect/clean 20 percent of drop inlets a minimum of once per year; clean as appropriate	Inspect during semi-annual channel inspections and after major storms; clean as appropriate
City of North Las Vegas	Sweep curbed-and-paved public city streets once every 30 days[c]	Inspect/clean 20 percent of drop inlets a minimum of once per year; clean as appropriate	Inspect during semi-annual channel inspections and after major storms; clean as appropriate
City of Henderson	Sweep curbed-and-paved public city streets once every 30 days	Inspect/clean 20 percent of drop inlets a minimum of once per year; clean as appropriate	Inspect during semi-annual channel inspections and after major storms; clean as appropriate

Notes:

[a] Clark County sweeps most urban public streets on a 7- to 10-day schedule.
[b] CLV sweeps most urban public streets on a 14-day schedule.
[c] CNLV sweeps most urban public streets on a 14-day schedule.
[d] Unincorporated Clark County is divided into 9 zones. Maintenance Management Division estimates it takes 8 to 10 weeks to complete a full rotation through all 9 zones. Therefore, most inlets will be inspected/cleaned four times per year.
[e] County also currently routinely inspects all detention basins two times per year.

- Planning Area 5 entities have enacted litter control ordinances and dumping ordinances. The Clark County Public Response Office provides code enforcement for unincorporated Clark County based on citizen complaints. Ordinances related to water quality include the junk, trash, and debris ordinance and the prohibition of outside storage. The Clark County Solid Waste Environmental Protection Team (SWEPT) assists citizens in cleaning up illegal dumping and trash violations on roadways and alleyways in unincorporated Clark County.

Table 9-2

Maintenance BMP Summary Report for 2006-2007

Maintenance BMP Activity	Clark County	City of Las Vegas	City of North Las Vegas [a]	City of Henderson
Street Sweeping				
Streets Swept (miles)	64,444	220,500	87,168	37,070
Material Removed (cubic yards)	25,594	[b]	19,309	[c]
Storm Drain Maintenance				
Number of Inlets Cleaned/Maintained	14,617	57,000	228	814
Material Removed (cubic yards)	N/A	[b]	1,970	[c d]
Detention Basins				
Number of Basins Inspected/Cleaned	14	18	9	8
Material Removed (cubic yards)	152	[b]	1,471	1,305
Sediment Removed (cubic yards)	121,615			
Number of Complaints Received	N/A	N/A	41	6

Notes

[a] Quarterly data is available in Las Vegas Valley NPDES Municipal Stormwater Discharge Permit Annual Report 2006-2007.

[b] Total material removed from all maintenance activities = 48,500 cubic yards

[c] Material removed from combined street sweeping and drain inlet maintenance activities = 2,814 cubic yards

[d] 12,900 cubic yards of material was removed from maintenance of open channels

All material removed from streets, drain inlets and detention basins was hauled to the Apex Landfill

N/A = Data is not available.

- Public education related to nonpoint source pollution causes and impacts. Planning Area 5 entities have created various public service announcements, publications, conducted school programs, staff booths at community events, and mark storm drain inlets. For animal waste cleanup, the Las Vegas Valley Stormwater Quality Management Committee (SQMC) provides "pooper scoopers" at the CCRFCD office and at various public events.

The Las Vegas Valley entities have participated in or supported other activities that have helped control water quality in runoff from developed areas. These activities include the following:

- As members of CCRFCD, Planning Area 5 entities have supported programs to reduce sediment discharges by protecting channel banks from excessive erosion through channel stabilization and lining projects. In addition, detention basin maintenance activities are effective in removing sediment from the stormwater system and preventing pollutants from entering downstream water bodies.

- Planning Area 5 entities have enacted ordinances protecting natural washes and providing a buffer zone to protect them from development. They have supported the Clark County Wetlands Park, which maintains and enhances desert wetlands that provide natural water quality benefits to Lower Las Vegas Wash.

- As members of SNWA, entities have participated in the construction of 11 erosion control structures in Lower Las Vegas Wash. These structures effectively reduce bank erosion, reduce the volume of sediment transported to Lower Las Vegas Wash and Lake Mead, and encourage development of riparian wetlands that improve water quality. SNWA has plans to construct more erosion control structures in the future.

- Planning Area 5 entities have implemented programs in association with the Clark County Drought Ordinance to reduce overwatering and associated pollutant runoff. The programs restrict the installation of lawns in new construction, restrict landscape watering to specified days in both existing and new construction, and pay for the replacement of existing lawns with xeriscape. An enforcement program ensures that water conservation requirements are followed. These measures reduce dry weather flows in municipal streets, the use of fertilizers and pesticides, and the wet weather wash off and discharge of these substances.

- Planning Area 5 entities encourage the use of sustainable development practices by the local development community. Two examples are the U.S. Green Building Council LEED rating system, and the Southern Nevada Home Builders Association (SNHBA) Green Building Initiative. The LEED program is a certification program that offers credits for stormwater management design techniques that minimize site runoff. It is supported by all the communities in Las Vegas Valley. The Green Building Initiative is an initiative of SNHBA to encourage use of green building techniques by residential developers. These techniques include site design and irrigation system measures to reduce landscape watering runoff and the associated contribution of pollutants to the drainage system. To date, Green Building Initiative standards are voluntary and only used as a guide for new residential development in Las Vegas (CCRFCD 2007).

- The Las Vegas Valley Watershed Advisory Committee (LVVWAC) has recently been formed to coordinate water quality management activities on a watershed basis. An objective of LVVWAC is to develop a Regional Water Quality Management Plan for Las Vegas Valley. The Work Plans developed for the Regional Water Quality Plan will likely include recommendations for BMPs to address nonpoint sources.

9.3.2 Structural Control Program

Paragraph 4.6.1.2 of the MS4 permit requires development of *"a plan to reduce the discharge of pollutants from MS4s which receive discharges from areas of new development and significant redevelopment."* To date, the Permittees have addressed this requirement through regional detention basins and various training programs to address pollution prevention methods. As a result of an EPA audit of the MS4 Program, the Permittees agreed to develop and implement improvements to current programs targeting runoff from areas of new development and redevelopment. The program components currently under investigation are discussed in the following sections.

9.3.2.1 Detention Basin Program

Regional detention basins are key components of the Las Vegas Valley MS4 system. These detention basins, funded by CCRFCD, are part of the regional flood control master plan for the Las Vegas Valley. Although existing detention basins have not been designed to intentionally provide water quality benefits, the detention of water causes sediment to settle to the floor of the detention basins along with associated pollutants. The sediments and associated pollutants are then removed through maintenance activities. The Planning Area 5 entities believe the existing and proposed detention basins provide benefits to control runoff from developed areas, and thus are an important post-construction BMP for areas of new development and redevelopment.

In order to be an effective BMP, regional detention basins must meet two criteria: (1) they must control runoff from a majority of the developed area in the Valley; and (2) they must be effective in removing constituents of concern. **Figure 9-1** is a map showing the location of existing regional detention basins and the areas from which they capture runoff. This map demonstrates that all areas on the north, west and south sides of the urban core are controlled by one or more regional detention basins. These are the areas where the majority of new development is occurring. Therefore, runoff from most new development will be captured and detained in a regional detention basin. CCRFCD has plans to expand the system of regional detention basins as development continues.

A detention basin monitoring program was conducted between 2005 and 2008. Inflow and outflow samples were collected at Meadows Detention Basin, Lower Las Vegas Wash Detention Basin and Upper Flamingo Detention Basin.

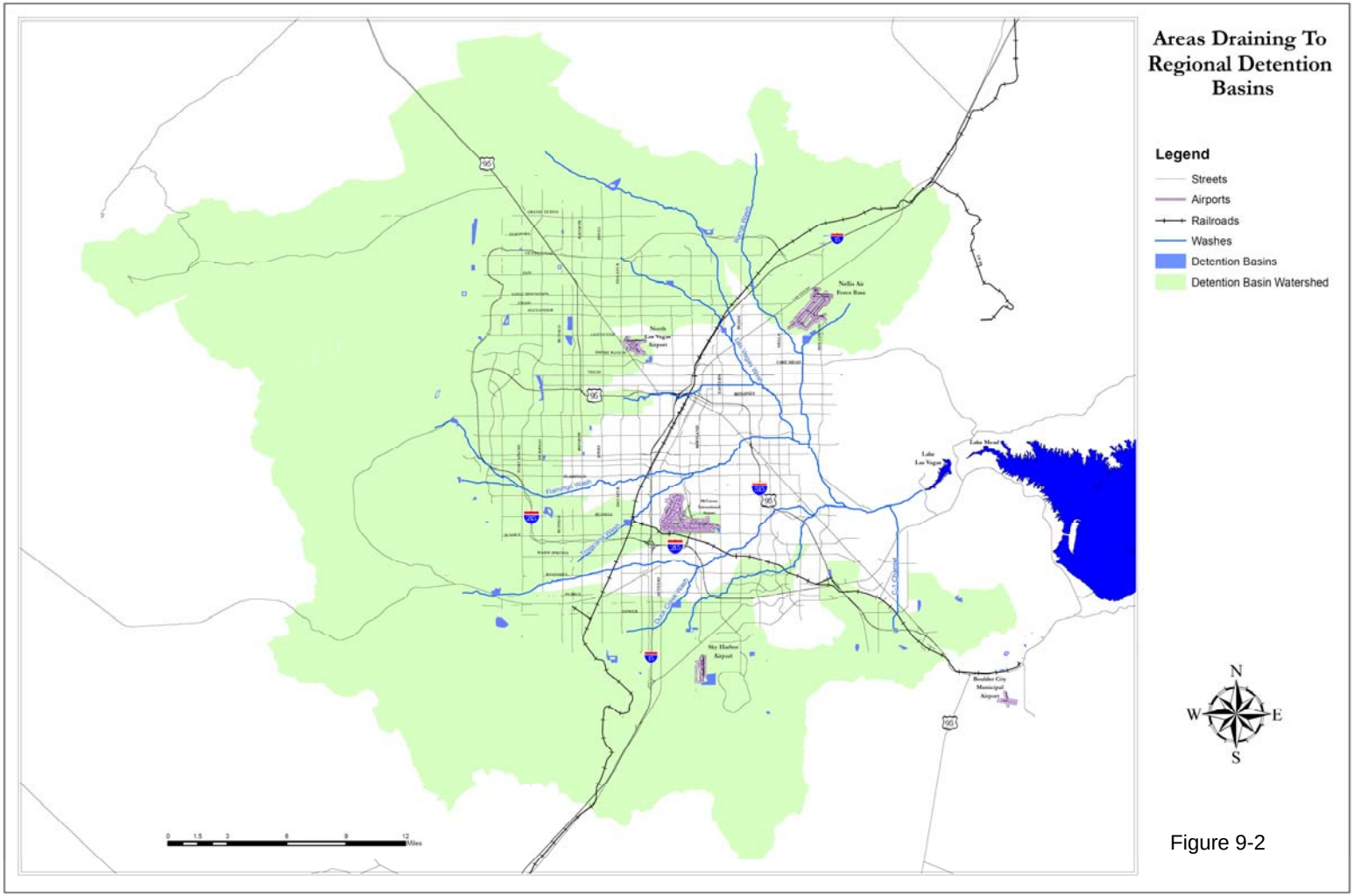


Figure 9-1
Areas Draining to Regional Detention Basins in the Las Vegas Valley

Detention basin monitoring data suggests that existing regional detention basins provide moderate benefits for reducing certain constituent concentrations. These benefits apply more significantly to constituents occurring primarily in particulate form, but results can vary widely from storm to storm and from site to site. The detention basin monitoring program did not sample for reduction in sediment load between inflows and outflows. However, monitoring of detention basin sediment removal volumes shows that the basins are effective in retaining sediment and preventing it from being conveyed into Las Vegas Wash and Lake Mead (CCRFCD, 2007).

9.3.2.2 Post-Construction Program

EPA and NDEP have determined that the regional detention basins alone do not satisfy the minimum requirements for a post-construction program. Therefore, in compliance with direction received from NDEP, the entities are developing an expanded program to address runoff from areas of new development and significant redevelopment. The enhanced program will include an ordinance or regulations specifying requirements for new development to manage runoff quantity and quality, and a process for selecting BMPs to be implemented by developers. It will also include a process for assuming adequate maintenance of BMPs. The entities have formed a stakeholder group to develop the details of a post-construction program and make recommendations for adoption by the SQMC.

9.3.2.3 Construction Best Management Practices

The Las Vegas Valley MS4 Stormwater Management Plan includes a Construction Site Program which complements the state's program. This local program includes inspection of active construction sites and enforcement of local ordinances prohibiting discharge of non-stormwater to the drainage system. Based on guidance from NDEP, the local entities are in the process of improving the construction site program by adopting ordinances and policies for erosion and sediment control, enhancing the inspection and enforcement activities and providing better guidance for BMP selection and design. One of the tasks of the stakeholder group is to recommend improvements to BMP guidance currently available to contractors in the Las Vegas Valley area. The Las Vegas Valley MS4 prepared and adopted a Construction Site BMP Guidance Manual that provides guidance on selecting, installing and maintaining construction site BMPs specifically in Las Vegas Valley.

.

The SQMC is working with the Truckee Meadows MS4 Committee to prepare a Nevada BMP Field Guide that could be used by contractors, engineers, and construction site inspectors throughout the state when selecting, installing and maintaining construction site BMPs. CCRFCD has committed to contribute $10,000 to the cost of printing the Field Guide. Preparation of the Field Guide is being managed by the Truckee Meadows MS4 Committee (CCRFCD, 2007). It is expected to be published in 2008.

9.4 PLANNING AREAS 2, 3, AND 4

9.4.1 Urban Best Management Practices

NDEP's construction site permit requirements, construction BMPs, and the industrial permit program described in Section 9.2.2, apply to Planning Areas 2, 3, and 4.

EPA's Phase II Storm Water Program applies to smaller entities (populations greater than 10,000 with a density of at least 1,000 people per square mile not covered under Phase I). The Phase II regulations require similar program elements to the Phase I program including the establishment of approved BMPs for construction sites, post construction runoff control, and good housekeeping/source control measures, and public outreach. At present, no communities in Planning Areas 2, 3, and 4 have Phase II Storm Water programs, although Coyote Springs has applied for an MS4 permit. Boulder City and Mesquite have populations greater than 10,000, they do not meet the density requirement.

Rural areas of Planning Areas 2, 3, and 4 do not fall under an EPA/State of Nevada MS4 permit program. However, BMPs specific to urban activities can be implemented for water quality protection at the discretion of local communities.

9.4.2 Agricultural Best Management Practices

Preventing and mitigating nonpoint source pollution from cropland and other associated agricultural activities is overseen through educational activities, programs, and policies directed by the NRCS, and Conservation Districts. The Army Corps of Engineers and the Bureau of Reclamation (Reclamation) also work in conjunction with irrigation districts on projects to improve water quality. In Planning Areas 2, 3, and 4, agricultural BMPs are generally implemented on a voluntary basis by landowners.

The State's *BMP Handbook* recommends farming and livestock BMPs including those listed in **Table 9-3**.

Table 9-3

Farming and Livestock BMPs Recommended in Nevada BMP Handbook

Farming	Livestock
Irrigation water management – efficient control of irrigation and drainage water	Planned grazing system – grazing different units in sequence to allow units to rest over a period of years.
Irrigated cropland management including: conservation cropping system, minimum tillage, cover crops, mulching, pest control and others.	
Native meadowland irrigation management – effectively utilize irrigation water, minimize erosion and loss of nutrients.	Proper grazing use – grazing at an intensity which will maintain enough cover to protect the soil and desirable vegetation.
Pasture and hayland management - Develop a management system for sustained forage production and land treatment practices suited to soil and site conditions.	
Salinity control – minimize salt concentration in surface runoff and groundwater, often requires drainage improvements.	Range improvements – using specific treatments including seeding, planting, prescribed burning, and brush/weed management.
Chiseling or subsoiling – breaking up shallow, impervious layers in soils to improve infiltration, plant root penetration, and protect from wind erosion.	
Soil amendment, fertilizer, and pesticide management to minimize water contamination.	Livestock facilities – build to reduce the degradation of surface runoff water quality.

Note: Adapted from Conservation Commission (1994)

The 2002 Farm Bill Conservation Programs provide funding under several categories for environmental projects that could include stormwater BMPs. Farmers and ranchers can institute stormwater BMPs on their properties with design and construction assistance from NRCS. One applicable program is the Environmental Quality Incentives Program (EQIP), which pertains to cropland, range land, pasture, private non-industrial forestland, and other farm or ranch lands. One of the national priorities of EQIP is the reduction of nonpoint source pollution including nutrients, sediment, pesticides, or excess salinity (Nevada NRCS, 2008). Qualifying landowners can apply for technical and financial assistance to install BMPs as part of the EQIP program through their local NRCS office.

In 2002, EPA required concentrated animal feeding operations to implement comprehensive nutrient management plans (CNMPs) as NPDES permit requirements. CNMPs can include

structural and non-structural BMPs to minimize nonpoint source pollution in Planning Areas 2, 3, and 4. Nevada NRCS offers technical and financial assistance to help operators plan and implement CNMPs (Nevada NRCS, 2008).

9.5 ALTERNATIVE WASTEWATER TREATMENT METHODS AND DISPOSAL

A number of methods for wastewater treatment and disposal in Clark County have been investigated. The investigation was focused on identifying methods that are suitable for smaller and rural systems that may see rapid transitions from rural to urban development, although some of the technologies (e.g., sequencing batch reactors [SBRs] and ozone) are better suited to address treatment issues in larger systems. The discussion of wastewater treatment and disposal methods has been organized into treatment approaches and technologies, and effluent disposal methods, as shown below:

Treatment Approaches

- Satellite water reclamation
- Package plants and interim package plants

Treatment Technologies

- SBRs
- MBRs
- Wetlands treatment
- Advanced Ecologically Engineered System (AEES)
- Ozone disinfection

Effluent Disposal

- Groundwater recharge
- Nonpotable reuse
- Return to waterways

A brief summary of these investigations follows below. These discussions briefly introduce the method, and how it might be applied. This list is not a comprehensive list of feasible options, but merely a representative collection of available and feasible options. Because not all methods have been tested for suitability in Clark County, proposed methods and projects will be reviewed on a case-by-case basis.

9.5.1 Treatment Approaches

Basic treatment approaches can be ranked from small individual septic systems, to large advanced wastewater treatment facilities that provide comprehensive biological, chemical, and physical treatment processes in primary through tertiary treatment stages. The focus of this discussion is to introduce basic treatment approaches that would suit smaller and rural systems, but be expandable, if needed.

9.5.1.1 Satellite Water Reclamation

Small systems that already have a central treatment facility but would need significant outlays to expand either the treatment facility or the collection system could also utilize satellite treatment facilities to intercept wastewater for treatment. Satellite water reclamation has been investigated and implemented by all three wastewater agencies in the Las Vegas Valley. The CLV, CCWRD and COH are continuing to pursue this alternative with the preparation of facility plans and designs for facilities ranging in size from 1 mgd to 40 mgd.

The seasonal variations in reclaimed water demands in the Las Vegas Valley are significant as minimum day demand can be less than 20 percent of maximum day demand. This large variation means that satellite plants must be capable of variable production rates or be operated in a base-loading manner where excess influent is sent to the main plant.

9.5.1.2 Package Plants and Interim Package Plants

Package plants are an option for small systems that have large private contributors. Package plants are defined in NRS 445A.380 as a plant, consisting of units or modules, which is designed for construction, assembly, connection and installation at the site for wastewater treatment. In addition, the package plants are privately owned and operated to treat wastewater flows from a limited area, with a minimum design flow of 5,000 gpd. It should be noted that package plants are privately owned, and if publicly owned sewer systems are available in the service area, a permit from NDEP will not be issued.

NDEP has prepared a fact sheet entitled, *WTS-41: Guidance Document for Design and Permitting of a Package Wastewater Treatment Plant* to assist with the design and permitting processes of package plants. Effluent limitations for package plants must meet, at minimum, secondary treatment standards of 30 mg/L BOD_5, 30 mg/L TSS, and a pH range of 6 to 9 standard units (S.U.).

Interim package plants are defined in Clark County Code Title 24.28 and the definition is included in Section 5.2 of the WQMP.

9.5.2 Treatment Technologies

The following treatment technologies may be applicable to small but growing systems, either in central treatment plants, or in the reduced-scale approaches described above.

9.5.2.1 Sequencing Batch Reactors

SBRs are an alternative activated sludge (AS) configuration that uses a batching process to fill, react, settle and decant all in the same tank. However, several trains are needed to synchronize the various steps. In addition, since the batch process typically discharges from the tanks within 30 minutes, hydraulic peaks require equalization basins downstream of the SBRs so the filtration/disinfection process does not become hydraulically overloaded.

Effluent quality from an SBR process is similar to that for a conventional AS plant. However, there are some drawbacks to SBRs: the basin must be significantly larger than the conventional AS aeration basins and the aeration system capacity is typically much higher.

9.5.2.2 Membrane Bioreactors

The MBR process combines the AS and solids separation (membranes) in the same basin. The AS process is accomplished by aerating the mixed liquor in the basin. Typically, slight vacuum is used to draw the effluent from the process through the membranes. Pretreatment includes screening and grit removal upstream of the membranes. Nutrient removal is achieved with anaerobic and anoxic zones. Chemical treatment is generally needed to reduce the phosphorous levels and meet discharge requirements for the receiving waters.

An MBR process has many advantages. Combining the aeration and solids separation into a single tank reduces the overall footprint of the process, minimizing the amount of land required. Since the solids are separated from the liquid by the membrane, it is not crucial to develop good settling solids. MBRs are operated with a longer Solids Residence Time of 12 to 20 days, which produces a very stable system. Due to the system's stability and fewer process components, MBR plants can be more automated, generally reducing the number of personnel.

The effluent quality from an MBR plant is excellent, as shown in **Table 9-4**. While an MBR plant must still have the capability to disinfect effluent, continuous disinfection may not be required, which reduces O&M costs.

Table 9-4

Typical MBR Plant Effluent Quality

Parameter	Effluent Quality
BOD_5, mg/L	< 1
Total Suspended Solids, mg/L	< 1
NH_3-N, mg/L	< 0.5
Total Nitrogen, mg/L	< 10 (with anoxic zone)
Turbidity, NTU	< 0.1
Fecal Coliform, MPN/100 ml	< 2.2
Total Phosphorous, mg/L	< 0.1 (with chemical addition)
Total Ammonia Nitrogen, mg/L	< 10 (with anoxic zone)

9.5.2.3 Wetlands Treatment

The use of wetlands for treatment of municipal and industrial wastewater has been successfully implemented in other areas of the United States. The basic treatment process consists of wetlands vegetation and associated bacteria that uptake and feed on phosphorus and nitrogen, thereby reducing the concentrations of these constituents in the wastewater effluent. Wetlands provide many other benefits including flood control protection, channel stabilization, animal habitat, and the potential for nonpoint source pollutant treatment. Since wetlands treatment of wastewater relies on vegetation growth, successful treatment requires a dense stand of healthy plants. However, as the vegetation matures, the treatment benefits of wetlands tend toward a steady state. As plants begin to die, the phosphorus in them can return to the waste stream as the plants decompose. For wetlands treatment to be a long-term, viable supplementary treatment process, regular maintenance of both the vegetation and other solid residues is required. The wetlands maintenance may include the periodic harvesting or rotation of the wetlands vegetation out of the waste stream. Harvesting or diverting the waste stream can potentially conflict with newly-established habitat for flora and fauna and may be viewed as construction in a wetlands, which can bring additional scrutiny and regulatory requirements. Wetlands treatment may also result in an increase in evaporation of effluent flows which could require a corresponding incremental reduction of Lake Mead supply to allow for the increase in consumptive use.

9.5.2.4 Advanced Ecologically Engineered System

The AEES is an emerging wastewater treatment technology that can be described as a combination between a wastewater treatment plant and a wetlands system. The Living Machine®, one example of an AEES, consists of a series of tanks which contain vegetation and organisms and may be contained in a greenhouse. The Living Machine® is suited for treating municipal and some industrial wastewaters and is designed utilizing the same processes as conventional biological treatment system, such as sedimentation, filtration, clarification, adsorption, nitrification and denitrification, volatilization, and anaerobic and aerobic decomposition. The specific components of the Living Machine® are selected based on the wastewater influent quality and treatment requirements. The Ethel M Botanical Gardens in the COH contains a Living Machine® to treat process wastewater from the Ethel M Chocolate Factory. In addition, the Las Vegas Springs Preserve uses an AEES for wastewater treatment.

One advantage of this type of system may be in areas where the general public opposes a conventional wastewater treatment facility. An AEES or the Living Machine® may be considered as an aesthetically pleasing alternative to treat wastewater. According to the EPA's *Wastewater Technology Fact Sheet - The Living Machine®*, the Living Machine® has reliably achieved the treatment goals for BOD_5, TSS, total nitrogen, nitrate, and ammonia as listed in **Table 9-5**.

Table 9-5

Reliably Achieved Treatment Goals of the Living Machine®

Parameter	Effluent Quality
BOD_5, mg/L	< 10
Total Suspended Solids, mg/L	< 10
Total Nitrogen, mg/L	< 10
Nitrate, mg/L	< 5
NH_3, mg/L	< 1

The EPA listed some disadvantages in the *Wastewater Technology Fact Sheet - The Living Machine®*. Through demonstration testing, the Living Machine® achieved about 50 percent removal of influent phosphorous, with influent phosphorus in the range of 6 to 11 mg/L. Other disadvantages are that the Living Machine® may require a larger footprint than a conventional system and systems in temperate climates may require containment within a greenhouse.

9.5.2.5 Ozone Disinfection

Disinfection is utilized in wastewater treatment to inactivate or destruct pathogens to prevent the spread of waterborne diseases to downstream users and the environment (EPA, 1999). Ozone is produced when oxygen is exposed to a high energy source; the energy source disassociates oxygen molecules into atoms and through collisions of oxygen atoms and molecules, ozone is formed. According to the EPA, ozone treatment is capable of achieving higher disinfection levels than chlorination or UV disinfection (EPA, 1999). Ozone disinfection is used in water and wastewater treatment facilities to meet a variety of objectives, including:

- Bacterial disinfection
- Virus, cyst, and oocyst inactivation
- Oxidation of taste and odor compounds
- Oxidation of metals
- Color removal

In 2005, SNWA received a grant from the American Water Works Association Research Foundation (AWWARF) to evaluate endocrine disrupting compounds (EDCs) using conventional and advanced treatment methods. Results of the study showed that ozone disinfection was more effective in removal of EDCs than chlorination and UV disinfection (SNWA, 2007).

9.5.3 Effluent Disposal

Effluent disposal methods can often provide alternative means to protect water quality than more extensive and expensive treatment.

9.5.3.1 Groundwater Recharge of Treated Effluent

During preparation of the feasibility studies and facility plans for satellite water reclamation facilities, the potential for direct recharge of treated wastewater into the groundwater basin was evaluated. This concept was not pursued in design for a variety of reasons:

- Direct recharge of treated wastewater was not permitted by Nevada statute

- The feasibility of treated wastewater recharge depends on the groundwater aquifer geologic composition and the use of membranes technologies that may be required to remove fine particles from the effluent before recharge can be effective.

According to the Nevada Underground Injection Control Program, it is permissible to dispose of treated wastewater effluent from small package plants up to large municipal treatment plants into recharge wells (NDEP, 2007). The wastewater effluent must be treated, at minimum, with secondary treatment processes. In addition, membrane technology is considered an acceptable treatment technology and membrane technologies are being incorporated into the design of treatment facilities within Clark County. Thus, groundwater recharge of treated wastewater effluent may be considered for municipal facilities within Clark County.

Groundwater recharge may be an option for effluent disposal. The ability to obtain recharge credits for recovery in the future would need to be coordinated with the Nevada Division of Water Resources, the agency responsible for allocating groundwater resources in Nevada, in accordance with NRS Chapters 533 and 534. If future recovery is not possible, groundwater recharge would simply be a disposal option.

9.5.3.2 Nonpotable Reuse

As discussed elsewhere in this report, wastewater reclamation and nonpotable reuse are implemented throughout the Las Vegas Valley. Nonpotable reuse is also feasible for smaller communities, where reclaimed water can be provided for a number of uses, including irrigation and cooling water for power facilities, to name some of the more common uses.

9.5.3.3 Return to Waterways

The use of a deep water outfall diffuser in Lake Mead was investigated for the CCWRD in 1990. The concept consisted of construction of 17 miles of pipeline from the CCWRD AWT plant to the bottom of Lake Mead in the Boulder Basin and a diffuser at the discharge point. The analysis concluded that the outfall diffuser appeared to be a feasible method of achieving the ammonia water quality standards for Lake Mead. The permitting and constructability of such an outfall were not evaluated.

SCOP is currently in the design phase and was discussed in Section 5 of the WQMP. The SCOP project will discharge the effluent in an open, well-mixed area of Lake Mead.

9.5.4 Treatment Matrix

The previous subsections have provided some discussion of alternative wastewater treatment methods available. These methods and/or technologies are not necessarily pertinent to each planning area. **Table 9-6** summarizes issues related to wastewater treatment in each of the planning areas, and identifies which methods and/or technology may be applicable to address their issues.

Table 9-6

Issues and Applicable Wastewater Methods and/or Technology By Planning Area

	Planning Area							
Issue	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Density of Septic Systems		b, c, d	a, b, c, d		a, d	b		b, c, d
Rapid Population Growth		b, c, d	b, c, d	b, c, d	a, d	b, c, d	b, c, d	
Non-conventional treatment		e, f	e, f		e, f, h			
Increased Demand for Reuse/Potable Water		a, i	i		i	a, i	i	
Emerging Contaminants		g	g	g	g	g	g	
Availability of Land		b, c, d	b, c, d		c, d			

Notes:

a. SWR – Satellite Water Reclamation
b. PP – Package Plant
c. SBR
d. MBR
e. Wetlands Treatment
f. AEES
g. Ozone Disinfection
h. Groundwater Recharge
i. Nonpotable Reuse

9.6 RECOMMENDATIONS

The recommendations for BMPs and alternative treatment methods and disposal were compiled from previous 208 WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to BMPs and alternative treatment methods and disposal for the *Clark County Area-Wide WQMP*:

- Coordinate inclusion of State of Nevada-recommended construction of BMPs.
- The more urban areas of Planning Areas 2, 3, and 4 should apply permanent and construction BMPs.
- The rural areas of Planning Areas 2, 3, and 4 should implement farming and livestock BMPs consistent with the Nevada *BMP Handbook* and potentially take advantage of NRCS technical and financial assistance.
- CCRFCD currently serves as lead agency and coordinator for the Las Vegas Valley stormwater discharge permit compliance effort. CCRFCD should provide similar

assistance to Clark County communities in Planning Areas 2, 3, and 4 in developing BMP programs, if requested.

- Support implementation of a construction site runoff management program and erosion and sediment control BMPs developed for the MS4 permit program.

- Support implementation of a post-construction runoff program and permanent development BMPs developed for the MS4 permit program.

- Support investigation of opportunities to retrofit existing flood control detention basins and design of future basins, to provide additional water quality benefits.

- Support public education programs by SNWA and others to reduce outdoor water use and limit urban water and limit urban area nuisance flows.

- Support SNWA in constructing erosion control structures in lower Las Vegas Wash (Planning Area 5).

- Support LVVWAC in developing a Regional Water Quality Management Plan for the Las Vegas Valley (Planning Area 5).

9.7 REFERENCES

Clark County Department of Comprehensive Planning, *South County Water Quality Management Plan Amendment*, Prepared by CH2M HILL, June 2004 (the Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County).

----- *Las Vegas Valley 208 Water Quality Management Plan Amendment*, Prepared by MWH, July 1997 (the Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County).

----- *Northeast Clark County 208 Water Quality Management Plan*, 2000 (the Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County).

Clark County Regional Flood Control District, *Las Vegas Valley NPDES Municipal Stormwater Discharge Permit Annual Report 2006-2007*. Prepared for Las Vegas Valley Stormwater Quality Management Committee, 2007.

Clean Water Coalition, *Systems Conveyance & Operations Program, Boulder Islands Lake Diffuser System Preliminary Design Report, Volume I of III,* Prepared by Black & Veatch, August 2007.

Environmental Protection Agency, *Wastewater Technology Fact Sheet*, The Living Machine®, 2001.

Nevada Conservation Commission, *Best Management Practices Handbook*, 1994.

Nevada Division of Environmental Protection, Bureau of Water Pollution Control, Ground Water Protection Branch. *Nevada, Underground Injection Control Program*. April 26, 2007.

----- *General Permit for Stormwater Associated with Industrial Activity (General Permit NVR050000)*, 2003.

----- *WTS 41: Guidance Document for Design and Permitting of a Package Wastewater Treatment Plant, Publications and Fact Sheets* Web Page, 2006a. Accessed January 23, 2008, at: http://ndep.nv.gov/bwpc/fact01.htm.

Southern Nevada Water Authority and Arizona State University, *Removal of EDCs and Pharmaceuticals in Drinking and Reuse Treatment Processes*, Shane Snyder, 2007

U.S. Department of Agriculture, Natural Resources Conservation Service, *Nevada NRCS Programs,* 2008. Accessed March 31, 2008, at: http://www.nv.nrcs.usda.gov/programs/

Section 10

Section 10
Wellhead Protection

10.1 INTRODUCTION

Amendments to the national SDWA in 1986 mandated that each state develop a Wellhead Protection Program for the purpose of protecting groundwater that serves as a source for public drinking water supplies (Amendments to the SDWA, 1986).

In Nevada, the program is administered by the NDEP BWPC. The NDEP states that wellhead protection is important because remediation of contaminated groundwater is expensive and sometimes it may be impossible to return the contaminated water to drinking water quality.

10.2 NEVADA WELLHEAD PROTECTION PROGRAM

WHPPs in Nevada are developed and managed at the local level, such as the public water system, city, or township; however, guidance and technical assistance on the elements of the program may be provided by the NDEP and the Nevada Rural Water Association. Communities are encouraged to submit WHPPs for NDEP endorsement. WHPPs that are deemed to provide adequate protection to the community drinking water supply will be endorsed by the NDEP and are then eligible for financial assistance.

Elements of a WHPP are provided below and are described in the following subsections:

- Formation of a WHPP team
- Delineation of wellhead protection areas (WHPAs)
- Inventory of potential contaminant sources within WHPAs
- Selection and implementation of management strategies
- New well planning
- Contingency plan development
- Public participation

10.2.1 Formation of a Wellhead Protection Program Team

A WHPP team is formed with representatives from any group that may be affected by or is interested in wellhead protection activities. Duties should be assigned to each WHPP team member.

10.2.2 Delineation of Wellhead Protection Areas

Each public drinking water supply well in a community should define a WHPA, which is the land surface area above the capture zone of the well in which activities and land uses must be managed to protect the underlying groundwater. Generally, the WHPA is represented on the land surface as a circular or elliptical shape and is provided on a WHPP map. The WHPA should be delineated using the appropriate method for the specific hydrologic conditions, available data, and financial constraints; the delineation must be consistent with protection goals and possible management strategies.

10.2.3 Inventory of Potential Contaminant Sources Within Wellhead Protection Areas

Upon delineation of a WHPA, any existing and potential contaminant sources within the WHPA must be identified. Contaminant sources are any activity or land use that may release toxic substances onto the ground surface or soil that could travel through the soil and contaminate groundwater. The inventory of potential contaminant sources should include historic, existing, and possible future land uses and activities. Some examples of potential contaminant sources have been identified by the NDEP and include:

- Landfills
- Leaking underground storage tanks
- Septic systems
- Fertilizers and pesticides
- Poorly constructed or improperly abandoned wells
- Household hazardous waste

10.2.4 Selection and Implementation of Management Strategies

The map including the WHPA and the potential contaminant sources should be overlain with land use and zoning maps to determine management strategies for the WHPP. The management strategies should be feasible options that protect the drinking water from the identified potential contaminants and may consist of regulatory and/or nonregulatory strategies. Some examples of regulatory and nonregulatory management strategies identified by the NDEP are shown in **Table 10-1**.

Table 10-1

NDEP
Examples of Management Strategies for a WHPP

WHPP Management Strategies	
Regulatory	**Nonregulatory**
Zoning ordinances	Groundwater monitoring
Source or use prohibition	Land acquisition
Design or operating standards	Public education
Site plan reviews	Household hazardous waste collection

10.2.5 New Well Planning

WHPAs and identification of potential contaminant sources should be prepared for all possible and future well sites.

10.2.6 Contingency Plan Development

Contingency plans should be developed to minimize the risk of groundwater contamination in the event of an accident or emergency. New well sites can be selected so that the risk to groundwater sources is minimized.

10.2.7 Public Participation

Public participation should be integrated into all elements of the WHPP. The public should be encouraged to behave in manner that is protective of the groundwater or wellhead.

10.3 CLARK COUNTY WELLHEAD PROTECTION PROGRAMS

As of April 2007, five community water systems and two non-transient non-community water systems in Clark County had prepared WHPPs (NDEP, 2007). According to the EPA's *Public Water Systems Facts and Figures*, a community water system is a public water system that supplies water to the same population year-round; a non-transient, non-community water system is a public water system that regularly supplies water to at least 25 of the same people at least 6 months per year, but not year-round (e.g., schools, factories, office buildings, and hospitals). **Table 10-2** shows the community water systems and non-transient non-community water system in Clark County, by planning area. The locations of

WHPAs within Clark County are available in GIS format from the NDEP and are displayed in **Figure 10-1**.

Table 10-2

Clark County Communities
With Completed Wellhead Protection Plans (April 2007)

Planning Area	Wellhead Protection Community	System Type
1	Indian Springs	Community Water System
	Creech Air Force Base	Non-Transient Non-Community Water System
2	Moapa Valley Water District	Community Water System
3	None	None
4	None	None
5	Blue Diamond Village	Community Water System
	Nellis Air Force Base	Non-Transient Non-Community Water System
6	Sandy Valley	Community Water System
7	None	None
8	Searchlight	Community Water System

The following subsections outline local planning efforts and WHPPs within Clark County or provide information on how the WHPPs can be obtained.

10.3.1 Indian Springs

WHPP information for the community of Indian Springs was not provided in the *Clark County Wellhead Protection Report*, but information can be obtained by contacting the community of Indian Springs, or contacting the Nevada NDEP Bureau of Water Pollution Control.

10.3.2 Creech Air Force Base

Creech Air Force Base is not regulated by the state of Nevada and, due to confidential information, no WHPP data could be obtained.

10.3.3 Moapa Valley Wellhead Protection Program

The Moapa Valley Water District recognized the need to develop a WHPP to protect the public drinking water supply and received funding from the NDEP to draft the plan. Details


Lincoln County
Clark County
Nye County
Arizona
Inyo County
San Bernardino County
Mohave County
California
Planning Area 1:
Sand Spring - Tikaboo Valleys
Planning Area 2:
Muddy River - Meadow Valley Wash
Planning Area 3:
Lower Virgin Valley
Planning Area 4:
Grand Wash - Lake Mead
Planning Area 5:
Las Vegas Wash
Planning Area 6:
Ivanpah - Pahrump Valleys
Planning Area 7:
Havasu - Mohave Lakes
Planning Area 8:
Paiute Wash
Muddy River
Virgin River
Las Vegas Wash
Lake Mead
Colorado River
15
93
95
1. Indian Springs
2. Creech Air Force Base
3. Moapa Valley
4. Nellis Air Force Base
5. Nellis-AFB-Craig Road Complex
6. Blue Diamond
7. Sandy Valley
8. Searchlight
MWH
PBS&J
Wellhead Protection Areas
N
0 3.75 7.5 15 Miles
10-1
Wellhead Protection Areas

of the WHPP included identifying geographical impact areas that influence the public water supply sources, conducting a risk assessment of the potential contaminant sources, and recommending land uses in the WHPA that would minimize the potential for groundwater contamination.

10.3.4 Blue Diamond Village

WHPP information for Blue Diamond Village was not provided in the *Clark County Wellhead Protection Report*, but information can be obtained by contacting the community of Blue Diamond, or contacting the Nevada NDEP Bureau of Water Pollution Control.

10.3.5 Nellis Air Force Base

Nellis Air Force Base is not regulated by the state of Nevada and, due to confidential information, no WHPP data could be obtained.

10.3.6 Sandy Valley Wellhead Protection Program

The Sky Ranch Estates Owners Association applied for and received funding from the NDEP to prepare a WHPP in Sandy Valley and, additionally, the Sky Ranch Estates Owners Association received funding for their WHPP Implementation Plan. According to the *Clark County Wellhead Protection Report*, the WHPP Implementation Plan outlined a proactive approach to protect the drinking water supply through education and a push for local legislative reform.

10.3.7 Searchlight Wellhead Protection Program

The Searchlight area supported mining and prospecting activities in the late 19th century through the early 20th century. According to the *Clark County Wellhead Protection Report*, planning of the WHPP for Searchlight began in 2003 and was developed with consideration of past and present activities in the area. Preparation of the WHPP involved various agencies (with responsibilities for water service, land use, water reclamation, environmental health, emergency response, and wellhead protection) and members of the community. The WHPP identifies potential sources of water contamination, groundwater demands, and future land use.

10.3.8 Underground Fuel Tanks

Title 30.44.020 of the Clark County Code requires that underground fuel tanks must be set back 1,000 feet from any well used as a source of potable water, lake, or major wash unless the underground tank meets the stringent structural requirements as indicated by the SNHD.

According to the *Clark County Wellhead Protection Report*, this ordinance specifically pertains to new construction of convenience stores, service stations, and truck stops where underground fuel tanks may affect the local water sources.

10.3.9 Las Vegas Valley Groundwater Management Program

The Las Vegas Valley Groundwater Management Program was developed by SNWA to protect and manage the primary groundwater supply for the Las Vegas Valley. Currently, the planning process is underway to develop the Las Vegas Valley Aquifer Protection Plan, which will also address the small systems within the Las Vegas Valley.

The Las Vegas Valley Groundwater Management Committee has recommended a number of activities to provide wellhead protection and encourage land-use practices to protect the aquifer from pollutants. These activities include identifying potential containment sources and investigating options for managing these sources. The goal is to reduce or eliminate the potential threat to drinking water supplies either through regulatory or statutory controls, or by using nonregulatory (and often voluntary) measures that involve the public. Information and tips to protect wellheads are available on the Las Vegas Valley Groundwater Management Program website, which include:

- Establish a wellhead protection area, which should be a circle around the well that has a minimum radius of 100 feet from the wellhead.

- Develop wells only outside areas of potential contamination. A well should not be located near corrals, pastures, feed lots, or drainage ways of underground fuel storage tanks.

- Do not spill, store, or dispose of animal wastes, fuels, pesticides, fertilizers, paints, and other harmful products within a WHPA or within the WHPA of adjacent properties.

- Private well owners should test well water at least once each year for coliform bacteria and at least once every 3 years for the Routine Domestic Water Analysis. More information can be provided by a certified private laboratory or contact the following organizations:

    - The SNHD can provide a list of Nevada Certified Laboratories and, upon request, will provide an interpretation of laboratory results.

- The University of Nevada, Reno Water Data Interpreter will assess laboratory results.

10.4 RECOMMENDATIONS

The recommendations for wellhead protection were compiled from previous 208 WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to wellhead protection for the *Clark County Area-Wide WQMP*:

- Coordinate and/or assist with developing wellhead protection plans and public outreach programs about groundwater protection for communities that rely on groundwater supplies for potable water.

- Clark County should work with SNWA to develop a County-wide wellhead protection ordinance. In support of this effort, it is recommended that SNWA provide a comprehensive database and map inventory of groundwater wells currently in use and those not in use, and determine the number and location of all abandoned groundwater wells.

- Expand education and programs related to wellhead protection for private and non-municipal systems.

10.5 REFERENCES

Clark County Department of Air Quality and Environmental Management and Clark County Department of Comprehensive Planning, *Clark County Wellhead Protection Report Draft*, May 21, 2007.

Environmental Protection Agency, *Public Water Systems Facts and Figures*, *Undated.* Accessed November 20, 2007, at: http://www.epa.gov/safewater/pws/factoids.html

----- *Amendments to the Safe Drinking Water Act*, 1986.

Las Vegas Valley Groundwater Management Program, *Well Protection, Undated.* Accessed November 20, 2007, at: http://www.lasvegasgmp.com/html/lvgw_well_protection.html

Nevada Division of Environmental Protection, *Communities with Completed Wellhead Protection Plans,* April 2007. Accessed November 19, 2007, at: http://ndep.nv.gov/bwpc/docs/completed_whpplans_apr07.pdf

----- Bureau of Water Pollution Control, *Nevada Wellhead Protection, Undated.* Accessed November 19, 2007, at: http://ndep.nv.gov/bwpc/wellhead.htm

----- Bureau of Water Pollution Control, *Nevada Wellhead Protection Program Fact Sheet*, *Undated.* Accessed November 19, 2007, at: http://ndep.nv.gov/bwpc/whpp_fs2.pdf

Section 11

Section 11
Colorado River and Lake Mead

11.1 INTRODUCTION

Water resources and environmental planning efforts on Colorado River and Lake Mead are summarized in this section. The other major tributaries to Lake Mead, the Virgin and Muddy Rivers, are discussed in Section 12, Environmental/Integrated Planning Coordination.

11.2 LAS VEGAS WASH

As the terminal outlet of the Las Vegas Drainage Basin, the Las Vegas Wash flows from west to east and empties into Las Vegas Bay in Lake Mead on the Colorado River. The Wash provides approximately 2 percent of the total water inflow to Lake Mead (97 percent comes from the Colorado River and 1 percent from the Virgin and Muddy Rivers) Las Vegas Wash Coordination Committee [LVWCC], 1999).

Las Vegas Wash is integral to water quality planning activities within the Las Vegas Valley since protection of the unique Wash environment involves wastewater treatment, water rights and return flow credits, salinity control for the Colorado River, park planning, and water quality standards. The Wash also provides habitat to approximately 300 fish and wildlife species and more than 200 species of upland, riparian, and wetland plants. As urban development continues in the Valley, the natural resource value of Las Vegas Wash will continue to increase.

Headcutting, the process of upstream advance of a gully and vertical channel downcutting by erosion, is the primary form of erosion in the lower Wash. Increasing urbanization in the Valley has increased both storm flows and sewage discharges, and has accelerated the erosion process in the Wash, deepening and widening the channel and discharging sediment into Lake Mead. Since the 1970s, channel erosion in the Wash has steadily reduced the area of wetlands vegetation and decreased travel times of waters discharged from WWTPs to Lake Mead. Major events to control erosion in the Wash and protect/enhance wetlands include implementation of the Las Vegas Wash Integrated & Comprehensive Management Program, development of the 1995 Wetlands Park Master Plan, and improvements to the water quality of nonpoint source discharges since the joint NPDES stormwater permit was issued in 1990. A limited chronology of erosion events, studies, plans, reports, and improvement activities influencing Las Vegas Wash is presented in **Table 11-1**.

Table 11-1

Chronology of Activities Influencing Las Vegas Wash

Activity/Event	Year	Reference
Normal summer flow in Wash reported as approximately 1 cfs	Pre-1928	Roline and Sartoris, 1995
Lake Mead formed	1935	Clark County, 1990
Perennial surface flow in Las Vegas Wash from magnesium refining plant discharge - wetland area developed along almost the entire length of the Wash	1943	Clark County, 1990 Roline and Sartoris, 1995
Municipal wastewater contributing to steady state flow in Wash	1955	Clark County, 1990
Early scoured erosion gullies	1967	Clark County, 1990
Sewage and Wastewater Advisory Committee organized	1973	NRS 244A
Las Vegas Wash Development Advisory Committee organized	1973	
First Colorado River return flow credit through Las Vegas Wash	1975	U.S. Bureau of Reclamation (Reclamation), 1976
Duck Creek erosion gully formed	1975 - 1979	Clark County, 1990
Las Vegas Valley Water Quality Program established	1979	
Las Vegas Valley Lateral (LVVL) threatened by flooding	1980	Clark County, 1990
Travel time through entire Wash equals 18 hours	1980	Roline and Sartoris, 1988
Clark County AWT begins operation	1982	Clark County
Las Vegas Wash and Tributaries Study published	October 1982	USACE, 1982
Approximately 300 acres of cattail marsh in Wash	1982	Reclamation, 1987
Las Vegas Wash Salinity Control Report published	1983	V. Bostick, 1983

Table 11-1 (Continued)

Chronology of Activities Influencing Las Vegas Wash

Activity/Event	Year	Reference
Morphometry of Wash changed drastically - severe flooding and erosion moved the lower channel headcut further upstream, creating a more confined channel and reducing the marsh cattail area to about 40 percent of its former size	1983 1984	Reclamation, 1987
Revision to method for calculation of Las Vegas Wash return flow credits	1984	Reclamation, 1986
LVVL exposed	1984	Clark County, 1990
Temporary grade control structure (GCS) built	1984	Colorado River Commission (CRC)
GCS built by CRC to protect LVVL	1985	Clark County, 1990
Travel time through entire Wash equals less than 6 hours due to reduction of marsh vegetation	1985	Roline and Sartoris, 1987
CCRFCD formed	1985	
Flood Control Master Plan published (subsequently updated every 5 years)	1986	Clark County Regional Flood Control District, 1986
Approximately 128 acres of cattail marsh in Wash	1986	Reclamation, 1987
Clark County Task Force formed to focus on erosion problems in the Wash	1986	
Las Vegas Wash Comprehensive Study published	1987	Wash Task Force Subcommittee, 1987
Las Vegas Wash Vegetation Study published	1987	Reclamation, 1987
LVVL reburied approximately 150 feet below streambed	1987	Clark County, 1990
Las Vegas Wash Integrated & Comprehensive Management Program (ICMP) published	1988	Clark County Board of Commissioners, 1988
Work Program Description (Phase I of ICMP) published	April 1988	Clark County, 1988

Table 11-1 (Continued)

Chronology of Activities Influencing Las Vegas Wash

Activity/Event	Year	Reference
Lake Las Vegas 208 Water Quality Management Plan Amendment published	April 1988	adopted by Clark County Board of Commissioners, 1988
Transcontinental Properties constructed an earthen dam to form Lake Las Vegas	1989 (dam completed in 1991)	Paulson, et al., 1994
Erosion Mitigation Plan Las Vegas Wash Erosion Mitigation Project (Phase II of the ICMP) published	December 1989	Clark County, 1989
Lake Las Vegas begins to fill	1990	Paulson et al., 1994
Water quality monitoring conducted in Wash and Lake Mead per requirements of wastewater treatment plant NPDES permits Reclamation Technical Services Center (Denver, CO) publishes annual report of findings from Las Vegas Wash Water Quality Monitoring Program	1990-current	City of Las Vegas, Clark County Water Reclamation District, and the City of Henderson Roline and Sartoris
NPDES Stormwater Permit issued jointly to Clark County Regional Flood Control District; Cities of Las Vegas, North Las Vegas, and Henderson; Clark County; and Nevada Department of Transportation - permit authorizes the permitted agencies to discharge from stormwater outfalls on Las Vegas Wash and its tributaries BMPs and elimination of illegal/illicit connections have improved the quality of stormwaters entering Las Vegas Wash - see Section 8 of this document for additional information	December 13, 1990 - effective date of the permit	Annual reports produced by CCRFCD and submitted by the permittees to the State of Nevada.
Substantial erosion in old Las Vegas Wash channel	Aug-Sept 1991	Paulson et al., 1994

Table 11-1 (Continued)

Chronology of Activities Influencing Las Vegas Wash

Activity/Event	Year	Reference
Question 5 Bond Funds ($13.3 million) allocated for development of the Clark County Wetlands Park	1991	Clark County citizens
City of Henderson Water Reclamation Facility built	1994	City of Henderson
City of Henderson 2-acre wetland revegetation project - developed to mitigate construction of an open channel to carry treated effluent to Las Vegas Wash near Pabco Road, includes a Riparian Habitat Restoration Plan	1994	City of Henderson
Average annual discharge exceeds 184 cfs	1994	Roline and Sartoris, 1995
Clark County Wetlands Park Master Plan published	July 1995	Clark County, 1995
Clark County Desert Conservation Plan published	August 1995	Clark County, 1995
U.S. Bureau of Reclamation responds to Clark County inquiries relating to applications for rights-of-way for Wetlands Park facilities on federal lands administered by Reclamation. This letter outlines the responsibilities of the County and Reclamation and establishes Reclamation as lead agency for environmental review in accordance with National Environmental Policy Act (NEPA).	1995	Administrative Draft Environmental Impact Statement (EIS) for Clark County Wetlands Park
Lake Las Vegas 8-acre revegetation project (wetland enhancement) located at the far western end of the Lake - Las Vegas Wash water used for the wetland system	1995	Transcontinental Properties
Nevada Highway 167 (Northshore Road) bridge stabilization and wetlands restoration on Las Vegas Wash - to reduce the potential for further channel bed and bank erosion within the Wash between Lake Las Vegas and Las Vegas Bay, included wetlands restoration	1997	NPS, Lake Mead NRA

Table 11-1 (Continued)

Chronology of Activities Influencing Las Vegas Wash

Activity/Event	Year	Reference
Lake Mead Water Quality Forum and Water Quality Citizens Advisory Committee established	1997	Water Quality Forum
Las Vegas Wash Coordination Committee (LVWCC) established	1998	Las Vegas Wash Coordination Committee
Clark County Wetlands Park Master Plan Final Environmental Impact Statement published	1998	Reclamation and Clark County, 1998
Emergency repairs of the GCS completed	1998	SNWA
Severe flood events (July 1998, September 1998 and July 1999) scour sediment from the Wash, increase channel erosion, advance headcutting, remove vegetation, destroy the temporary GCS	1998-1999	
Annual surveys to determine breeding occurrence for southwestern willow flycatcher	1998 to present	SNWA
Wetlands decline to approximately 200 – 300 acres	1999	LVWCC, 1999
Construction of Pabco Road erosion control structure (ECS)	2000	
Construction of permanent GCS	2000	
Biological Resource and water quality monitoring to inventory species that use the Wash	2000 to present	LVWCC
Annual vegetation monitoring and salt cedar removal	2000 to present	Las Vegas Wash Coordination Committee and Wash Green-Up Volunteers and Bureau of Reclamation
Las Vegas Wash Comprehensive Adaptive Management Plan published	2000	LVWCC
Construction of Monson and Visitors Center Weirs completed	2002	LVWCC

Table 11-1 (Continued)

Chronology of Activities Influencing Las Vegas Wash

Activity/Event	Year	Reference
Construction of Rainbow Gardens Weir completed	2004	LVWCC
Pittman Pilot Wetlands Project (0.5-acre pilot project to determine water quality benefits of constructed wetlands)	2005	LVWCC
Construction of Powerline Crossing Weir completed	October 2006	LVWCC
Construction of the Upper Diversion Weir completed	2007	LVWCC
Controlled burn at Bostick Weir (fifth burn on the Wash to clear tamarisk)	January 2007	Nevada Division of Forestry
Marsh bird surveys on Wash	2007	LVWCC
Construction began on the Upper Diversion Weir	2007 (expected completion by 8/2008)	LVWCC
Revegetation efforts reach 170 acres, including 60 acres at S108	August 2007	LVWCC

11.2.1 Water Quality Issues

During nonstorm periods, water quantity and quality within the Wash are directly related to wastewater discharges, nuisance runoff from urban areas, and shallow groundwater. The largest portion of the dry weather flow is treated effluent from wastewater treatment plants in Las Vegas Valley. These flows are the primary source of Nevada's Colorado River return flow credits, an important water resource for Southern Nevada. The wastewater treatment plants in the Las Vegas Valley include: the CLV WPCF, the CCWRD Treatment Plant and the AWT, and the COH WRF and WWTP. The following sections summarize current research into water quality issues for the Wash.

11.2.1.1 Septic System Tributary Interaction Study

In cooperation with DAQEM, SNWA conducted a septic system tributary interaction study for Las Vegas (Dano, 2003). In response to observed elevated coliform bacteria levels in the tributary network to Las Vegas Wash, the investigation tested the hypothesis that septic

systems transmit coliforms to the shallow groundwater system and ultimately to the Wash tributary system. All surface water samples collected for the study (from Duck Creek, Flamingo Wash, and Sloan Channel) contained elevated fecal coliform levels as compared with corresponding groundwater samples. Fecal coliform were not detected in almost all groundwater samples. As expected, surface water samples had higher levels of coliform after storm events (although groundwater samples remained unchanged). The study concluded that fecal coliforms are not a pervasive component of septic systems discharge away from the immediate vicinity of septic systems leach fields and that it is unlikely that fecal coliforms in streams are derived from septic systems. A point source investigation of coliforms in the inflows to the tributary network was recommended for further research.

In addition to fecal coliform analysis, the Septic System Tributary Interaction Study included analysis of pharmaceuticals and personal care products (PPCPs) in surface and groundwater samples in areas tributary to Las Vegas Wash with a high density of septic systems. Most samples were below the level of detection for these compounds, however, PPCPs were consistently present at some sites. The study concluded that trace levels of PPCPs suggests that the processes of attenuation greatly reduce the concentrations of these septic systems source compounds. The presence of progesterone at a low level at one sampling site (Maple Cleaner monitoring well) and the absence of fecal coliform at this site suggest that septic systems have influenced shallow groundwater chemistry and that coliform attenuate more rapidly than PPCPs.

11.2.1.2 Perchlorate

Perchlorate, which occurs both naturally and through manufacturing, is used as an oxidizer in rocket fuel and can be found in airbags, fireworks, and fertilizers. According to the NDEP (2008), perchlorate was first detected in the Lower Colorado River in 1997. Although there is no federal drinking water standard for perchlorate, due to possible interference with thyroid function, NDEP, SNWA, EPA, the COH, and Kerr-McGee undertook an investigation into the source of the contaminant.

Perchlorate was traced to Las Vegas Wash, with the contaminant entering the Wash via groundwater and surface water flows from areas used for manufacturing. The Southern Nevada Perchlorate Cleanup Project includes a system to pump groundwater, treat the flows biologically, and then discharge the water back to the Wash. The treatment system is 99 percent effective in perchlorate removal; perchlorate entering the environment has been reduced by 85 percent since 1997 and as of April 2005, 1,574 tons of perchlorate have been removed from the environment (NDEP, 2008). Since January 2007, perchlorate concentrations in Las Vegas Wash (Northshore Road sampling station) have been below 100 µg/L.

NDEP continues to monitor perchlorate levels in Las Vegas Wash, Lake Mead and points on the Colorado River downstream of Lake Mead. The level reported in the Lower Colorado River is currently below the drinking water safety limit of 24.5 parts per billion (ppb) set by EPA in February 2005, and also below the California MCL of 6 ppb and reportable detection limit of 4 ppb, adopted in October 2007.

11.2.1.3 Selenium

As part of an ongoing bioassessment study, selenium source identification sampling along the major tributaries (Pittman Wash, Whitney Drainage, Duck Creek, Monson Channel, Flamingo Wash, Tropicana Wash, Sloan Channel, and Las Vegas Creek, and major dewatering sources) of Las Vegas Wash is conducted by the LVWCC (February 2008). Together with data from bird eggs, fish tissue (surveys conducted in 2003, 2005, and 2007), and soil samples, these data will be used to identify sources of selenium in the Las Vegas Valley and to help assess the impacts selenium has on wildlife. The CWC is developing a Selenium Management Plan and the planning document will be complete in July 2008. The CWC, CCWRD, SNWA, U.S. Fish and Wildlife Service (USFWS) and USGS are conducting a fathead minnow study, to study long term reproductive effects on a laboratory species of fish.

Several streamcourses in the Las Vegas Valley have recently been identified for selenium in the revised 303(d) list of impaired water bodies. The 303(d) list is discussed in Section 4 of this report.

11.2.1.4 Emerging Contaminants

Enhancements in laboratory analytical capabilities coupled with evidence of failures in human and wildlife reproductive health has focused attention on the presence of harmful chemical categories defined as EDCs and PPCPs. EDCs are substances that act like hormones in the endocrine system and disrupt the function of the endogenous hormones. PPCPs include over-the-counter and prescription drugs, veterinary drugs, nutritional supplements, agricultural chemicals, and other consumer products such as fragrances, cosmetics, and sunscreen agents. These chemical compounds have subtle toxicological effects and occur in municipal wastewater due to unregulated activities of individuals.

The ecological and human health impacts from continual exposure to trace levels of these EDC and PPCP organic compounds in the aquatic environment are complex and poorly understood. Additional studies are being performed by SNWA, USGS, and USFWS. A USGS study found higher concentrations of synthetic chemicals in Las Vegas Wash and Las Vegas Bay in comparison to other sample sites within the Lake Mead NRA (Rosen, et al., 2006). Male carp from Las Vegas Wash and Las Vegas Bay were found to have less of a particular male sex hormone and showed signs of smaller sex glands and androgen blood levels than those in other test sites, an effect related to higher concentrations of EDCs in the water.

SNWA is involved with water quality sampling for emerging contaminants and CWC is tracking emerging treatment technologies for their removal. Data will be reviewed every three years.

11.2.2 Sensitive Species and Habitats

Several federal and state statutes regulate actions potentially affecting vegetation and wildlife resources on the Las Vegas Wash.

Federal Status – The federal Endangered Species Act of 1973 (FESA) (16 USC 1531 et seq.) as amended, provides the USFWS the authority to protect wildlife and plant species designated as threatened or endangered. FESA defines an Endangered species (FE) as "any species which is in danger of extinction throughout all or a significant portion of its range …." A Threatened species (FT) is defined as "any species which is likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range." Additionally, all wild birds except starlings and house sparrows are protected by the Migratory Bird Treaty Act (MBTA) of 1986. The Bald Eagle Act of 1940 (amended in 1962) further protects bald eagles and golden eagles. Additional legislation affording protection to wildlife species and their habitat includes the Sikes Act, Title II (16 USC 670 et seq.) as amended, the Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC 1701) and NEPA.

State Status – Legislation directing wildlife management and protection also exists at the state level under NAC 503.005 to 503.104 and under NRS 527.060 to 527.300 for management and protection of plants. The Mojave desert tortoise is a protected reptile in Nevada under Section 501.110.1(d) of the NRS; Protected and Rare, outside the urban areas of Clark County under Section 503.080/1(a) of the NAC; and it is unlawful to transport animals across state lines without consent from Nevada Division of Wildlife (NDOW).

Actions that have the potential to directly affect individuals or essential habitat of federal or state Threatened or Endangered species may be considered as "taking" that species, and are prohibited by the FESA. Impacts arising from projects having any nexus with agencies,

policies, or funding sources of the federal government may require formal consultation and mitigation with USFWS under FESA, Section 7. For entirely private actions, permission to take a species or its habitat may require formal consultation and mitigation programs under the federal ESA, Section 10.

As described in Section 12**,** the Clark County Multiple Species Habitat Conservation Plan (MSHCP) (Clark County and USFWS, 2000) is intended under Section 10(a) of the FESA to support the issuance, by the USFWS, of a permit or permits (Section 10(a) Permit) that would:

- Allow the incidental "take" of threatened or endangered species resulting from otherwise lawful activities on non-federal properties within the county; and

- Allow the incidental "take" of threatened or endangered species that are currently unlisted but may become listed in the future.

The MSHCP identifies 79 species as Covered Species, 103 species as Evaluation Species, and 51 as Watch List Species. Las Vegas Wash and the Colorado River are included in the desert riparian/aquatic ecosystem (rivers and streams generally lower than 4,000 feet), which provides habitat for 14 Covered Species and 12 High-Priority Evaluation Species (Clark County and USFWS, 2000).

Covered Species – The covered species are listed below with their common and scientific names.

Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis	*Myotis evotis*
American peregrine falcon	*Falco peregrinus anatum*
Yellow-billed cuckoo	*Coccyzus americanus*
Vermilion flycatcher	*Pyrocephalus rubinus*
Southwestern willow flycatcher	*Empidonax traillii extimus*
Phainopepla	*Phainopepla nitens*
Summer tanager	*Piranga rubra*
Blue grosbeak	*Guiraca caerulea*
Arizona Bell's vireo	*Vireo bellii arizonae*
Banded gecko	*Coleonyx variegatus*
Western red-tailed skink	*Eumeces gilberti rubricaudatus*
Great Basin collared lizard	*Crotaphytus insularis bicinctores*
Relict leopard frog	*Rana onca*

High-Priority Evaluation Species – The high priority evaluation species are listed below with their common and scientific names.

Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*
Kit fox	*Vulpes macrotus*
Banded Gila monster	*Heloderma suspectum cinctum*
Arizona (southwestern) toad	*Bufo microscaphus microscaphus*
Moapa dace	*Moapa coriacea*
Woundfin	*Plagopterus argentissimus*
Virgin River chub	*Gila seminuda*
Virgin River chub (Muddy River population)	*Gila seminuda*
Desert sucker	*Catostomus clarki*
Flannelmouth sucker	*Catostomus latipinnis*
Moapa White River springfish	*Crenichthys baileyi moapae*
MacNeil sooty wing skipper	*Hesperopsis gracielae*

Key sensitive species for Las Vegas Wash include the desert tortoise, southwestern willow flycatcher, Yuma clapper rail (and other marsh birds), bats, and Las Vegas bearpoppy.

Desert Tortoise – The north side of Las Vegas Wash contains suitable habitat (creosote bush and saltbush scrub) for the federally threatened desert tortoise. Tortoise burrows have been documented within the Clark County Wetlands Park and in 2003, two live tortoises were found (LVWCC, March 2007a). A new post-and-cable fence (27,000 feet) will protect this habitat from the Sunrise Mountain Trailhead to the Rainbow Gardens Weir (LVWCC, February 2008).

Southwestern Willow Flycatcher – A federally endangered neotropical migrant that breeds in the riparian forests of the southwest. Preferred nesting sites include dense thickets of willow 10 to 20 feet tall and surrounded by water, although the species has adapted to live in habitats dominated by non-native tamarisk (SNWA, 2008a). SNWA has conducted annual flycatcher surveys in the Las Vegas Wash since 1999 and participates in the Southwestern Willow Flycatcher Recovery Team, which provides recommendations on recovery strategies and actions for this species. Since the surveys began, generally one or two detections are made each year, although large detections were made in 2000 (seven) and 2004 (eighteen) (LVWCC, September 2007). To date, observed individuals have not been confirmed as the endangered southwestern subspecies.

Marsh Birds – Using the standardized North American marsh bird monitoring protocol, the Las Vegas Wash Project Coordination Team surveyed for secretive marsh birds, bitterns and rails, in 2007 (LVWCC, June 2007). Species documented by the surveys include: American coot, common moorhen, Virginia rail, least bittern, pied-billed grebe and sora. The survey was also supplemented by a call broadcast survey that targeted the federally

endangered Yuma clapper rail. Since 1998, surveys have identified three transient Yuma clapper rails (LVWCC, May 2006).

Bats – A 2-year bat monitoring study conducted in the Wash from 2005 through 2006 identified 16 different species (two state sensitive, four state protected, and eight federal species of concern) (LVWCC, June 2007). The study included acoustic monitoring stations that can record the patterns of echolocation - the high-frequency, sonar-like navigation system used by bats. The patterns were analyzed to determine the species of bat.

Bearpoppy – The Las Vegas bearpoppy (state critically endangered) is found near Las Vegas Wash in the Clark County Wetlands Park (north side of the Wash off of Hollywood Drive) (LVWCC, August 2006). Growing exclusively in gypsiferous soils, bearpoppy habitat has been reduced by development in the Valley.

12.2.3 Coordination Activities and Projects

11.2.3.1 Clark County Wetlands Park Master Plan

A Wetlands Park Master Plan was originally developed by Clark County in 1979 but never implemented. Renewed community interest and funding from a 1991 bond measure allowed the development of a new Wetlands Park Master Plan in 1995 (Southwest Wetlands Consortium, 1995). This document outlines components of a plan to transform an approximately 8 square mile area along an approximately 7 mile reach of Las Vegas Wash above Lake Las Vegas into a Wetlands Park which will provide conservation, recreation, and educational opportunities for residents and visitors to Las Vegas Valley. The Master Plan details trails, a visitor center, and landscape design for the park as well as park management. It describes three phases of park development, to be completed over 15 to 20 years (1995 to 2010/2015). Phasing for the park was established using a set of criteria based on stabilizing environmental conditions and adding public value. The foundation for development of the park is the construction of up to 15 ECSs within Las Vegas Wash. As of 2006, 10 weirs have been constructed (plus three constructed by the NPS below Northshore Drive) along with several miles of bank stabilization (LVWCC, 2006). These structures have effectively reduced erosion and sediment transport to Lake Mead as well as reduced wetlands loss.

Other Master Plan elements have also been constructed: the Wetlands Information Center, concrete walking trails, graveled secondary trails, bird viewing blind, many acres of habitat revegetation, trash removal, and invasive species removal. Construction of more trails, a connecting bridge, a community park, and a Nature Center is ongoing and will be completed in the near-term. Future work will further expand the trail system, complete construction of the balance of the ECSs, and construct a scenic drive on the southern edge of the park.

11.2.3.2 Las Vegas Wash Coordination Committee

The LVWCC was formed in 1998. It includes 29 member agencies, including the Clark County DAQEM and brings all interested stakeholders together under the administration of the SNWA. Three study teams work to implement the recommendations for projects to address erosion, habitat loss, and water quality outlined in the Las Vegas Wash Comprehensive Adaptive Management Plan (LVWCAMP) (LVWCC, 1999). Of the 44 actions recommended in the LVWCAMP, the following are identified as key recommendations:

- Define the structure for local oversight of the Las Vegas Wash Comprehensive Adaptive Management Plan.
- Install ECSs.
- Identify water resources needed to maintain the Clark County Wetlands Park. (The LVWCAMP was identified as the vehicle to be used for implementing the Clark County Wetlands Park Master Plan.)
- Participate in and support the implementation of the Alternate Discharge Study conducted by the municipal wastewater dischargers (COH, CLV, and CCWRD). (This project is now known as SCOP.)
- Establish off-stream wetlands and evaluate storm water detention/retention basins.
- Conduct sediment transport modeling.
- Develop long-term monitoring programs.
- Develop a central database for shallow groundwater information.
- Support the development and implementation of a standardized environmental review process among planning entities.
- Investigate potential funding sources.
- Continue implementation of the Public Outreach Program.

Since development of the LVWCAMP, SNWA has prepared the Las Vegas Wash Capital Improvements Plan (Wash CIP) (SNWA, 2005) to summarize projects necessary to support long-term enhancement and management of the Wash. Wash CIP project elements include:

- Channel bed stabilization – installation of gradient control weirs.
- Channel bank protection – installation of rock rip-rap armor and revegetation of stream banks.

- Revegetation – wetland and dry land revegetation to achieve erosion protection, ecosystem restoration, water quality improvement, and to meet environmental permitting requirements (In collaboration with SNWA and Reclamation, maintenance activities associated with revegetation efforts on the Wash (controlled burns, invasive species removal, and trash cleanup) were conducted by conservation camp crews from the Nevada Division of Forestry from August 2005 to December 2006 [LVWCC, March 2007b]).
- Comprehensive programs – supporting capital expense activities necessary to support construction activities (i.e., dust control practices, water quality monitoring, mapping).

11.2.3.3 Las Vegas Wash Weed Partnership

Invasive weeds tend to out-compete native species, thereby reducing habitat values, and can be destructive to crops and livestock. Management issues regarding three invasive species (tall whitetop, giant reed, and tamarisk) are spearheaded by the multi-agency Las Vegas Wash Weed Partnership, formed in 2002. Their mission is to promote awareness among the landowners and land managers within the planning area, facilitate cooperation and collaboration to create a weed control plan, and implement on-the-ground weed management activities in a 9-mile stretch of the Lower Las Vegas Wash (from Vegas Valley to Lake Las Vegas). This area is a major seed source for downstream Lake Mead and the Lower Colorado River system. The group developed an Integrated Weed Management Plan for the Lower Las Vegas Wash (LVWCC & Las Vegas Wash Weed Partnership [LVWWP], 2003), conducts weed control activities, improves public awareness of weeds and pursues additional funding.

11.2.3.4 Clean Water Coalition Systems Conveyance and Operations Program

When SCOP goes on line, flows in Las Vegas Wash will be approximately 50 mgd (77 cfs) and concentrations of perchlorate, TDS, and selenium in Las Vegas Wash are anticipated to increase. Chlorophyll levels in inner Las Vegas Bay are expected to be reduced along with the decreased phosphorus loadings. Standards for water quality in Lake Mead will continue to be met.

As stated in the Final EIS (CWC, 2006), the project is intended to provide a system that:

- Provides maximum flexibility for management of increasing amounts of treated effluent flows between the current discharge location at the Las Vegas Wash and Las Vegas Bay, and other locations within Lake Mead.

- Provides flexibility to meet current and future water quality standards for known pollutants, and as yet unknown standards for additional contaminants that may be regulated in the future.
- Enhances the Las Vegas Bay area of the Lake Mead NRA by protecting and maintaining the recreational and resource values of the entire Lake Mead NRA and continuing to meet beneficial uses, while more than doubling the treated effluent flows discharged to Lake Mead.
- Accommodates Lake Mead's lowering water levels because the amount of mixing and dilution available in the inner Las Vegas Bay would decrease as the Lake level decreases.
- Provides flexibility to avoid possible impacts to source-water quality at the SNWA System intake structures.
- Avoids the ratcheting-down effects of Nevada's RMHQs anti-degradation system that happens in effluent-dominated waterways such as the Las Vegas Wash, by relocating the discharge to a natural, noneffluent dominated waterway in which the existing water quality is set by the natural flow conditions, not the effluent itself.

11.2.3.5 Las Vegas Valley Watershed Advisory Committee

LVVWAC was formed in late 2007 as a result of the successes that were achieved through the Las Vegas Wash Management Advisory Committee and LVWCC. Nine local and regional agencies comprise the LVVWAC and they include the COH, CNLV, CLV, Clark County, CCRFCD, CCWRD, the CWC, the LVVWD, and SNWA.

The LVVWAC provides a forum to develop a cohesive direction and an integrated approach to addressing water quality issues in the Las Vegas Valley and Lake Mead. In order to protect the quality of and maximize existing and future Colorado River and in-state water resources, the treatment, reuse, and discharge of water from point and nonpoint sources in the Las Vegas Valley must be recognized and managed as critical elements in Southern Nevada's long-term water resource planning.

Among the LVVWACs primary duties are to develop regional water quality goals for the Las Vegas Valley watershed and Lake Mead and to recommend mechanisms, through a regional water quality plan, found in Appendix D, to enable these goals to be met in order to protect the quality and quantity of water resources. An additional goal is to develop a cohesive direction and integrated approach to address treatment issues relating to wastewater, drinking water, and stormwater. The LVVWAC will evaluate all existing Lake Mead water quality plans for consistency and will serve as a conduit to integrate and coordinate these plans to achieve the agreed-upon water quality goals.

11.3 LAKE MEAD

Lake Mead was formed after the Hoover Dam (also known as Boulder Dam) was completed. The 726-foot-high dam, located approximately 25 miles southeast of Las Vegas on the Colorado River at Black Canyon between Nevada and Arizona was constructed between 1931 and 1935 as a national public works project to control flooding and drought and provide hydroelectric power to fast-growing Southern California. Water impounding began in February 1935 and power generation began in 1936. Located in the Mojave Desert, Lake Mead is the largest manmade water body in the United States (more than 110 miles long with more than 822 miles of shoreline) and has the largest surface area (more than 162,600 acres) of any reservoir in the Northern Hemisphere. The reservoir has four major basins from upstream to downstream:

- Temple Basin
- Gregg Basin
- Virgin Basin
- Boulder Basin

The Colorado River flows through Glen Canyon National Recreation Area and Grand Canyon National Park before reaching Hoover Dam and Lake Mead. The Moapa and Virgin Rivers discharge into the Overton Arm of the Virgin Basin, and Las Vegas Wash discharges into the narrow inlets of Las Vegas Bay, a large arm of the Boulder Basin.

Lake Mead is a deep, warm, monomictic reservoir. Thermal stratification develops in May and June, and a classic thermocline develops in July between a depth of 33 and 48 feet. Destratification begins in October and the reservoir is completely destratified by January.

Lake Mead is managed by Reclamation for a variety of beneficial uses including water supply, propagation of wildlife and aquatic life, and recreation. Water from Lake Mead is provided to Arizona, California, Nevada, several Native American tribes, and the country of Mexico.

11.3.1 Recreation

The 1.5-million-acre Lake Mead national recreation area was established in 1964 as the first NRA created by an act of Congress. The Lake Mead NRA includes 1,482,476 acres of federal land and 28,212 acres of non-federal land. Managed by the NPS, the Lake Mead NRA encompasses both Lake Mead and Lake Mohave (which is 50 miles south of Las Vegas

along the Arizona/Nevada border). A General Management Plan to accommodate increased visitor use while maximizing resource protection was developed for the Lake Mead NRA in 1986. The plan includes proposals for new development, improved access and structural and nonstructural flood protection for developed areas to protect visitor safety during flash floods.

Six major developments are located around Lake Mead – these are centered around marina activities and most have concession services for overnight visitors and day users. Services include:

- Marine and boat rentals
- Restaurants, cafes, and snack bars
- Accommodations
- Service station and fuel
- Groceries and souvenirs
- Fishing equipment and tackle
- RV campgrounds with hookups
- Paddle wheel tour boat to Hoover Dam

Lake Mead also has 258 undeveloped coves that are accessible by water or approved roads. Most of the recreation opportunities are water-oriented, although hiking and four-wheel driving on approved roads are also accommodated. In 2002, the NPS promulgated a rule allowing for the continued use of personal watercraft on 95 percent of Lakes Mead and Mohave (NPS, 2003). The plan was developed to provide long-term protection of park resources while allowing a variety of recreational opportunities for park visitors. Five percent of the park waters are designated as primitive or semiprimitive settings where personal watercraft will be prohibited. Other provisions include requiring all boaters to possess a marine head or portable toilet while camping on the shoreline. Also, boats that do not meet the EPA rule for gasoline spark-ignition marine engines will be prohibited on Lakes Mead and Mohave beginning December 31, 2012. The NPS will require the exclusive use of four-stroke engines, direct-injection two-stroke engines, or equivalent technology starting in 2013.

11.3.2 Sensitive Species and Habitats

Three of America's four desert ecosystems - the Mojave, Great Basin, and Sonoran Deserts – are present in the Lake Mead NRA. The vegetation community mapped by BLM (1998)

adjacent to the Lake Mead NRA is a combination of Southern Desert Scrub and Mojave Desert Scrub. Sensitive and invasive species issues for Lake Mead include:

Southwestern Willow Flycatcher – Under a Memorandum of Agreement (MOA) with the Reclamation, SNWA funds the San Bernardino County Museum surveys for southwestern willow flycatcher along the lower Virgin and Muddy Rivers and Lake Mead (SNWA, 2008a). The goals of the surveys are to locate breeding pairs, gather demographic information and characterize occupied habitat.

Razorback Sucker – Lake Mead is designated as critical habitat for the federally Endangered razorback sucker (*Xyrauchen texanus*) since it provides deep water, shallow bays and cove habitats. Native to the Colorado River Basin, razorback sucker populations have declined from introduction of non-native species and construction of dams (SNWA, 2008b). A substantial population occurs in Lake Mohave but predatory non-native fish limit survival. Ongoing study (trammel netting, passive integrated transponder tagging, and larva sampling) of razorback suckers is a cooperative effort among the SNWA, Colorado River Commission, Nevada Division of Wildlife, NPS, and Reclamation. In addition, the Lower Colorado River Multi-Species Conservation Program was initiated in 1993 by the States of Arizona, California, Nevada and federal agencies in a cooperative effort to aid in the recovery of the razorback sucker.

Bonytail Chub – The federally endangered bonytail chub may be found in Lake Mead, and critical habitat for the species has been designated in Lake Mohave (USFWS, 1990). Wild populations of this fish continue to decline due to insufficient recruitment of young to offset the loss of adults due to natural mortality. Reduced survival is attributed to changes in water flows and habitat conditions, and most significantly, to the introduction of non-native fish species. To forestall extinction of this species, stocking of captive-born sub-adult fish is conducted in the Upper Colorado River Basin and in Lake Mohave and Lake Havasu.

11.3.3 Water Quality and Volume Coordination Activities

11.3.3.1 Lake Mead Water Quality Forum

Established by the NDEP, the purpose of the Lake Mead Water Quality Forum is to protect public health and preserve the water quality of Las Vegas Wash, Las Vegas Bay, and Lake Mead by coordinating the efforts of the various stakeholders, including:

- Identifying issues regarding water quality and impacts on the water supply
- Providing a forum to build consensus and share information

- Coordinating study efforts, provide technical updates and disseminate information to the public
- Serving as a clearinghouse on water quality issues and provide peer review
- Enhancing the public input process
- Identifying further study work that may be necessary

Key water quality issues for the Forum in recent years have been selenium, perchlorate, and phosphorus. Coordination of Lake Mead sampling efforts is promoted by the Lake Mead Interagency Workgroup (made up of members from Reclamation, SNWA, CLV, CCWRD, and COH). Since July 1997, the Lake Mead Water Quality Citizens Advisory Committee, a citizens group appointed by the SNWA Board of Directors in the late 1990's to make water quality recommendations, has also acted to identify and prioritize various issues of concern to the public and to present these issues to the Forum.

11.3.3.2 Colorado River Commission

The Colorado River Commission (CRC) is the State of Nevada executive agency responsible for acquiring and managing Nevada's share of water and hydropower resources from the Colorado River. The CRC "shall receive, protect and safeguard and hold in trust for the State of Nevada all water and water rights, and all other rights, interests or benefits in and to the waters" of the Colorado River (NRS § 538.171). Nevada's Colorado River consumptive use apportionment is 300,000 acre-feet a year. Colorado River water is accounted for as consumptive use. Consumptive use is equal to Colorado River Diversions minus Colorado River return flow-credits. Colorado River diversions, return flow-credits, and consumptive use are reported by the CRC to Reclamation. A majority of return-flow credits are returned to the Colorado River through Las Vegas Wash to Lake Mead using an accounting method first approved by the Reclamation in 1984 with administrative updates occurring on several occasions. Colorado River water treated and returned to the Colorado River system is eligible for return flow credits.

11.3.3.3 Boulder Basin Adaptive Management Plan

The Boulder Basin Adaptive Management Plan (BBAMP) is the operational plan for the preferred alternative in the Final EIS (the SCOP project). The BBAMP provides a mechanism to ensure the SCOP project meets water quality and environmental goals. CWC performed water quality modeling of Lake Mead for SCOP. The CWC, SNWA, National Park Service, U.S. Fish and Wildlife Service, and Reclamation entered into a Memorandum of Understanding to implement the BBAMP. The BBAMP will establish water quality management objectives and monitoring programs, an annual operation and management plan, and a core management team to oversee the BBAMP. One element of the BBAMP is the development of a Selenium Management Plan for Las Vegas Wash and Las Vegas Bay

which is being undertaken by the CWC, while accounting for the reclamation of treated effluent as Colorado River return flow credits. CWC has identified the following water quality objectives for the BBAMP:

Boulder Basin Adaptive Management Plan

1. Meet the water quality objectives of the core management team comprised of the National Park Service, Bureau of Reclamation, Fish and Wildlife Service, Southern Nevada Water Authority and Clean Water Coalition and use those objectives for SCOP and BBAMP plans and actions.

National Park Service Organic Act

1. Protect Lake Mead National Recreation Area resource values and purposes

2. Protect ecological health of sports fisheries and native fisheries by managing water quality and nutrient inputs to support algal and zoo-plankton production

3. Protect ecological health of sports fisheries, native fisheries and water dependent wildlife through research on emerging contaminants of concern

4. Promote public confidence that Lake Mead meets expectations for fishing, boating and swimming

5. Maintain high quality recreation experience

Clean Water Act

1. Meet state and federal water quality standards for Lake Mead, Colorado River, Las Vegas Bay and Las Vegas Wash for temperature, pH, total phosphates, dissolved oxygen, chlorophyll a, total ammonia, total dissolved solids, chloride, sulfate, suspended solids, total inorganic nitrogen, nitrate, nitrite, turbidity, fecal coliform, e. coli, color and priority pollutants

2. Wastewater reclamation facilities meet a summed waste load allocation of 334 pounds/day of total phosphorus discharged to Las Vegas Bay and Lake Mead

3. Maintain high levels of total inorganic nitrogen removal by the wastewater reclamation facilities and monitor, assess and manage its impact in Boulder Basin

4. Wastewater reclamation facilities meet NPDES Discharge Permit limits for total suspended solids, biochemical oxygen demand, pH, fecal coliform, and total residual chlorine.

5. Meet the NPDES Municipal Separate Storm Sewer permit to use best management practices for urban storm water and construction runoff

6. Meet state water quality standards for body contact throughout Lake Mead

Endangered Species Act

1. Meet federal and state standards for selenium in the Wash and tributaries through a Selenium Management Plan

2. Provide and protect critical habitat for razorback sucker in the Boulder Basin and bird species in the Las Vegas Wash and Boulder Basin

3. Support the maintenance and growth of the razorback sucker population through continued monitoring, Fathead Minnow study, fish surveys and EDC research reviews

4. Protect against taking of birds, nests and eggs by controllable flows in Las Vegas Wash

5. Support vegetative health in Las Vegas Wash without sacrificing other water quality goals

Safe Drinking Water Act

1. Protect the source water in Lake Mead to support meeting primary and secondary drinking water standards

2. Manage phosphorus and other nutrients where they impact taste and odor, algal toxins, increased biomass production and organic carbon formation

3. Address conditions that may enhance proliferation of invasive mussels that impact water quality or operations

4. Address a range of expected conditions including lowered lake levels increased mass loading, changes in effluent discharge points and changes in Lake Mead intakes and outlets

5. Preserve public confidence in Lake Mead and the Colorado River downstream as a safe and reliable drinking water source.

Regional Resource Management

1. Maintain the maximum return flow credits for reclaimed water returned to Lake Mead

2. Recognize the total net "carbon footprint" of water and wastewater treatment, transmission and residuals disposal operations in the Las Vegas Valley

3. Maximize the renewable energy recovery from SCOP hydropower without sacrificing water quality objectives

11.3.3.4 Southern Nevada Water Authority

SNWA and its members receive approximately 90 percent of their drinking water from the Colorado River. SNWA participates in a variety of local, regional and state-to-state efforts to ensure the effective management of this resource and continued availability for meeting the future water needs of Southern Nevada.

11.4 RECOMMENDATIONS

The recommendations for Colorado River and Lake Mead were compiled from previous 208 WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to the Colorado River and Lake Mead for the *Clark County Area-Wide WQMP*:

- Consider impacts to sensitive species when planning new facilities or taking other actions that may impact Las Vegas Wash wetlands.

- As additional acreages of wetlands are developed in the Clark County Wetlands Park, continue implementation of a water quality sampling program to document the treatment of wastewater effluent by wetlands systems.

- Coordinate the Wetlands Park Plan implementation with the CCRFCD and SNWA with regard to the flood control/erosion control structures necessary to reduce flood damage, increase nutrient cleansing potential, and reduce the transport of sediments to the Las Vegas Bay and Lake Mead (Planning Area 5).

- CCRFCD, SNWA, CWC, and the wastewater agencies should continue their partnership with Clark County to address issues in the Las Vegas Wash after the SCOP project.

- The CWC BBAMP process should continue to establish water quality objectives for the Las Vegas Wash and Lake Mead, monitoring programs, an annual operation and management plan, and a core management team.

- The CWC and member agencies should complete the SCOP.

- The Water Quality Plans and goals adopted by the LVVWAC should be used for future 208 WQMP amendments, to the extent that they cover the same planning areas.

11.5 REFERENCES

Clark County Regional Flood Control District, *Flood Control Master Plan*, Prepared by MWH, 1986.

Clark County, *208 Water Quality Management Plan for Clark County Nevada*, Prepared by Black & Veatch Engineers-Architects, 1990. (The Clark County Area-Wide Water Quality Master Plan replaces and supersedes all previous Water Quality Management Plans and amendments regarding Clark County of any portion of Clark County.)

Clark County, *Clark County Desert Conservation Plan*. Prepared by RECON, 1995.

Clark County Department of Comprehensive Planning and USFWS, *Final Clark County Multiple Species Habitat Conservation Plan and Environmental Impact Statement for Issuance of a Permit to Allow Incidental Take of 79 Species in Clark County, Nevada*, Prepared by RECON, 2000.

Clark County Department of Parks and Recreation and Clark County Department of Comprehensive Planning, *Clark County Wetlands Park Master Plan*, Prepared by Southwest Wetlands Consortium, 1995.

Clean Water Coalition, Systems Conveyance and Operations Program – *Final Environmental Impact Statement,* 2006.

Dano, E., *Septic System Tributary Interaction Study, Las Vegas, Nevada, Research conducted by SNWA in cooperation with the Clark County Department of Air Quality and Environmental Management*, 2003.

Las Vegas Wash Coordination Committee, *Las Vegas Wash Comprehensive Adaptive Management Plan (LVWCAMP)*, 1999.

----- *2006 Year-End Report*, 2006.

----- *E-mail Update on Yuma Clapper Rail*, May 2006. Accessed April 10, 2008, at: http://www.lvwash.org/members/lvwcc_email_update/2006_May/lvwash%20e-mail%20update%20May%202006.pdf

----- *E-mail Update on Bearpoppy*, August 2006. Accessed April 10, 2008, at: http://www.lvwash.org/members/lvwcc_email_update/2006_Aug/lvwash%20e-mail%20update%20Aug%202006.pdf

----- *E-mail Update on Desert Tortoise,* March 2007a. Accessed April 10, 2008, at:

http://www.lvwash.org/members/lvwcc_email_update/2007_Mar/lvwash%20e-mail%20update%20Mar%202007.pdf

----- *Las Vegas Wash Revegetation and Site Maintenance Final Report*, Prepared by SNWA and U.S. Bureau of Reclamation, March 2007b.

----- *E-mail Update on Marsh Birds and Bats*, June 2007. Accessed April 10, 2008, at: http://www.lvwash.org/members/lvwcc_email_update/2007_Jun/lvwash%20e-mail%20update%20Jun%202007.pdf

----- *E-mail Update on Surveys for the Endangered Southwestern Willow Flycatcher*, September 2007. Accessed April 10, 2008, at: http://www.lvwash.org/resources/docs/doc_library.html

----- *E-mail Update on Selenium and Fencing*, February 2008. Accessed April 10, 2008, at: http://www.lvwash.org/members/lvwcc_email_update/2008_Feb/lvwash%20e-mail%20update%20Feb%202008.pdf

Las Vegas Wash Coordination Committee & Las Vegas Wash Weed Partnership, *Integrated Weed Management Plan for the Lower Las Vegas Wash,* 2003. Accessed June 6, 2008, at: http://www.lvwash.org/resources/docs/intweedmngmtplan200309_toc_exsummary.pdf

National Park Service, *Record of Decision on the Final Lake Management Plan/Final Environmental Impact Statement for the Management of Water-Based Recreation*, 2003.

National Park Service and U.S. Bureau of Reclamation, *Records of Decision for the Final Environmental Impact Statement for the Clean Water Coalition Systems Conveyance and Operations Program*, July 2007.

Nevada Division of Environmental Protection (NDEP), *Southern Nevada Perchlorate Cleanup Project,* 2008. Accessed at: http://ndep.nv.gov/bca/perchlorate05.htm.

----- *Southern Nevada Perchlorate Cleanup Project*, 2008. Accessed June 6, 2008, at: http://ndep.nv.gov/bca/file/perchlorate_northshore.xls.

Paulson, L.J., M. Salas and V. Salas, *Water Quality Monitoring in Las Vegas Wash: Las Vegas Wash Project 1993*, submitted to Steven C. Ainsworth, Lake Las Vegas Joint Venture, 1994.

Roline, R.A. and J.J. Sartoris, *Las Vegas Wash Effluent Monitoring Study*. Rep. Progr. - 1986. Appl. Sci. Refer. No. 87-2-9. U.S. Bur. Reclam. Denver, CO, 1987.

----- *Changes in Morphology of Las Vegas Wash and the Impact on Water Quality, U.S. Bureau of Reclamation, Lake and Reservoir Management 4(1)*: 135-142, 1988.

----- *Las Vegas Wash Water Quality Monitoring Program 1994 Report of Findings, U.S. Bureau of Reclamation, Technical Memorandum No. 8220-95-3*, 1995.

Rosen, Michael R,. et al., *Investigations of the Effects of Synthetic Chemicals on the Endocrine System of Common Carp in Lake Mead, Nevada and Arizona, U.S. Geological Survey, Fact Sheet 2006-3131, Version 1.1*, October 2007. Prepared in cooperation with the U.S. Fish and Wildlife Service and National Park Service, 2006. Accessed March 24, 2008, at: http://pubs.usgs.gov/fs/2006/3131/.

Southern Nevada Water Authority, *Las Vegas Wash Capital Improvements Plan*, 2005.

----- *Southwestern Willow Flycatcher information, 2008a.* Accessed March 24, 2008, at : http://www.snwa.com/html/env_flycatcher.html.

----- *Razorback Sucker information*, 2008b. Accessed March 24, 2008, at: http://www.snwa.com/html/env_razorback_sucker.html

U.S. Army Corps of Engineers, *Las Vegas Wash and Tributaries Study*, 1982.

U.S. Bureau of Land Management, *Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement*, 1998.

U.S. Bureau of Reclamation, *Compilation of Records in Accordance with Article V of the Decree of the Supreme Court of the United States in Arizona v. California, Dated March 9, 1975, Calendar Year 1984*. October 10, 1976.

----- *Compilation of Records in Accordance with Article V of the Decree of the Supreme Court of the United States in Arizona v. California, Dated March 9, 1964, Calendar Year 1984*. March 1986.

----- *Las Vegas Wash Vegetation Study*. Denver, Colorado, 1987.

U.S. Fish and Wildlife Service, *Bonytail Chub Recovery Plan*, U.S. Fish and Wildlife Service, Denver, CO, 35 pp, 1990.

Section 12

Section 12
Environmental / Integrated Planning Coordination

12.1 INTRODUCTION

This section briefly summarizes of the roles and responsibilities of environmental agencies, with a highlight on important planning documents that influence planning coordination in Clark County.

12.2 ENVIRONMENTAL AGENCIES AND ORGANIZATIONS

Agencies at the federal, state, regional and local levels have prepared various environmental documents and plans related to water resources in Clark County. **Table 12-1** lists major environmental agencies and organizations and summarizes their relevant responsibilities, planning documents, and projects. A brief summary of the key environmental activities requiring integrated planning coordination is provided in **Table 12-1**.

Table 12-1

Agencies and Organizations Responsible for Environmental Planning in Clark County

Agency/ Organization	Responsibilities, Planning Documents, and Projects
Clark County Department of Air Quality and Environmental Management	• *208 Water Quality Management Plan* Administering Agency • *Multiple Species Habitat Conservation Plan* • State Implementation Plans for PM10 and carbon monoxide • Eco-County Initiative
Clark County Department of Comprehensive Planning	• Land use planning agency (*Clark County Comprehensive Plan*)
Clark County Regional Flood Control District	• Stormwater management lead agency • *Flood Control Master Plan* and *Updates* (latest is the 2007 *Las Vegas Valley Flood Control Master Plan Update Final Project Control Plan*) • *Storm Water Management Plan for MS4 Permittees*

Table 12-1 (Continued)

Agencies and Organizations Responsible for Environmental Planning in Clark County

Agency/ Organization	Responsibilities, Planning Documents, and Projects
Conservation District of Southern Nevada	• Partners with agencies and private business to implement programs to conserve natural resources
High Desert Resource Conservation & Development Council	• Local volunteer council which promotes conservation • Focused on native vegetation restoration in southern Nevada
U. S. Fish and Wildlife Service	• *Multiple Species Habitat Conservation Plan*; Section 10(a) permitting • *Virgin River Fishes Recovery Plan* • *Muddy River Ecosystem Recovery Plan*
U.S. Army Corps of Engineers	• Administers the permit program related to Section 404 of the CWA - impacts to wetlands; wetlands mitigation bank administration
Bureau of Land Management	• Manages substantial land holdings within Clark County • *Las Vegas District Resource Management Plan*
U. S. Bureau of Indian Affairs	• Trustee for the Moapa Indian Reservation
Nevada Division of Environmental Protection	• Administers Section 401 Water Quality Certification Program; issues NPDES discharge permits – Discussed in Section 4 • Established the Lake Mead Water Quality Forum
Southern Nevada Water Authority	• Water Purveyor in the Las Vegas Valley and Boulder City • Treatment and Transmission Facility • Administration and funding for Virgin River, Muddy River, and Las Vegas Wash and Lake Mead scientific investigations focusing on vegetation communities and sensitive species

Table 12-1 (Continued)

Agencies and Organizations Responsible for Environmental Planning in Clark County

Agency/ Organization	Responsibilities, Planning Documents, and Projects
Muddy River Regional Environmental Impact Alleviation Committee	• Local group dedicated to the enhancement of the riparian area along the Muddy River • On-going tamarisk removal and native vegetation replanting
Lake Mead Water Quality Forum	• Purpose is to protect public health and preserve the water quality of Las Vegas Wash, Las Vegas Bay, and Lake Mead – Discussed in Section 11
Clean Water Coalition	• Systems Conveyance and Operations Program – Discussed in Section 5 • *Boulder Basin Adaptive Management Plan (BBAMP)* – Discussed in Section 11 • *Selenium Management Plan* – Discussed in Section 11 • Water Quality Modeling in Lake Mead – Discussed in Section 11 • Endocrine Disrupting Chemical Research – Discussed in Section 11
Colorado River Commission	• Administers programs impacting Colorado River and tributary flows in Nevada – Discussed in Section 11
U.S. Bureau of Reclamation	• Manages Hoover Dam, Lake Mead, and Lake Mojave – Discussed in Section 11 • Administers Colorado River Contracts
National Park Service	• Manages public recreation and natural resources within Lake Mead National Recreation Area – Discussed in Section 11 • *Lake Mead NRA General Management Plan*
Las Vegas Valley Watershed Advisory Committee	• Protection, preservation and quality/quantity enhancement of water resources in the Las Vegas Valley watershed (More information in Section 4.1)

12.2.1 Clark County

Clark County is the local land-use planning agency and the lead agency for environmental issues in the county. The Board of County Commissioners is designated as the Area-Wide

Water Quality Management Planning Organization (NRS 244A) and has delegated the administration and management of the *208 Water Quality Management Plan* to the Department of Air Quality and Environmental Management, Water Quality Management Team.

12.2.1.1 Clark County Department of Air Quality and Environmental Management

Separated into two divisions, the Environmental Management division of DAQEM:

- Develops documents that provide guidelines and direction for environmentally responsible land use within Clark County
- Coordinates with other entities to ensure best management practices are used for managing environmental issues
- Manages environmental programs for compliance with laws, regulations and mandates.

DAQEM Environmental Management Division is the lead agency for the Clark County MSHCP and for the Water Quality Program. The mission of the Clark County Water Quality Program is to protect, preserve and enhance the quality of Clark County's water resources for the benefit of present and future generations through pro-active long-term planning, real-time monitoring, community education, regulations, compliance assurance, and working together with the public, federal, state and local agencies. The Water Quality Planning Team works with the municipalities, wastewater dischargers, affected industry, and concerned citizens to develop and ensure compliance with area-wide water quality management plans.

The DAQEM air quality management division monitors and maintains air quality in Clark County. DAQEM is the developer of the State Implementation Plans (SIPs) for criteria pollutants including ozone and particulate matter for Clark County. The Clark County portion of the SIP is a federally enforceable plan that explains how the County will comply with federal air quality standards. Since water resources projects involving construction of new facilities would be required to minimize construction-related dust, the SIP for airborne particulate matter is described in further detail below.

12.2.1.1.1 State Implementation Plan for PM10

Under the Clean Air Act, EPA established primary and secondary National Ambient Air Quality Standards (NAAQS) with the goal of protecting public health. The Las Vegas Valley was classified as a "serious" nonattainment area for particulate matter less than 10 microns in diameter (PM10) in early 1993. The approximately 1,500-square-mile nonattainment area includes:

- CLV
- CNLV
- COH
- Unincorporated areas of Clark County
- Desert National Wildlife Refuge lands
- Toiyabe National Forest lands
- Red Rock Canyon National Conservation Area
- Nellis Air Force Base
- Lake Mead National Recreation Area lands
- BLM lands

Clark County submitted a revised SIP to EPA in June 2001 that demonstrated that the adoption and implementation of Best Available Control Measures (BACMs) and Best Available Control Technologies (BACTs) would result in attainment of the annual average PM10 NAAQS by 2001 and attainment of the 24-hour NAAQS by December 31, 2006. The county has since met all of its SIP commitments and ambient air quality data collected from 2004 to 2006 demonstrate attainment of both the annual and the 24-hour PM10 NAAQS (DAQEM, 2007).

Even with attainment of the dust standards, Clark County continues to conduct research into paved road dust emissions (using vehicle-mounted continuous measurement systems), soil surface characterization (via satellite imagery), and environmental standards for dust suppressant products.

To minimize fugitive dust emissions throughout the county, dust permits are required for any topsoil disturbance (or continued construction) of 0.25 acre or more, a trench of 100 feet in length or more, or demolition of 1,000 square feet or more (DAQEM, 2003). Dust control must be practiced even for smaller sized projects. Therefore, all projects related to water quality management in Clark County must be reviewed for conformance with District rules and regulations. Minimally, all projects involving earthwork must incorporate construction BMPs for dust control.

12.2.1.1.2 Clark County Multiple Species Habitat Conservation Plan

Formal habitat conservation planning in Clark County began with efforts to protect the desert tortoise (*Gopherus agassizii*). First listed as endangered under an emergency listing in 1989, the desert tortoise was later listed as federally threatened in 1990 under the FESA. The *Desert Tortoise Habitat Conservation Plan* (*HCP*) was subsequently prepared under Section 10(a) of the FESA for the incidental take of desert tortoise in Clark County. A short-term (3-year) *HCP* was approved in 1991 and the USFWS issued a Section 10(a)(1)(B) incidental take permit that allowed development on up to 23,000 acres of habitat in exchange for the conservation of more than 400,000 acres of desert tortoise habitat. The plan imposed a per-acre fee as a mitigation measure for all development within the permit area, and required developers to survey for and remove tortoises from most lands within the permit area before disturbance.

The *HCP* was superseded by the *Clark County Desert Conservation Plan* published in 1995. The *Desert Conservation Plan* outlined a strategy to allow Clark County as well as state and federal resource managers to address the conservation and protection of habitat necessary to preserve other plant and wildlife resources to avoid the need for listing those species. The *Desert Conservation Plan* covered an area of approximately 525,000 acres including all nonfederal lands within Clark County. Approximately 114,000 acres were projected to be developed over the permit period (30 years, from 1994 to 2023); most of this acreage is desert tortoise habitat.

In addition to the species formally designated as threatened or endangered, there are other sensitive species within Clark County. In October 1994, Clark County began the process of prioritizing these other species of concern to meet its multiple species commitment as set forth in the *Desert Conservation Plan*. The "Multiple Species Prioritization" developed during this process included 15 species (plus southwestern willow flycatcher [*Empidonax traillii extimus*]) which occur or have the potential to occur within Clark County.

In 2000, the county completed an MSHCP which expanded conservation planning beyond the species covered by the original "Multiple Species Prioritorization." The MSHCP promotes an ecosystem-based habitat preservation strategy to address the needs of the entire range of biological resources in Clark County (and some transportation rights-of-way into neighboring counties) (Clark County, 2000). The Section 10 take permit (USFWS, 2001) was signed on January 9, 2001, and the Implementing Agreement signed by all parties in January 2001. The MSHCP covers 78 species and 11 ecosystems (alpine, bristlecone pine, mixed conifer, pinyon-juniper, sagebrush, blackbrush community, salt desert scrub, Mojave desert, mesquite and catclaw community, desert riparian/aquatic, and perennial springs) and replaces the *Desert Conservation Plan*, which focused solely on the desert tortoise. Four of the covered species are endangered under the FESA: the southwest willow flycatcher, Moapa dace (*Moapa coriacea*), Virgin River chub (*Gila seminuda*), and woundfin minnow (*Plagopterus*

argentissimus); one species is threatened, the Mojave desert tortoise; and one species is a candidate for listing, the blue diamond cholla (*Cylindropuntia multigeniculata*). The MSHCP outlines hundreds of specific conservation measures to protect the covered species while allowing development pursuant to the USFWS incidental take permit (not to exceed 145,000 acres) for a 30-year period. The Clark County Desert Conservation Program (DCP) implements the MSHCP to maintain a Section 10 take permit for desert tortoise and for assurances of the same for 77 other species. Fees are collected per acreage of disturbance, excluding up to 15,000 municipal acres, and monies are expended on implementation of the MSHCP.

12.2.1.1.3 Eco-County Initiative

The Clark County Board of Commissioners approved an expansive sustainability initiative designed to step up conservation of existing natural resources at the county level and seek participation from surrounding cities. The Inventory Subcommittee developed a Sustainability Inventory, or estimate of the County government's greenhouse gas emissions, that sets forth a framework for a regional plan for greenhouse gas emissions reductions. The chair of the inventory subcommittee was from DAQEM. The draft Preliminary Report from the Inventory Sub-Committee identified the following major sustainability measures to promote water conservation:

- SNWA's Water Smart Landscapes Rebate program (WSL) helps property owners convert water-thirsty grass to xeriscape.

- SNWA's instant rebate coupons (pool cover, rain sensor, and smart irrigation controller) are given to single-family, residential property owners for the purchase of water-saving products.

- In support of the SNWA Drought Plan, Clark County has adopted various restrictions to help curb water use during current drought conditions, including landscape watering restrictions (seasonal scheduling); surface, building, equipment and vehicle washing; landscape development codes; conservation provisions for golf course irrigation; restrictions on operation of ornamental fountains; temporary drought surcharges; and public involvement and awareness programs designed to solicit public support and cooperation in the reduction of water consumption.

- Per the Water Conservation Action Plan, the Department of Parks & Recreation (DPR) has installed MAXICOM (master valves and flow sensors) in urban Clark County parks, implemented a Park and Street Xeriscape Renovation Program, renovated two regional parks with drought-resistant landscaping, implemented the Synthetic Turf Conversion Program for athletic fields within the park system, and

incorporated decorative walking paths, shade shelters, and planter boxes between green spaces in parks to further reduce water consumption.

- The CCDOA has replaced acres of grass with xeriscape and remodeled airport restrooms for lower water usage.

The following major sustainability measures to promote water reuse were identified:

- The CCWRD supplies five community golf courses, Silver Bowl Park, and CCWRD treatment facilities with reclaimed water for irrigation use. Reclaimed water use at schools is being planned.

- Reclaimed water is used as a coolant at a number of power generation stations in Clark County.

- In some areas, reclaimed water is available to contractors for dust control during earthmoving, grading, and construction activities.

- SNWA member agencies use 24 mgd for reuse and send more than 165 mgd of highly-treated wastewater to the Las Vegas wash for return credits.

- SNWA and CWC compared water reuse practices in Southern Nevada to those in other arid or semi-arid communities.

- SNWA will reclaim in-state water from outside the Las Vegas Valley through direct reuse, or accounting for these imports as consumptive use prior to reaching Lake Mead.

The CCRFCD, acting as lead agency and in conjunction with the DAQEM, initiated the following major sustainable measures with regards to managing storm water and urban runoff:

- A SWMP has been developed.

- A construction site inspection program has been implemented to reduce the amount of sediment and construction pollutants entering the storm drain system

- A public service announcement was developed focusing on the importance of keeping storm drains clear of clogging debris. Other PSAs developed by the CCRFCD focus on proper fertilizing of lawns, responsible disposal of pet waste, and the benefits of using commercial car washes.

- CCRFCD continues to participate in the Lake Mead Water Quality Forum, the Las Vegas Wash Coordination Committee, and the Management Advisory Committee for the Las Vegas Wash, with the goal of advocating additional storm water and urban runoff sustainability measures.

SNWA and some of the nation's largest water agencies formed the Water Utility Climate Alliance to improve research into the impacts of climate change on water utilities, develop strategies for adapting to climate change and implement tactics to reduce greenhouse gas emissions.

12.2.1.2 Clark County Department of Comprehensive Planning

The Clark County Comprehensive Plan (Clark County, 2006a) is a compilation of individual documents (elements) to guide the long-term general policy plan for the physical development of unincorporated Clark County. The Conservation Element of the Comprehensive Plan outlines policies for air quality, flood control, land conservation, species protection, water resources, and water quality. Clark County has prepared 11 land-use plans for the various subregions in the county to guide decisions on growth and development.

12.2.1.3 Clark County Regional Flood Control District

The CCRFCD service area includes Clark County and the incorporated cities of Boulder City, COH, CLV, Mesquite, and CNLV. CCRFCD is charged with developing a coordinated and comprehensive master plan to solve flooding problems, to regulate land use in flood hazard areas, to fund and coordinate the construction of flood control facilities, and to develop and contribute to the funding of a maintenance program for Master Plan flood control facilities.

In addition to flood protection, CCRFCD works to improve the water quality of stormflows consistent with the municipal stormwater NPDES permit. The CCRFCD also monitors rainfall and flow data during storms and works with appropriate public works and safety crews. The Las Vegas Valley Stormwater Quality Management Committee is a community partnership of the CCRFCD focused on the development and implementation of stormwater pollution monitoring, control, and outreach efforts within the Las Vegas Valley. The Stormwater Quality Management Committee prepares the SWMP, which describes the programs, practices, and responsibilities adopted by the Las Vegas Valley MS4 permittees to implement NPDES Permit No. NV0021911, including BMPs for construction activities. The MS4 permittees are CCRFCD, Clark County, the CLV, the CNLV, and the COH. The permit authorizes the permittees to discharge municipal stormwater runoff to Las Vegas Wash, its tributaries, and other waters of the United States.

12.2.2 Conservation District of Southern Nevada

The Conservation District of Southern Nevada (CDSN) provides resource conservation technical services, education, information, planning assistance, and coordination. Projects include air quality mitigation on vacant lands, demonstration gardens for water conservation, pet waste management for water quality improvement, stormdrain labeling for Las Vegas Wash and Lake Mead water quality improvement, and work at the Clark County Wetlands Park.

12.2.3 High Desert Resource Conservation & Development Council

Created by the U.S. Department of Agriculture (USDA), the nonprofit High Desert Resource Conservation & Development Council (RC&D) program is led by local volunteer councils that help people care for and protect their natural resources in a way that improves the local economy, environment, and living standards. To achieve these goals, RC&D partners with the private sector, corporations, foundations, and all levels of government. The purpose of RC&D is to promote conservation, development, and use of natural resources; to improve the general level of economic activity; and to enhance the environment and standard of living in all communities.

The area for the High Desert RC&D covers almost 22.5 million acres in the southern and central Nevada counties of Clark, Esmeralda, Lincoln, and Nye. The High Desert RC&D is involved with projects ranging from native seed banks, to tree planting, to weed eradication, to demonstration gardens. In cooperation with BLM, the Natural Resources Conservation Service, farmers, and schools, the RC&D sponsors the Nevada Native Seed Project, a program to raise native seed suitable for rehabilitation of Mojave Desert land in southern Nevada (RC&D, 2007).

Relative to water resources planning in Clark County, since RC&D projects emphasize vegetation restoration, they would be expected to decrease sediment erosion and therefore locally improve surface water quality.

12.2.4 U.S. Fish and Wildlife Service

USFWS is the federal agency that works to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. With the goal of conserving ecosystems upon which threatened and endangered species of fish, wildlife and plants depend, Congress passed the FESA in 1973. The FESA:

- Defined categories of "endangered" and "threatened" (FESA Section 3)
- Made plants and all classes of invertebrates eligible for protection (FESA Section 3)

- Required federal agencies to undertake programs for the conservation of endangered and threatened species and prohibited federal agencies from authorizing, funding, or carrying out any action that would jeopardize a listed species or destroy or modify its "critical habitat" (FESA Section 7)

- Applied broad taking prohibitions to all endangered animal species, which could apply to threatened animal species by special regulation (FESA Section 9)

- Made matching federal funds available for states with cooperative agreements (FESA Section 6)

Under Section 7 of the FESA, federal agencies must consult with USFWS to determine potential impacts on protected species from proposed projects. USFWS has established a system of informal and formal consultations under Section 7 to ensure compliance with the FESA. In Clark County, the MSHCP facilitates FESA compliance for some water resources projects that do not involve federal agencies.

12.2.4.1 Virgin River Restoration Efforts

USFWS manages restoration efforts on the Virgin River, including areas in Clark County. The Virgin River's headwaters are in Washington, Kane, and Iron Counties of Utah, and the lower reaches run through Mohave County, Arizona, and Clark and Lincoln Counties, Nevada, eventually emptying into the Colorado River at Lake Mead. The overall watershed for the river is 5,900 square miles, much of it federal or state lands. The Virgin River riparian corridor, home to more than 200 species of wildlife (U.S. Army Corps of Engineers [USACE], undated), is being impacted by invasive species as well as rapidly expanding urban development.

The USFWS Virgin River Fishes Recovery Team was formed in 1990 after the listing of Virgin River chub as an endangered species. The Lower Virgin River Recovery Implementation Team was subsequently formed to assist in the recovery of a variety of species and habitats along the Virgin River. The primary objective of the USFWS Virgin River Fishes Recovery Plan (USFWS, 1995b) is to prevent the extinction of the woundfin minnow and the Virgin River chub. Recovery goals include protection of the required stream flows and water quality of the Virgin River to support self-sustaining populations and reestablishing self-sustaining populations in other locations. The long-term goal is to downlist these species to threatened status, although due to the irretrievable loss and degradation of the majority of their habitat and the existing and future pressures from water development, it is not certain that the two species can be recovered sufficiently to the point where delisting is possible (USFWS, 2006).

Together with USFWS, the Utah Department of Natural Resources, Washington County Water Conservancy District, NPS, BLM, Dixie Conservation District, Washington County Farm Bureau, and The Nature Conservancy work together as part of the Virgin River Program, which strives to protect, enhance, conserve, and recover native species in the Virgin River Basin while ensuring that water development can continue in a sustainable manner. Virgin River Program activities include:

- Enhancing and protecting floodplain and wildlife habitat
- Guiding proactive water development strategies to allow continued economic growth and recovery of fish and wildlife habitat
- Monitoring and stocking fish (including woundfin minnow stocking on October 17, 2007)
- Controlling nonnative fish (including rotenone applications in select reaches to eradicate red shiner)
- Providing water releases to enhance fish survival during low-flow periods
- Installing fish screens and providing fish passage on diversion structures
- Outreaching to local schools and communities
- Assisting with watershed planning measures and developing master plans for the basin to guide floodplain management, flood damage restoration, revegetation, and infrastructure protection

12.2.4.2 Muddy River Restoration Efforts

Approximately 60 miles northeast of Las Vegas, the Muddy River begins as a series of thermal springs in the Moapa Valley before reaching Lake Mead. Before Hoover Dam was constructed, the river flowed into the Virgin River just upstream of the confluence with the Colorado River. The Muddy River is habitat for the federally endangered Moapa dace as well as other species of concern, including invertebrates (Moapa pebblesnail (*Fluminicola avernalis)*, grated tryponia (*Tryponia clathrata*), Moapa warm spring riffle beetle (*Stenelmis moapa*), Amargosa naucorid (*Ambrysus amargosus*), and the Moapa naucorid (*Usingerina moapensis*), fish (Moapa White River springfish (*Crenichthys baileyi*), and birds (loggerhead shrike [*Lanius ludovicianus]* and phainopepla [*Phainopepla nitens]*). Moapa dace are limited to stream habitat in five thermal headwater spring systems and the main stem of the upper Muddy River (USFWS, 1995a). Occupied habitat in the upper river and in four of the spring systems is on private land. The fifth spring system originates on the Moapa Valley National Wildlife Refuge (NWR), but the outflow flows through private land before reaching the Muddy River. Located on 106 acres in northeastern Clark County, the Moapa Valley NWR was established in 1979 to secure dace habitat. Stresses to the ecosystem include exotic plant species (tamarisk and Russian knapweed), nonnative animal species (crayfish, tilapia, bullfrog), groundwater withdrawals in the Coyote Spring Valley, river entrenchment, and land development.

The Muddy River Project is a collaboration of USFWS, Clark County, BLM, the locally based nonprofit Muddy River Regional Environmental Impact Alleviation Committee (MRREIAC), and The Nature Conservancy. Its aims are to protect and restore the Mojave Desert aquatic ecosystem (enhance the riparian area, clear and revegetate the river, clear areas for picnicking and camping, and improve water quality and quantity), forge positive working relationships between public and provide stakeholders, and to ensure the success of the Clark County MSHCP.

The USFWS developed a *Muddy River Ecosystem Recovery Plan* (1995a) to address management of the Moapa dace and the seven species of special concern. Made up of federal and state agencies, environmental organizations and local stakeholders working together, the Muddy River Restoration Implementation Team was formed in 1998 to identify specific actions to protect both aquatic and riparian communities along the river, including: protection of instream flows and historic habitat, restoration/management activities, dace population monitoring, dace health research, and public information and education.

USFWS staff work with The Nature Conservancy to manage the Moapa Valley NWR. The endangered Moapa dace have increased in number as stream habitat has been restored by removing excess vegetation, removing gravel, and restoring natural pools, riffles, and the stream bottom. Other efforts focus on control of tilapia, an exotic fish species which threatens the dace and other native fish in the Muddy River.

12.2.5 U.S. Army Corps of Engineers

The USACE is the federal agency that provides engineering services to the nation including:

- Planning, designing, building and operating water resources and other civil works projects
- Designing and managing the construction of military facilities for the Army and Air Force
- Providing design and construction management support for other Defense and federal agencies

Relevant to Clark County water resources, the USACE has initiated a watershed study of the Virgin River basin. Approximately 70 stakeholders have provided input to the process that includes a multi-jurisdictional floodplain management strategy, a watershed analysis identifying ongoing activities and areas of additional work, and an overall watershed strategy with an implementation plan (USACE, 2007). Top issues identified by the stakeholders include floodplain management, land-use planning, invasive species, sensitive species (including woundfin minnow, Virgin River chub, and the Virgin spinedace [*Lepidomeda mollispinis mollispinis*]), and water supply.

12.2.6 Bureau of Land Management

BLM is the federal agency responsible for carrying out management and conservation programs on 258 million surface acres, as well as 700 million acres of subsurface mineral estate. These public lands make up about 13 percent of the total land surface of the United States and more than 40 percent of all land managed by the federal government.

Relevant to Clark County water resources, BLM has conducted tamarisk removal efforts (Healthy Forest Initiative project) along the Virgin River near Bunkerville and Mesquite to reduce the fire threat to these rapidly growing communities, and to achieve sustainable restoration of the high-value riparian habitats. Crews have treated more than 5,000 acres using mechanical, hand-cutting, herbicidal, seeding, and prescribed pile burning techniques, resulting in significant reestablishment of native plants.

Tamarix ramosissima (saltcedar or tamarisk) is an invasive shrub that out-competes native riparian taxa since it can tolerate saline soils and periods without water and since it is a large seed producer and sprouter. Tamarisk also has a high evapotranspiration rate and in general provides overall lower habitat values than native species. Tamarisk is considered a water quality and quantity problem on the Virgin River, resulting in increased evapotranspiration (and therefore water volume reductions) and increased soil salinity.

BLM administers approximately 55.6 percent of the land in Clark County (BLM, 1998). In 1992, BLM released the Stateline Resource Area Draft Resource Management Plan/Environmental Impact Statement. Since then, the Stateline Resource Area was renamed as the Las Vegas Field Office. The Las Vegas Resource Management Plan and Final Environmental Impact Statement were released in 1998. The plan provides management guidance for about 3.7 million acres of public land in the Las Vegas Field Area, focused on: land tenure, desert tortoise, mineral development, offroad vehicle use, special management area, areas of critical environmental concern, and utility corridors. Many of the federal resource management activities in the county will overlap or impact water resources planning activities by Clark County. Relative to water resources planning, the Resource Management Plan includes measures such as:

- Determine water needs to meet objectives
- File for water rights on public and acquired lands, in accordance with state water laws, for those waters not federally reserved
- Minimize point and nonpoint sources of pollution (including salts) following Best Management Practices
- Determine instream flow requirements and apply for necessary water rights on the Virgin River and Meadow Valley Wash
- Maintain the quality of waters presently in compliance and improve the quality of those waters found to be in noncompliance with state and/or federal water quality standards
- Minimize the threat of flood and sediment damage on populated areas from public land management actions by providing lands necessary to construct flood control structures
- Use appropriate measures for improvement of riparian areas, including fencing and/or alternate water sources away from the riparian area
- Maintain existing wildlife waters; construct new guzzlers, as needed; design new waters for lifestock, wild horses, and burros to reduce potential conflicts with wildlife
- Participate in an eligibility determination of the Virgin River for Wild and Scenic River designation when initiated by either Arizona or Utah BLM
- Manage Moapa NWR to complement spring and aquatic habitat for special status species, including projects that may affect groundwater level or spring flows

12.2.7 Bureau of Indian Affairs

The Bureau of Indian Affairs (BIA) is the federal agency responsible for the administration and management of 55.7 million acres of land held in trust by the United States for American Indians, Indian tribes, and Alaska Natives. BIA develops forestlands, leases assets, directs agricultural programs, protects water and land rights, develops and maintains infrastructure, and conducts economic development. Within the 208 planning area is the Moapa River Indian Reservation (or Moapa Indian Reservation) - the 71,954-acre land-base for the Moapa Band of Paiute Indians.

12.2.8 Nevada Division of Environmental Protection

NDEP's mission statement is "to protect and enhance the environment of the state, consistent with the public health and enjoyment, the propagation and protection of terrestrial and aquatic life, the operation of existing industries, the pursuit of agriculture, and economic development of the state." Relative to water resources planning, NDEP is the administering agency for the SDWA, NPDES (discharge permits) and Water Quality Certification (CWA Section 401) programs for the state. The Bureau of Safe Drinking Water protects public health by assuring that the public water systems provide safe and reliable drinking water. The BWPC protects the waters of the state from the discharge of pollutants by issuing discharge permits, which define the quality of the discharge necessary to protect the quality of the waters of the state, enforcing the state's water pollution control laws and regulations, and by providing technical and financial assistance to dischargers. (Section 7 summarizes existing discharge permits in Clark County.) The Bureau of Water Quality Planning protects the beneficial uses of ground and surface waters through the establishment of water quality criteria and an antidegradation policy to protect and maintain existing water quality.

NDEP is the certifying agency for the WQMP prior to the document being submitted to EPA.

12.2.9 Southern Nevada Water Authority

SNWA is a cooperative agency composed of seven member agencies (BBWD, Boulder City, CCWRD, COH, CLV, LVVWD, and CNLV), which addresses southern Nevada's water needs on a regional basis. As the regional water resources planning agency for the Las Vegas Valley, SNWA's responsibilities include:

- Managing all water supplies available to southern Nevada through an approved water budget
- Managing regional water resource management and conservation programs

- Ensuring regional water quality as determined by state and federal standards
- Allocating and distributing Colorado River water and any other water that becomes available to southern Nevada among water purveyors
- Long-term water resource planning
- Presenting a unified position on water issues facing southern Nevada
- Building and operating regional facilities to provide a reliable drinking water delivery system to all member agencies

SNWA administers and funds several projects in Clark County including research projects on the Muddy River, Virgin River, and Lake Mead.

In the Muddy River, SNWA is a member of the Executive Committee of the Muddy River Recovery Implementation Program (RIP). The RIP is an endangered species program whose participants work toward water resource development and recovery of federally listed species. The RIP Program Area extends from the headwaters of the Muddy River downstream to the confluence of Lake Mead. To that end, SNWA is committed to the protection of the federally protected species in the Muddy River and its tributaries and favors the protection of water quality that benefits the listed species.

In the Muddy River, SNWA participates in interagency surveys for protected species in the Muddy River related to SNWA water resources. These include: Moapa dace (Moapa coriacea), Moapa speckled dace (Rhinicthys osculus moapae), Moapa White River springfish (Crenichthys baileyi moapae), Virgin River chub (Gila seminuda), southwestern willow flycatcher (Empidonax traillii extimus), Yuma clapper rail (Rallus longirostris yumanensis) and yellow-billed cuckoo (Coccyzus americanus). SNWA also partially funds and cooperates in spring habitat restoration and surveys for endemic macro-invertebrates.

In September 2007, SNWA acquired Southern Nevada Public Lands Management Act funding to purchase the Warm Springs Natural Area in Moapa. Twenty or so thermal springs form the headwaters of the Muddy River and lie within 1218-acre Warm Springs Natural Area and Moapa Valley National Wildlife Refuge. The entire Moapa dace population - which is dependent on the thermal properties of the springs - exists on the Warm Springs Natural Area and the Refuge. SNWA committed to manage the property as a natural area for the benefit of the endangered Moapa dace and other sensitive species.

In the Virgin River, SNWA is involved in the following biological research projects: water consumption by native and nonnative (tamarisk) vegetation, riparian vegetation mapping, and

surveys for the Virgin River chub and woundfin (Plagopterus argentissimus). SNWA funds federally endangered bird surveys in the Virgin River for southwestern willow flycatcher, yellow-billed cuckoo, and Yuma clapper rail. In addition, SNWA is a member of the Executive Committee of the Virgin River Habitat Conservation Recovery Program and a member of the Virgin River Conservation Partnership.

12.3 CLARK COUNTY WATER QUALITY MANAGEMENT PLANNING PROCESS FLOW DIAGRAM

The 208 WQMP planning process, once initiated, is an ongoing area-wide water quality plan. There are no specific update requirements, however Section 130.6 Part 130 40 CFR Chapter One states: "area-wide water quality management plans shall be updated as needed to reflect changing water quality conditions, results of implementation actions, new requirements or to remove conditions in prior conditional or partial plan approvals." In addition, Nevada Revised Statute 244A.571 states the specific required elements of a water quality management plan. Conformance with the current approved area-wide WQMP is necessary in order for NDEP to issue NPDES permits. There are three other conditions that can trigger a WQMP revision:

- NPDES discharge permit is sought for a facility not included in the current, certified WQMP.
- NPDES discharge permit is sought for an existing facility at a capacity not included in the current, certified WQMP.
- EPA funding is sought for a facility not included in the current, certified WQMP.

Once one of these conditions has been identified, the WQMP planning process begins. **Figure 12-1** depicts the 208 planning process in Clark County.

12.4 SUMMARY

Integration among the different agencies that plan and implement environmental projects is essential to successful protection and use of water resources in the region. Compliance requirements with environmental laws, regulations, and plans can significantly influence the location and timing of water infrastructure projects. Already a major participant in environmental planning activities, Clark County will continue to coordinate with all relevant groups. Furthermore, as county-initiated projects develop, Clark County will work with appropriate state and federal agencies to obtain necessary permits and approvals.

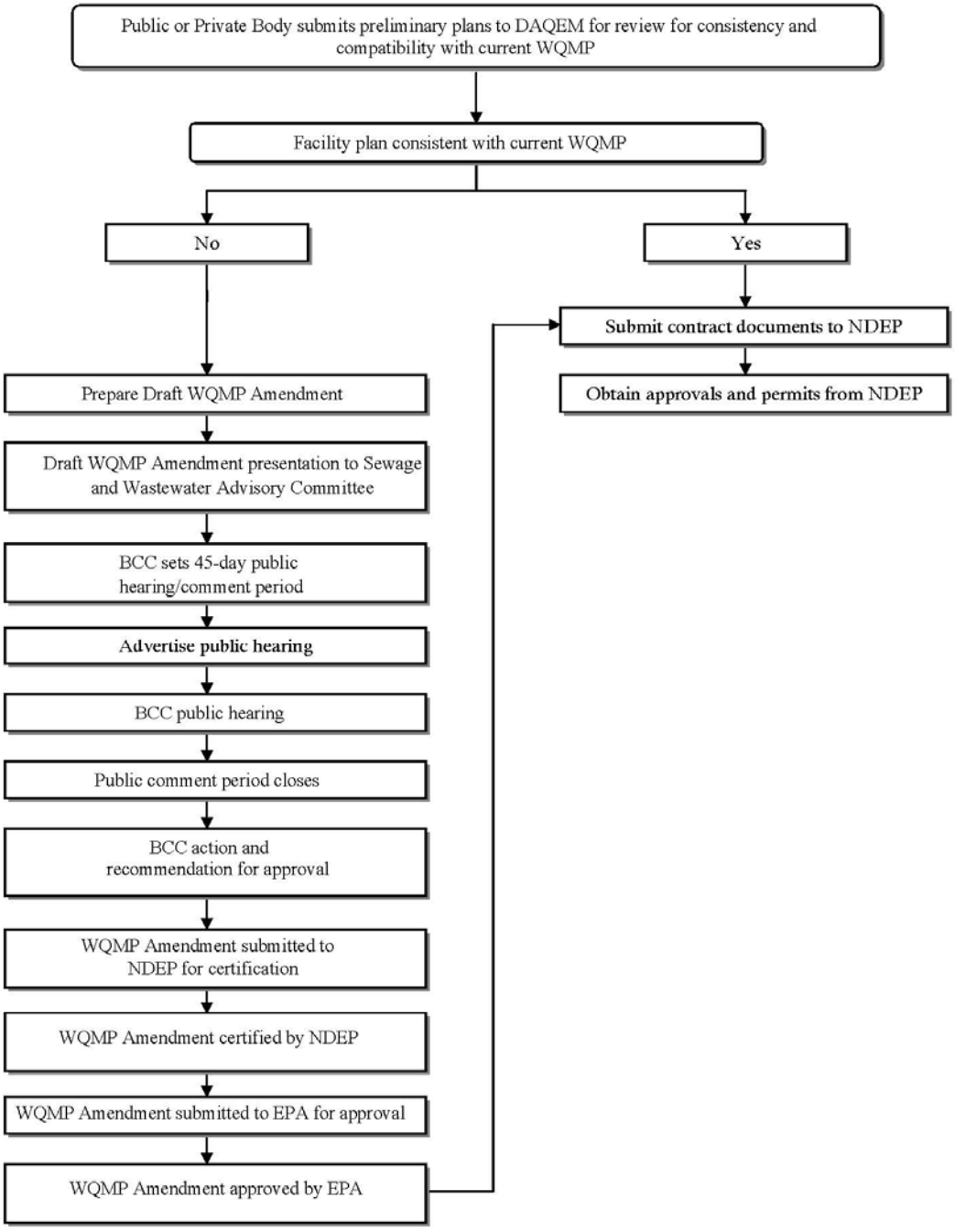


Figure 12-1
Water Quality Management Planning Process for Clark County, Nevada

12.5 RECOMMENDATIONS

The recommendations for environmental/integrated planning coordination were compiled from previous WQMPs in Clark County and discussions with the *Clark County Area-Wide WQMP* POC. The following are the recommendations pertaining to the environmental/integrated planning coordination for the *Clark County Area-Wide WQMP*:

- Continue communications with all relevant agencies, including the Conservation District of Southern Nevada, High Desert Resource Conservation and Development Council, CWC, SNWA, Mesquite, Moapa Valley and Bunkerville Citizen's Advisory Committees, NDEP, U.S. National Park Service, Reclamation, U.S. Bureau of Land Management, USFWS, U.S. Bureau of Indian Affairs, U.S. Army Corps of Engineers, and the Colorado River Commission.

- Review all projects for conformance with DAQEM rules and regulations. Implement mitigation measures for air quality impacts, as necessary.

- Continue implementation of the recommendations in the Clark County Solid Waste Management Plan. Measures relevant to water quality protection include: control of littering and illegal dumping; increased education on waste stream separation and recovery; and identification and analysis of bio-solids management alternatives.

- Continue to coordinate revegetation and other mitigation efforts for utility crossings of Las Vegas Wash (e.g., BLM, TTF, and Southwest Gas Corp.) with the Wetlands Park Wetland Mitigation and Riparian Enhancement Plan.

- Coordinate construction of flood control facilities with improvements included as part of the Clark County Wetlands Park.

- Continue cooperation between the four municipal agencies in Las Vegas Valley (Planning Area 5) in complying with the NPDES municipal stormwater permit; this will include joint efforts in stormwater monitoring, public education, BMP planning, and other efforts of the Stormwater Quality Management Committee.

- Coordinate nonpoint source management strategies with other watershed management approaches adopted by the wastewater agencies in the Las Vegas Valley (Planning Area 5).

- Continue cooperation between the municipalities in the Las Vegas Valley (Planning Area 5) and NDEP in addressing stormwater runoff quality and illegal/illicit discharges from construction sites and industrial properties.

- Expand educational programs that encourage conservation and protection of water resources.

- Perform periodic analysis and continued coordination of land and water availability to address environmental issues.

- Coordinate efforts with DAQEM to ensure the PM10 Air Quality State Implementation Plan is consistent with the WQMP.

- In 2007, Clark County passed an Eco-County Initiative to reduce greenhouse emissions and conserve resources and has convened a committee to assess sustainability issues. Local government agencies should continue to study and recommend measures to improve conservation efforts and evaluate the impacts of their policy decisions on the local ecological resources.

- The CWC should continue water quality sampling for emerging contaminants, tracking emerging treatment technologies for their removal, and reviewing data every three years.

- The actions recommended in the on-going CWC Selenium Management Plan should be reviewed and adopted as appropriate by the affected agencies.

12.6 REFERENCES

Brean, H., *New Owners Safeguarding Moapa Dace, Las Vegas Review-Journal*, January 3, 2008.

Clark County, *Clark County Desert Conservation Plan*, Prepared by RECON, 1995.

Clark County, *Final Clark County Nevada Multiple Species Habitat Conservation Plan and Environmental Impact Statement,* Prepared by RECON, 2000.

Clark County, *Clark County Comprehensive Plan as Amended*, Clark County, Nevada, 2006a.

Clark County, *Adaptive Management Report for the Clark County, Nevada Multiple Species Habitat Conservation Plan,* Unpublished Report from Clark County, Nevada, as Plan Administrator to US Fish and Wildlife Service. 116 pp, 2006b.

Clark County Department of Air Quality and Environmental Management, *Construction Activities Dust Control Handbook*, Adopted March 18, 2003.

----- *PM10 State Implementation Plan Milestone Achievement Report*, June 2007.

Clark County Department of Comprehensive Planning and U.S. Fish and Wildlife Service, *Preliminary Draft Clark County Multiple Species Habitat Conservation Plan and Environmental Impact Statement for Issuance of a Permit to Allow Incidental Take of 69 Species in Clark County, Nevada*, Prepared by RECON, 1998.

High Desert Resource Conservation and Development Council, *Annual Report,* January 2007.

Las Vegas Valley Stormwater Quality Management Committee, *Las Vegas Valley Storm Water Management Plan for Municipal Separate Storm Sewer System*, September 2003.

Southern Nevada Water Authority, *Being Environmentally Responsible Means Looking Out for the Little Guy*, *SNWA Fact Sheet*, 2008. Accessed March 25, 2008, at: http://www.snwa.com/assets/pdf/ad_2006_dace.pdf

U.S. Army Corps of Engineers, *Planning Ahead, Notes for the Planning and Policy Committee, Vol. 10, Issue 1*, January 2007. Accessed January 17, 2008, at: http://www.usace.army.mil/cw/cecw-cp/news/pa_newsletter/v10i1.pdf

----- *Virgin River and Tributaries – Utah, Arizona and Nevada, Comprehensive Analyses of Multi-jurisdictional Use and Management of Water Resources on a Watershed or Regional Scale*, Prepared by S. Estergard, Undated. Accessed at: http://www.usace.army.mil/cw/cecw-cp/news/Multi_juris_Virgin_River.pdf.

U.S. Department of the Interior, Bureau of Land Management, *Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement*, 1998.

U.S. Fish and Wildlife Service, *Endangered and Threatened Wildlife and Plants: Desert Tortoise, Final Rule*, Federal Register 55:12176-12191, 1990.

----- *Recovery Plan for the Rare Aquatic Species of the Muddy River Ecosystem*, 1995a.

----- *Virgin River Fishes Recovery Plan*, 1995b.

----- *Section 10 Take Permit for the Clark County Multiple Species Habitat Conservation Plan*, Carson City, Nevada, 2001.

----- *Analysis of Recovery Plan Implementation for Threatened and Endangered Warm Water Fishes of the Gila River Basin, Desert Fishes Team Report Number 3*, December 2006. Accessed at: http://www.peer.org/docs/fws/06_20_12_desert_fish_rpt.pdf

Section 13

Section 13
Recommendations

13.1 RECOMMENDATIONS

The following are the priority recommendations from the sections of the *Clark County Area-Wide WQMP*. The recommendations are organized by the sections of the document.

13.1.1 Section 2 – Population Projections

- Population projections for Clark County should be reviewed and revised as appropriate in future updates of the WQMP. CBER population forecasts should continue to be considered when making population projections.

13.1.2 Section 3 – Wastewater Flow Projections

- Coordination should continue between the SNWA, CWC, the wastewater dischargers to assure a proactive approach to identify future needs.

13.1.3 Section 4 – Water Quality Standards/Planning

- The WQMP should be updated and amended every five years. Amendments on a five-year basis will help to ensure that discharge permit revisions and applications are consistent with the WQMP, and that changing environmental conditions such as air and water quality can be integrated in a timely manner. The five-year update should include a status report on the recommendations contained in the previous WQMP.

13.1.4 Section 5 – Wastewater Collection, Treatment, and Disposal

- If plans to convert septic systems to connection to the sewer system are developed, the wastewater flow projections in each planning area should be revisited in future updates to the *Clark County Area-Wide WQMP*. If problems arise regarding the decommission of these septic systems or a major expansion occurs, then a feasibility study should be performed for the respective wastewater collection and treatment facilities.

- Expand household and commercial/industrial chemical and hazardous waste education and collection programs in accordance with potential growth in Clark County.

- Request the CCWRD to continue to monitor development in outlying communities such as Goodsprings and Sandy Valley and prepare facility needs assessments as necessary.

13.1.5 Section 6 – Water Reclamation

- CWC and SNWA are preparing the *Southern Nevada Regional Water Reuse Study*, which will update information provided in the *AWRS (2000)*. Future updates to the *Clark County Area-Wide WQMP* should include reclaimed water and reuse opportunities from the updated *Southern Nevada Regional Water Reuse Study*. A basic definition of reuse vs. reclamation should be included in the *Southern Nevada Regional Water Reuse Study*, and this definition should be incorporated into future WQMPs.

- Expanded Use of Gray Water and Reclaimed Water for Irrigation await the findings of the Southern Nevada Regional Water Recycling Study to ensure that this plan is correctly aligned with its recommendations.

- Assuming the TDS and salinity issues can be addressed, the CCWRD and the Moapa Valley Water District should work together to evaluate potential opportunities for water reclamation in the Moapa Valley Township (Planning Area 2).

- Evaluate/design new and existing public facilities and work with SNWA Conservation Department to add/retrofit irrigation systems to operate using reclaimed water.

- Review effluent reuse or water reclamation regulations that can benefit local end uses such as the aggregate industry, dust control, landscape irrigation, or other uses as deemed appropriate to maximize water conservation. This should be performed at existing wastewater treatment facilities and included in future plans for new wastewater treatment facilities.

- Boulder City has hired a consultant to complete a wastewater disposal/reuse study. Naturally, reuse alternatives will be far more expensive than the current disposal system. A collaborative effort among stakeholders should be employed to help fund reuse alternatives.

13.1.6 Section 7 – Point Sources

- CCRFCD and other agencies should proceed with implementation of master plans and other projects to mitigate channel erosion on Muddy River in lower Moapa

Valley and Hidden Valley (Planning Area 2), and on major tributaries in Mesquite and Moapa Valley.

- Public right-of-way, either in fee title or through conservation easements, should be obtained along the major watercourses in Clark County to allow for implementation of future projects and programs to mitigate erosion problems and preserve healthy riparian corridors.

- Clark County should work with CCRFCD to arrive at a method of determining the location and nature of impervious surfaces in the Valley, and to develop a map and database documenting this information.

- NDEP should provide a map and database to the CCDCP documenting dewatering NPDES permits issued in Planning Area 5, and that this be updated on a regular basis.

13.1.7 Section 8 – Nonpoint Sources

- Establish a financial assistance program for existing property owners relatively close to sewer lines to convert from septic systems to municipal wastewater treatment per DAQEM's April 2008 *Clark County Individual Sewage Disposal System Conversion Study*.

- Agencies should implement a pollution prevention program or participate in a cooperative regional pollution prevention program to address nonpoint source pollution in cooperation with the SQMC.

- Monitor local groundwater for elevated nitrate concentrations in areas with septic system densities approaching NDEP's allowed densities. When elevated concentrations are found, identify the source and potentially repair malfunctioning septic systems or connect to a municipal sewer system.

- Agencies should be encouraged to formulate a plan to address unpaved roads within the respective jurisdictions relative to stormwater management.

13.1.8 Section 9 – Best Management Practices and Alternative Treatment Methods and Disposal

- The more urban areas of Planning Areas 2, 3, and 4 should apply permanent and construction BMPs.

- The rural areas of Planning Areas 2, 3, and 4 should implement farming and livestock BMPs consistent with the Nevada *BMP Handbook* and potentially take advantage of NRCS technical and financial assistance.

- CCRFCD currently serves as lead agency and coordinator for the Las Vegas Valley stormwater discharge permit compliance effort. CCRFCD should provide similar assistance to Clark County communities in Planning Areas 2, 3, and 4 in development of BMP programs, if requested.

13.1.9 Section 10 – Wellhead Protection

- Coordinate and/or assist with developing wellhead protection plans and public outreach programs about groundwater protection for communities that rely on groundwater supplies for potable water.

- Clark County should work with SNWA to develop a County-wide wellhead protection ordinance. In support of this effort, it is recommended that SNWA provide a comprehensive database and map inventory of groundwater wells currently in use and those not in use, and determine the number and location of all abandoned groundwater wells.

13.1.10 Section 11 – Colorado River and Lake Mead

- As additional acreages of wetlands are developed in the Clark County Wetlands Park, continue implementation of a water quality sampling program to document the treatment of wastewater effluent by wetlands systems.

- The Water Quality Plans and goals adopted by the LVVWAC should be used for future 208 WQMP amendments, to the extent that they cover the same planning areas.

13.1.11 Section 12 – Environmental / Integrated Planning Coordination

- Coordinate nonpoint source management strategies with other watershed management approaches adopted by the wastewater agencies in the Las Vegas Valley (Planning Area 5).

- Expand educational programs that encourage conservation and protection of water resources.

- The actions recommended in the on-going CWC Selenium Management Plan should be reviewed and adopted as appropriate by the affected agencies.

Appendix A

Chronology of Major 208 Events

DAQEM
DEPARTMENT OF AIR QUALITY & ENVIRONMENTAL MANAGEMENT

Appendix A
Chronology of Major 208 Events

Feb 1965	The Water Pollution Control Act of 1965 was passed.
Jul 1968	The first community-wide effort to solve the Las Vegas Bay pollution problem was initiated. The interagency Water Pollution Control Task Force was formed and acted as a Technical Advisory Committee to the Clark County Board of County Commissioners (BCC).
Aug 1969	The Nevada State Board of Health issued a set of standards for immediate downstream discharge from the City of Las Vegas (CLV) Sewage Treatment Plant and the Clark County Water Reclamation District (CCWRD) Treatment Plant, formerly known as the Clark County Sanitation District (CCSD) Treatment Plant.
Dec 1971	The Environmental Protection Agency (EPA) notified the CCWRD and the CLV that the continued discharge of wastes into the watershed of Las Vegas Wash constituted a violation of the established state and federal water quality standards. The EPA allowed 180 days to resolve the violation or face federal pollution abatement action pursuant to Section 1 (g) of the Federal Water Pollution Control Act.
Jan 1972	In response to the EPA letter of violation, the BCC adopted a Resolution to expedite the construction of a wastewater treatment facility and appropriated funds for the completion of the required planning studies (Phase II) designed to meet EPA guidelines.
Oct 1972	The Federal Water Pollution Control Act (Clean Water Act) amendments (P.L. 92-500) is passed. This established a process for setting water quality standards, coordinating wastewater facilities, and creating an area-wide 208 Water Quality Management Plan. It required the Governor to designate an area-wide wastewater management agency responsible for Water Quality Management Plan activities.
Mar 1973	A draft Water Quality Management Plan was submitted to the Clark County Regional Planning Council, the State Bureau of Environmental Health, EPA and HUD for review. The State Legislature accepts the LVVWD report, but does not act on it.

Apr 1973	Senate Bill 288 and a portion of Chapter 244A (the County Sewage and Wastewater Law) was passed. These regulations charge Clark County with the responsibility of solving the pollution problems in the Las Vegas Bay and Wash.
Jul 1973	The LVVWD staff assigned to the Las Vegas Wash-Bay Pollution Abatement Project were transferred to Clark County to form a new department called the Wastewater Management Agency.
Jul 1973	The Sewage and Wastewater Advisory Committee (SWAC) was organized as required by NRS 244A.
Jul 1973	The 1973 session of the Nevada Legislature established Clark County as the lead agency responsible for implementing pollution abatement programs and developing beneficial wastewater re-uses. The Legislature also provided state bonding assistance for the acquisition of wastewater treatment facilities.
1973	The Nevada Bureau of Environmental Health issued water quality standards.
Sep 1973	The Office of the Attorney General for the State of Nevada released a legal opinion allowing the CLV to sell effluent and expand wastewater treatment capacity. The opinion noted that the plans must be coordinated with, and approved by the County, which is the master agency.
Sep 1973	The Wash Development Committee was appointed by the BCC to explore potential development of Las Vegas Wash as a park, recreational facility and wildlife center.
Nov 1973	The EPA approved the Nevada Water Quality Standards.
Mar 1974	The Governor held the first public meeting on the 208 area-wide wastewater management agency designation.
May 1975	NRS 244A was amended by the passage of Senate Bill 468. This amendment allowed the vesting of certain counties with 208 water quality management planning duties and responsibilities. It named Clark County as the master agency for wastewater treatment planning within its jurisdictional boundaries.
May 1975	The Governor designated Clark County as the 208 Water Quality Planning Management Agency. The EPA approved the Governor's designation.

Sep 1975	Clark County developed a 208 work plan and began the public hearing process.
Feb 1976	The final report of the Clark county area-wide Salinity Control Investigation was printed.
Jun 1976	Official statutory beginning of the 208 planning period.
Sep 1976	An area-wide Policy Advisory Committee, Citizen's Advisory Committee and a Technical Advisory Committee was created to guide development of the 208 plan.
Apr 1976	The first 208 reports were published. Four of the reports dealt with the following Las Vegas Wash issues: Las Vegas Wash development and coordination with the wastewater treatment facilities, salinity control recreation, and flood control aspects of the Wash.
Mar 1978	A draft plan of the 208 water quality management is published.
May 1978	Adoption of the 208 Plan by the BCC to develop technical and management plans for controlling point and non-point wastewater source pollution.
Jun 1978	Conditional certification of the 208 Plan by the State of Nevada.
Jul 1978	The BCC transfers 208 water quality planning functions from the CCWRD to the Department of Comprehensive Planning (DCP).
Mar 1979	The CLV, Clark County, the State of Nevada and the EPA enter into a Consent Decree agreeing on certain effluent limitations for the Las Vegas Wash and Lake Mead. It establishes a planning process to address other related issues such as treatment facilities planning, use of Las Vegas Wash and re-use of effluent. A multiple jurisdiction planning board, the Water Quality Study board (WQSB) is set up to manage what will be a new water quality standards and wastewater treatment facilities planning effort for the Las Vegas Valley. The program is called the "Las Vegas Valley Water Quality Program."
Jul 1979	Conditional approval from EPA for the May 1978 208 Plan received.
Oct 1979	The Revised Draft 208 Plan is published.
Dec 1979	Adoption of the Revised 208 Plan by the BCC.

May 1980	The revised area-wide 208 Plan is unconditionally certified by the State of Nevada.
Oct 1981	The revised area-wide plan is unconditionally approved by the U.S. EPA.
Nov 1982	Pursuant to Section 303 of the Clean Water Act, a triennial water quality study is submitted by the state to the EPA for their review and approval.
Mar 1984	The Division of Environmental Protection proposes a Water Quality Monitoring Program to define water quality problems, prioritize control, and schedule corrective actions to attain goals set in the continuing planning process.
Dec 1985	The BCC holds a public hearing to adopt a Resolution amending the area-wide 208 Plan by incorporating additional facilities necessary for wastewater collection, treatment and disposal as detailed in the reports entitled "Phase I Treatment Facility Study, 1980," "Facility Plan for 25 MGD Wastewater Treatment Plant Expansion, City of Las Vegas" January 1984, "Alternative Treatment Scenario for Las Vegas Valley Wastewater Flow, 1985," and further designating the Cities, Clark County and the CCWRD as the agencies responsible for the timing, financing and construction of facilities for their respective jurisdiction per the City/County cooperative Agreement. The BCC adopted the Resolution and the City/County Cooperative Agreement. This amendment to the 208 Plan was certified by the State of Nevada on June 3, 1986, however it was denied approval by the U.S. EPA on November 18, 1986.
Jan 1986	The City of Henderson requests that the Clark County Commission amend the 208 Plan to include activities related to the Lake Las Vegas project and for the expansion of the Henderson Sewage Treatment Facility.
Jun 1986	The State of Nevada certifies that the area-wide 208 Plan amendment adopted on December 16, 1985, and the City/County Cooperative Agreement is consistent with State Water Quality Management Objectives in a letter to EPA. This amendment to the 208 Plan was certified by the State of Nevada, however it was denied approval by the U.S. EPA on November 18, 1986.
Nov 1986	The EPA denies the January 1985 Resolution by the BCC to amend the area-wide 208 Plan amendment.

Sep 1987	The State Environmental Commission (SEC) adopts water quality standards for Las Vegas Wash and Lake Mead as proposed in June 1987.
Apr 1988	BCC adopts a resolution to amend the 208 Plan by adopting the revision entitled City of Henderson - Lake at Las Vegas.
Aug 1988	NDEP certifies the 208 Plan amendment incorporating the Lake at Las Vegas project. Oct 1988 BCC approved a cooperative agreement between CCWRD and Clark County to amend the 208 Plan for expansion of the capacity of treatment facilities.
Nov 1988	U.S. EPA approves the 208 Plan incorporating the City of Henderson Lake at Las Vegas project.
Nov 1988	BCC adopted resolution amending the 208 Plan to include a new section regarding Native American Indian Reservation jurisdictional authority, and to amend the Rural Areas section, and package plants for wastewater treatment.
Feb 1989	U.S. EPA unconditionally approves the revised 208 Plan for the Rural Areas of Clark County.
Jun 1990	BCC adopts a resolution incorporating the 208 Plan amendment addressing the anticipated need for sewage and wastewater treatment facilities in Laughlin.
Jun 1990	BCC adopts a resolution to amend the 208 Plan addressing the increasing population and wastewater flows to Las Vegas Wash.
Nov 1990	NDEP unconditionally approved the 6/90 Las Vegas Valley 208 Plan amendment.
Dec 1990	NDEP issues Las Vegas Valley National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit jointly to Clark County Regional Flood Control District, CLV, CNLV, City of Henderson (COH), Clark County, and Nevada Department of Transportation (NDOT).
Jun 1991	U.S. EPA unconditionally approved the 6/90 Las Vegas Valley 208 Plan amendment.
Jan 1993	U.S. EPA approves the 208 amendment addressing COH's request for continuous discharge to Las Vegas Wash.

Jan 1993	BCC adopts a resolution to amend the 208 Plan amendment (pages 1-13 and 3-41) for an increase in effluent disposal by the COH up to 10 MGD of treated wastewater to Las Vegas Wash on a year-round basis in addition to the seasonal 9.5 MGD discharge authorized by an existing NPDES permit.
Mar 1994	State of Nevada NDEP (French) publishes draft concentrations at North Shore Road.
Apr 1994	CLV treatment plant adds advanced treatment for phosphorus removal.
Nov 1994	CCWRD facilities come on-line.
Dec 1994	CLV treatment plant adds advanced treatment for ammonia removal.
Jun 1995	BCC directs staff to analyze sewer service planning areas in conjunction with an update to the Community District Element.
Aug 1995	BCC directs DCP to begin a Las Vegas Valley 208 Update, tying it to a request for an update to the Community District Element.
Oct 1995	MWH, formerly known as Montgomery Watson, was retained by DCP to produce 1.) a Scope of Work for the 1996 LVV 208 Update, 2.) an assessment of viable options for delineating sewer service boundary areas, and 3.) a map that would include sewer service facilities for each entity in the Valley with an overlay of the subdrainage basin.
Jan 1996	DCP distributed to SWAC the Draft Scope of Work for the Las Vegas Valley 208 Update.
Feb 1996	DCP requested wastewater flow projections (20 year) from CLV, COH, and CCWRD.
Apr 1996	The Scope of Work for the 1996 208 Water Quality Management Plan Update for the Las Vegas Valley is revised. DCP sends out for Requests for Proposals.
May 1996	The Las Vegas Valley dischargers request proposals for a facilities needs assessment for all three plants.
Jun 1996	MWH begins work on the Las Vegas Valley 208 Water Quality Management Plan Amendment.

Oct 1996	COH's first formal discharge begins.
Nov 1996	Lake at Las Vegas requests and is granted a discharge permit to release water from the dam and add fresh water.
Apr 1997	BCC holds the public comment period for the Las Vegas Valley 208 Water Quality Management Plan Amendment.
Sep 1997	MWH completes the Las Vegas Valley 208 Water Quality Management Plan Amendment.
Dec 1997	U.S. EPA approves the July 1997 Las Vegas Valley 208 Water Quality Management Plan Amendment.
Jul 1998	MWH is retained by CCDCP to amend the Clark County 208 Water Quality Management Plan Amendment to include the Northeast County 208 Water Quality Management Plan with a planning horizon through the year 2020.
May 2000	Draft Northeast County 208 Water Quality Management Plan is produced and reviewed by SWAC and the Technical Steering Committee
May 2000	BCC opens the public comment period for the Northeast County 208 Water Quality Management Plan.
Jun 2000	Public comment period for the Northeast County 208 Water Quality Management Plan closes. BCC hold public hearing.
Nov 2000	MWH completes the Northeast County 208 Water Quality Management Plan.
Apr 2001	The BCC approves an agreement with CH2M Hill to assist Clark County with preparing information for the South County WQMP.
2001	The BCC adopts the Las Vegas Valley Watershed Wastewater Needs Assessment Study and the Areawide Reuse Study as an implementation amendment to the 1997 Las Vegas Valley 208 WQMP.
Nov 2002	Forming of the Clean Water Coalition (CWC) as a joint powers authority under NRS 277.
Jun 2004	CH2MHill completes the South County WQMP.

Feb 2005	MWH is contracted and receives notice to proceed from the City of North Las Vegas to amend the July 1997 Las Vegas Valley 208 WQMP Amendment, to include the City of North Las Vegas (CNLV) Water Reclamation Facility to treat wastewater generated within CNLV limits. The final report is entitled the City of North Las Vegas Water Reclamation Facility Amendment to the 1997 Las Vegas Valley 208 WQMP.
May 2006	MWH completes the City of North Las Vegas Water Reclamation Facility Amendment to the 1997 to the Las Vegas Valley 208 Water Quality Management Plan.
Sep 2006	MWH is retained by CCDAQEM to prepare the Clark County Area-Wide WQMP with a planning horizon through the year 2030.
Oct 2007	The State of Nevada certifies the June 2007 Amendment to the Northeast Clark County 208 WQMP.
Dec 2007	U.S. EPA approves the June 2007 Amendment to the Northeast Clark County 208 WQMP.
Jun 2008	PBS&J is retained by CCDAQEM to create a public outreach campaign for the Clark County Area-Wide WQMP and to produce the final WQMP.

Appendix B

Federal and State of Nevada Water Quality Legislation

DAQEM
DEPARTMENT OF AIR QUALITY & ENVIRONMENTAL MANAGEMENT

Appendix B
Federal and State of Nevada Water Quality Legislation

FEDERAL WATER POLLUTION CONTROL ACT
Section 208, p. 70

AREAWIDE WASTE TREATMENT MANAGEMENT

SEC. 208. (a) For the purpose of encouraging and facilitating the development and implementation of area wide waste treatment management plans—

(1) The Administrator, within ninety days after the date of enactment of this Act and after consultation with appropriate Federal, State, and local authorities, shall by regulation publish guidelines for the identification of those areas which, as a result of urbanindustrial concentrations or other factors, have substantial water quality control problems.

(2) The Governor of each State, within sixty days after publication of the guidelines issued pursuant to paragraph (1) of this subsection, shall identify each area within the State which, as a result of urban-industrial concentrations or other factors, has substantial water quality control problems. Not later than one hundred and twenty days following such identification and after consultation with appropriate elected and other officials of local governments having jurisdiction in such areas, the Governor shall designate (A) the boundaries of each such area, and (B) a single representative organization, including elected officials from local governments or their designees, capable of developing effective areawide waste treatment management plans for such an area. The Governor may in the same manner at any later time identify any additional area (or modify an existing area) for which he determines areawide waste treatment management to be appropriate, designate the boundaries of such area, and designate an organization capable of developing effective areawide waste treatment management plans for such area.

(3) With respect to any area which, pursuant to the guidelines published under paragraph (1) of this subsection, is located in two or more States, the Governors of the respective States shall consult and cooperate in carrying out the provisions of paragraph (2), with a view toward designating the boundaries of the interstate area having common water quality control problems and for which areawide waste treatment management plans would be most effective, and toward designating, within one hundred and eighty days after publication of guidelines issued pursuant to paragraph (1) of this sub-section, of a single representative organization capable of developing effective areawide waste treatment management plans for such area.

(4) If a Governor does not act, either by designating or determining not to make a designation under paragraph (2) of this subsection, within the time required by such paragraph, or if, in the case of an interstate area, the Governors of the States involved do not designate a planning organization within the time required by paragraph (3) of this subsection, the chief elected officials of local governments within an area may by agreement designate (A) the boundaries for such an area, and (B) a single representative organization including elected officials from such local governments, or their designees, capableof developing an areawide waste treatment management plan for such area.

(5) Existing regional agencies may be designated under paragraphs (2), (3), and (4) of this subsection.

(6) The State shall act as a planning agency for all portions of such State which are not designated under paragraphs (2), (3), or (4) of this subsection.

(7) Designations under this subsection shall be subject to the approval of the Administrator.

(b)(1)(A) Not later than one year after the date of designation of any organization under subsection (a) of this section such organization shall have in operation a continuing areawide waste treatment management planning process consistent with section 201 of this Act. Plans prepared in accordance with this process shall contain alternatives for waste treatment management, and be applicable to all wastes generated within the area involved. The initial plan prepared in accordance with such process shall be certified by the Governor and submitted to the Administrator not later than two years after the planning process is in operation.

(B) For any agency designated after 1975 under subsection (a) of this section and for all portions of a State for which the State is required to act as the planning agency in accordance with subsection (a)(6), the initial plan prepared in accordance with such process shall be certified by the Governor and submitted to the Administrator not later than three years after the receipt of the initial grant award authorized under subsection (f) of this section.

(2) Any plan prepared under such process shall include, but not be limited to—

(A) the identification of treatment works necessary to meet the anticipated municipal and industrial waste treatment needs of the area over a twenty-year period, annually updated (including an analysis of alternative waste treatment systems), including any requirements for the acquisition of land for treatment purposes; the necessary waste water collection and urban storm water runoff systems; and a program to provide the necessary financial arrangements for the development of such treatment works, and an identification of open space and recreation opportunities that can be expected to result from improved water quality, including consideration of potential use of lands associated with treatment works and increased access to water-based recreation;

(B) the establishment of construction priorities for such treatment works and time schedules for the initiation and completion of all treatment works;

(C) the establishment of a regulatory program to—

(i) implement the waste treatment management requirements of section 201(c),
(ii) regulate the location, modification, and construction of any facilities within such area which may result in any discharge in such area, and
(iii) assure that any industrial or commercial waste discharged into any treatment works in such area meet applicable pretreatment requirements;

(D) the identification of those agencies necessary to construct, operate, and maintain all facilities required by the plan and otherwise to carry out the plan;

(E) the identification of the measures necessary to carry out the plan (including financing), the period of time necessary to carry out the plan, the costs of carrying out the plan within such time, and the economic, social, and environmental impact of carrying out the plan within such time;

(F) a process to (i) identify, if appropriate, agriculturally and silviculturally related nonpoint sources of pollution, including return flows from irrigated agriculture, and their cumulative effects, runoff from manure disposal areas, and from land used for livestock and crop production, and (ii) set forth procedures and methods (including land use requirements) to control to the extent feasible such sources;

(G) a process of (i) identify, if appropriate, mine-related sources of pollution including new, current, and abandoned surface and underground mine runoff, and (ii) set forth procedures and methods (including land use requirements) to control to the extent feasible such sources;

(H) a process to (i) identify construction activity related sources of pollution, and (ii) set forth procedures and methods (including land use requirements) to control to the extent feasible such sources;

(I) a process to (i) identify, if appropriate, salt water intrusion into rivers, lakes, and estuaries resulting from reduction of fresh water flow from any cause, including irrigation, obstruction, ground water extraction, and diversion, and (ii) set forth procedures and methods to control such intrusion to the extent feasible where such procedures and methods are otherwise a part of the waste treatment management plan;

(J) a process to control the disposition of all residual waste generated in such area which could affect water quality; and

(K) a process to control the disposal of pollutants on land or in subsurface excavations within such area to protect ground and surface water quality.

(3) Areawide waste treatment management plans shall be certified annually by the Governor or his designee (or Governors or their designees, where more than one State is involved) as being consistent with applicable basin plans and such areawide waste treatment management plans shall be submitted to the Administrator for his approval.

(4)(A) Whenever the Governor of any State determines (and notifies the Administrator) that consistency with a statewide regulatory program under section 303 so requires, the requirements of clauses (F) through (K) of paragraph (2) of this subsection shall be developed and submitted by the Governor to the Administrator for approval for application to a class or category of activity throughout such State.

(B) Any program submitted under subparagraph (A) of this paragraph which, in whole or in part, is to control the discharge or other placement of dredged or fill material into the navigable waters shall include the following:

(i) A consultation process which includes the State agency with primary jurisdiction over fish and wildlife resources.

(ii) A process to identify and manage the discharge or other placement of dredged or fill material which adversely affects navigable waters, which shall complement and be coordinated with a State program under section 404 conducted pursuant to this Act.

(iii) A process to assure that any activity conducted pursuant to a best management practice will comply with the guidelines established under section 404(b)(1), and sections307 and 403 of this Act.

(iv) A process to assure that any activity conducted pursuant to a best management practice can be terminated or modified for cause including, but not limited to, the following: (I) violation of any condition of the best management practice; (II) change in any activity that requires either a temporary or permanent reduction or elimination of the discharge pursuant to the best management practice.

(v) A process to assure continued coordination with Federal and Federal-State water-related planning and reviewing processes, including the National Wetlands Inventory.

(C) If the Governor of a State obtains approval from the Administrator of a statewide regulatory program which meets the requirements of subparagraph (B) of this paragraph and if such State is administering a permit program under section 404 of this Act, no person shall be required to obtain an individual permit pursuant to such section, or to comply with a general permit issued pursuant to such section, with respect to any appropriate activity within such State for which a best management practice has been approved by the Administrator under the program approved by the Administrator pursuant to this paragraph.

(D)(i) Whenever the Administrator determines after public hearing that a State is not administering a program approved under this section in accordance with the requirements of this section, the Administrator shall so notify the State, and if appropriate corrective action is not taken within a reasonable time, not to exceed ninety days, the Administrator shall withdraw approval of such program. The Administrator shall not withdraw approval of any such program unless he shall first have notified the State, and made public, in writing, the reasons for such withdrawal. (ii) In the case of a State with a program submitted and approved under this paragraph, the Administrator shall withdraw approval of such program under this subparagraph only for a substantial failure of the State to administer its program in accordance with the requirements of this paragraph.

(c)(1) The Governor of each State, in consultation with the planning agency designated under subsection (a) of this section, at the time a plan is submitted to the Administrator, shall designate one or more waste treatment management agencies (which may be an existing or newly created local, regional or State agency or potential subdivision) for each area designated under subsection (a) of this section and submit such designations to the Administrator.

(2) The Administrator shall accept any such designation, unless, within 120 days of such designation, he finds that the designated management agency (or agencies) does not have adequate authority—

(A) to carry out appropriate portions of an areawide waste treatment management plan developed under subsection (b) of this section;

(B) to manage effectively waste treatment works and related facilities serving such area in conformance with any plan required by subsection (b) of this section;

(C) directly or by contract, to design and construct new works, and to operate and maintain new and existing works as required by any plan developed pursuant to subsection (b) of this section;

(D) to accept and utilize grants, or other funds from any source, for waste treatment management purposes;

(E) to raise revenues, including the assessment of waste treatment charges;

(F) to incur short- and long-term indebtedness;

(G) to assure in implementation of an areawide waste treatment management plan that each participating community pays its proportionate share of treatment costs;

(H) to refuse to receive any wastes from any municipality or subdivision thereof, which does not comply with any provisions of an approved plan under this section applicable to such area; and

(I) to accept for treatment industrial wastes.

(d) After a waste treatment management agency having the authority required by subsection (c) has been designated under such subsection for an area and a plan for such area has been approved under subsection (b) of this section, the Administrator shall not make any grant for construction of a publicly owned treatment works under section 201(g)(1) within such area except to such designated agency and for works in conformity with such plan.

(e) No permit under section 402 of this Act shall be issued for any point source which is in conflict with a plan approved pursuant to subsection (b) of this section.

(f)(1) The Administrator shall make grants to any agency designated under subsection (a) of this section for payment of the reasonable costs of developing and operating a continuing areawide waste treatment management planning process under subsection (b) of this section.

(2) For the two-year period beginning on the date of the first grant is made under paragraph (1) of this subsection to an agency, if such first grant is made before October 1, 1977, the amount of each such grant to such agency shall be 100 per centum of the costs of developing and operating a continuing areawide waste treatment management planning process under subsection (b) of this section, and thereafter the amount granted to such agency shall not exceed 75 per centum of such costs in each succeeding one-year period. In the case of any other grant made to an agency under such paragraph (1) of this subsection, the amount of such grant shall not exceed 75 per centum of the costs of developing and operating a continuing areawide waste treatment management planning process in any year.

(3) Each applicant for a grant under this subsection shall submit to the Administrator for his approval each proposal for which a grant is applied for under this subsection. The Administrator shall act upon such proposal as soon as practicable after it has been submitted, and his approval of that proposal shall be deemed a contractual obligation of the United States for the payment of its contribution to such proposal, subject to such amounts as are provided in appropriation Acts. There is authorized to be appropriated to carry out this subsection not to exceed $50,000,000 for the fiscal year ending June 30, 1973, not to exceed $100,000,000 for the fiscal year ending June 30, 1974, not to exceed $150,000,000 per fiscal year for the fiscal years ending June 30, 1975, September 30, 1977, September 30, 1978, September 30, 1979, and September 30, 1980, not to exceed $100,000,000 per fiscal year for the fiscal years ending September 30, 1981, and September 30, 1982, and such sums as may be necessary for fiscal years 1983 through 1990.

(g) The Administrator is authorized, upon request of the Governor or the designated planning agency, and without reimbursement, to consult with, and provide technical assistance to, any agency designated under subsection (a) of this section in the development of areawide waste treatment management plans under subsection (b) of this section.

(h)(1) The Secretary of the Army, acting through the Chief of Engineers, in cooperation with the Administrator is authorized and directed, upon request of the Governor or the designated planning organization, to consult with, and provide technical assistance to, any agency designed 1 under subsection (a) of this section in developing and operating a continuing areawide waste treatment management planning process under subsection (b) of this section.

(2) There is authorized to be appropriated to the Secretary of the Army, to carry out this subsection, not to exceed $50,000,000 per fiscal year for the fiscal years ending June 30, 1973, and June 30, 1974.

(i)(1) The Secretary of the Interior, acting through the Director of the United States Fish and Wildlife Service, shall, upon request of the Governor of a State, and without reimbursement, provide technical assistance to such State in developing a statewide program for submission to the Administrator under subsection (b)(4)(B) of this section and in implementing such program after its approval.

(2) There is authorized to be appropriated to the Secretary of the Interior $6,000,000 to complete the National Wetlands Inventory of the United States, by December 31, 1981, and to provide information from such Inventory to States as it becomes available to assist such States in the development and operation of programs under this Act.

(j)(1) The Secretary of Agriculture, with the concurrence of the Administrator, and acting through the Soil Conservation Service and such other agencies of the Department of Agriculture as the Secretary may designate, is authorized and directed to establish and administer a program to enter into contracts, subject to such amounts as are provided in advance by appropriation acts, of not less than five years nor more than ten years with owners and operators having control of rural land for the purpose of installing and maintaining measures incorporating best management practices to control nonpoint source pollution for improved water quality in those States or areas for which the Administrator has approved a plan under subsection (b) of this section where the practices to which the contracts apply are certified by the management agency designated under subsection (c)(1) of this section to be consistent with such plans and will result in improved water quality. Such contracts may be entered into during the period ending not later than September 31, 1988. Under such contracts the land owners or operator shall agree—

(i) to effectuate a plan approved by a soil conservation district, where one exists, under this section for his farm, ranch, or other land substantially in accordance

with the schedule outlined therein unless any requirement thereof is waived or modified by the Secretary;

(ii) to forfeit all rights to further payments or grants under the contract and refund to the United States all payments and grants received thereunder, with interest, upon his violation of the contract at any stage during the time he has control of the land if the Secretary, after considering the recommendations of the soil conservation district, where one exists, and the Administrator, determines that such violation is of such a nature as to warrant termination of the contract, or to make refunds or accept such payment adjustments as the Secretary may deem appropriate if he determines that the violation bythe owner or operator does not warrant termination of the contract;

(iii) upon transfer of his right and interest in the farm, ranch, or other land during the contract period to forfeit all rights to further payments or grants under the contract and refund to the United States all payments or grants received thereunder, with interest, unless the transferee of any such land agrees with the Secretary to assume all obligations of the contract;

(iv) not to adopt any practice specified by the Secretary on the advice of the Administrator in the contract as a practice which would tend to defeat the purposes of the contract;

(v) to such additional provisions as the Secretary determines are desirable and includes in the contract to effectuate the purposes of the program or to facilitate the practical administration of the program.

(2) In return for such agreement by the landowner or operator the Secretary shall agree to provide technical assistance and share the cost of carrying out those conservation practices and measures set forth in the contract for which he determines that cost sharing is appropriate and in the public interest and which are approved for cost sharing by the agency designated to implement the plan developed under subsection (b) of this section. The portion of such cost (including labor) to be shared shall be that part which the Secretary determines is necessary and appropriate to effectuate the installation of the water quality management practices and measures under the contract, but not to exceed 50 per centum of the total cost of the measures set forth in the contract; except the Secretary may increase the matching cost share where he determines that (1) the main benefits to be derived from the measures are related to improving offsite water quality, and (2) the matching share requirement would place a burden on the landowner which would probably prevent him from participating in the program.

(3) The Secretary may terminate any contract with a landowner or operator by mutual agreement with the owner or operator if the Secretary determines that such termination would be in the public interest, and may agree to such modification of contracts previously entered into as he may determine to be desirable to carry out the purposes of the program or facilitate the practical administration thereof or to accomplish equitable treatment with respect to other conservation, land use, or water quality programs.

(4) In providing assistance under this subsection the Secretary will give priority to those areas and sources that have the most significant effect upon water quality. Additional investigations or plans may be made, where necessary, to supplement approved water quality management plans, in order to determine priorities.
(5) The Secretary shall, where practicable, enter into agreements with soil conservation districts, State soil and water conservation agencies, or State water quality agencies to administer all or part of the program established in this subsection under regulations developed by the Secretary. Such agreements shall provide for the submission of such reports as the Secretary deems necessary, and for payment by the United States of such portion of the costs incurred in the administration of the program as the Secretary may deem appropriate.

(6) The contracts under this subsection shall be entered into only in areas where the management agency designated under subsection (c)(1) of this section assures an adequate level of participation by owners and operators having control of rural land in such areas. Within such areas the local soil conservation district, where one exists, together with the Secretary of Agriculture, will determine the priority of assistance among individual land owners and operators to assure that the most critical water quality problems are addressed.

(7) The Secretary, in consultation with the Administrator and subject to section 304(k) of this Act, shall, not later than September 30, 1978, promulgate regulations for carrying out this subsection and for support and cooperation with other Federal and non-Federal agencies for implementation of this subsection.

(8) This program shall not be used to authorize or finance projects that would otherwise be eligible for assistance under the terms of Public Law 83–566.

(9) There are hereby authorized to be appropriated to the Secretary of Agriculture $200,000,000 for fiscal year 1979, $400,000,000 for fiscal year 1980, $100,000,000 for fiscal year 1981, $100,000,000 for fiscal year 1982, and such sums as may be necessary for fiscal years 1983 through 1990, to carry out this subsection. The program authorized under this subsection shall be in addition to, and not in substitution of, other programs in such area authorized by this or any other public law.

(33 U.S.C. 1288)

NEVADA REVISED STATUTES (NRS)

NRS 244A.459 Legislative determinations. It is hereby declared as a matter of legislative determination that:

1. It is essential to the maintenance of the public health, welfare and orderly local government that each county to which NRS 244A.455 to 244A.573, inclusive, pertain be empowered to become the master agency within its territory for the collection, disposal and treatment of sewage and wastewater. In addition, it is essential that the master agency be empowered to perform and require compliance with any and all areawide waste management planning which may be required by the State or Federal Government in connection with the exercise or implementation of any of the powers, authorizations and responsibilities provided in NRS 244A.455 to 244A.573, inclusive.
2. Granting to such counties the purposes, powers, rights, privileges and immunities provided in NRS 244A.455 to 244A.573, inclusive, will serve a public use and will promote the health, safety, prosperity, security and general welfare of the inhabitants thereof and of the State.
3. The acquisition, improvement, equipment, maintenance and operation of any project herein authorized is in the public interest, is conducive to the public health, and constitutes a part of the established and permanent policy of the State.
4. The necessity for the County Sewage and Wastewater Law is a result of:
    (a) The intense development of residential, commercial, industrial and other human activities in both incorporated and unincorporated areas within such counties;
    (b) The ensuing need for extensive, coordinated control, collection, disposal and treatment of all sources of pollution, including but not limited to sewage, wastewater and in place or accumulated pollution sources; and
    (c) The ensuing need for areawide waste management planning for such control, collection, disposal and treatment.
5. The Legislature recognizes the duty of such counties as instruments of State Government to meet adequately the needs for such facilities within their boundaries, in cooperation with the State, municipalities and districts within the county and in satisfaction of federal and state requirements and standards relating to pollution.
6. The Legislature recognizes that there may be alternative solutions to the pollution abatement problem in such counties. It is the intention of the Legislature that those charged with the responsibility of correcting the problem be able to avail themselves of all assistance that may develop through advances in technology and changing circumstances and regulations, federal or state, that have an impact on the problem. In construing the powers, authorities and responsibilities conveyed by the Legislature in NRS 244A.455 to 244A.573, inclusive, the economic burden on the citizens of this state and the ultimate feasibility of the projects undertaken shall be carefully weighed in the light of the state of the art and the regulations governing the master agency at the time undertaken. Among the factors which will determine the

ultimate resolution of the problem, the protection and the fullest beneficial use of the resource represented by the water shall be given top priority. The Legislature finds that the courses of action that may be developed to find satisfactory solutions are necessary for the preservation of this valuable natural resource of the State and are within the meaning of the second paragraph of Section 3 of Article 9 of the Constitution of the State of Nevada.

7. For the accomplishment of these purposes the provisions of NRS 244A.455 to 244A.573, inclusive, shall be broadly construed.
8. The notices herein provided are reasonably calculated to inform each interested person of his legally protected rights.
9. The rights and privileges herein granted comply in all respects with any requirement imposed by any constitutional provision.

(Added to NRS by 1973, 1726; A 1975, 1336; 1977, 19)—(Substituted in revision for NRS 244.9222)

NRS 244A.571 Areawide waste management plan: Development; required elements.

1. The officers of the county shall develop an areawide waste management plan pursuant to NRS 244A.459, subject to the approval of the State Department of Conservation and Natural Resources. The county officers may revise this plan as often as they deem it necessary. A plan must include but need not be limited to the following:
    (a) The identification of treatment works necessary to meet the anticipated municipal and industrial needs of the area for the treatment of waste over a 20-year period, with an analysis of alternative systems, including:
        (1) Any requirements for the acquisition of land;
        (2) The necessary systems for collection of wastewater and management of urban storm water runoff; and
        (3) A program to provide the necessary financial arrangements for the development of the treatment works;
    (b) The establishment of priorities for the construction of the treatment works and time schedules for the initiation and completion of all treatment works;
    (c) The establishment of a regulatory program to:
        (1) Carry out the waste treatment management requirements of section 201(c) of P.L. 92-500 (33 U.S.C. § 1281(c));
        (2) Regulate the location, modification and construction of any facilities within the area which may result in any discharge in the area; and
        (3) Ensure that any industrial or commercial wastes discharged into any treatment works in the area meet applicable pretreatment requirements;

(d) The identification of those agencies necessary to construct, operate and maintain all facilities required by the plan and otherwise to carry out the plan;

(e) The identification of the measures necessary to carry out the plan (including financing), the period necessary to carry out the plan, the costs of carrying out the plan within that period, and the economic, social and environmental effect of carrying out the plan within that period;

(f) A process to:

(1) Identify, if appropriate, agriculturally and silviculturally related nonpoint sources of pollution, including runoff from areas used for the disposal of manure and from land used for the production of livestock and crops; and

(2) Set forth procedures and methods, including requirements for land use, to control to the extent feasible those sources;

(g) A process to:

(1) Identify, if appropriate, mine-related sources of pollution including new, current and abandoned surface and underground mine runoff; and

(2) Set forth procedures and methods, including requirements for land use, to control to the extent feasible those sources;

(h) A process to:

(1) Identify sources of pollution related to construction; and

(2) Set forth procedures and methods, including requirements for land use, to control to the extent feasible those sources;

(i) A process to:

(1) Identify, if appropriate, salt water intrusion into rivers, lakes and estuaries resulting from reduction of fresh water flow from any cause, including irrigation, obstruction, groundwater extraction and diversion; and

(2) Set forth procedures and methods to control such an intrusion to the extent feasible where the procedures and methods are otherwise a part of the waste treatment management plan;

(j) A process to control the disposition of all residual waste generated in the area which could affect water quality; and

(k) A process to control the disposal of pollutants on land or in subsurface excavations within the area to protect the quality of ground and surface water.

2. In developing the elements of the areawide waste management plan, the county shall provide the most efficient areawide management system for the area.

(Added to NRS by 1975, 1334; A 1987, 373)

Appendix C

Hydrographic Basin Delineation

DAQEM
DEPARTMENT OF AIR QUALITY & ENVIRONMENTAL MANAGEMENT

Appendix C
Hydrographic Basin Delineation

Various agencies have created different delineations of hydrographic regions and areas within the United States. The planning areas created for this project are based on previous delineations by the United States Geological Survey (USGS) and the Division of Water Resources of the State Engineers Office.

In 1968, the Division of Water Resources of the State Engineers Office and the USGS prepared a delineation of Nevada hydrographic regions, which were further subdivided into hydrographic areas. Clark County comprises approximately 25 hydrographic areas (**Figure C-1)**.

In 1987, the USGS adopted a delineation of the nation based on hydrologic units. In this system, the nation is divided into 21 regions, and then further subdivided into sub-regions, accounting units, and cataloging units. The hydrologic units are categorized by hydrologic unit codes (HUCs), and the smallest of the areas, the cataloging units, are identified by 8-digit HUCs. Ten hydrologic cataloging units are either fully or partially contained within Clark County limits (**Figure C-2**).

Southern Nevada Water Authority (SNWA) retains copies of the geographic information system (GIS) files of the hydrographic areas delineation by the State Engineers Office. **Figure C-3** compares the boundaries of the USGS GIS delineation and the SNWA GIS files overlain on the State Engineers hydrographic areas map. The scan of the State Engineers map was referenced into the GIS file and sized and positioned using the Clark County boundary in the State Engineers map and the USGS delineation as control points. As shown in **Figure C-3**, the boundaries of the hydrologic cataloging units generally match the boundaries of the hydrographic areas. The planning area delineation for this project is based on the USGS hydrologic cataloging units, since it is the most current delineation.

The hydrologic cataloging units serve as the basis of the planning area delineation, with some modifications to the boundaries using the State Engineers hydrographic areas provided in the SNWA GIS files. As shown in **Figure C-2**, a small portion of HUC No. 15010013 from Lincoln County, Nevada, extends into Clark County. Since this area is similar to HUC No. 15010012 in regards to sewer and land-use, these two areas were merged for the analysis. Similarly, HUC No. 15010006 extends into Clark County from Arizona, and is similar to the sewer and land-use characteristics of HUC No. 15010005. Therefore, these two areas were also merged. Through discussions with the Project Oversight Committee (POC), it is deemed appropriate that the planning area for the Las Vegas Valley contains only the entities within the Las Vegas Valley boundary. Therefore, Hydrographic Area 211, shown in **Figure C-1**, was removed from the Las Vegas Valley planning area, HUC

No. 15010015, to contain the entities within the Las Vegas Valley in one planning area. **Figure C-4** shows the delineation of the resultant eight planning areas for Clark County.

Pursuant to discussions with the POC, a map of the significant political entities within Clark County was overlain on the planning areas to confirm that these municipalities do not overlap into multiple planning areas. **Figure C-5** displays the significant political entities in Clark County with the previous delineation of planning areas. The boundary for Clark County was modified after issue of the previous planning area delineations; thus, **Figure C-5** and the planning areas are revised to show the current Clark County boundary in 2007. Two significant political entities, the City of Henderson (COH) and the City of Boulder City (Boulder City), were noted to extend into planning areas with differing sewer and land characteristics. The planning area boundaries have been modified so that these municipalities are contained within separate planning areas and do not extend into neighboring planning areas. **Figure C-6** displays the modified planning area delineation with Clark County municipal boundaries and confirms that municipalities are contained within one planning area or planning areas with similar sewer and land characteristics.

Figure C-7 shows the proposed planning area delineation for use in the Clark County Area-Wide WQMP. Eight planning areas were created based on previous delineations by the United States Geological Survey (USGS) and the Division of Water Resources of the State Engineers Office. The planning areas are comprised of hydrographic regions as delineated by the Division of Water Resources of the State Engineers Office and the USGS. A map showing the boundaries of each WQMP planning area and the state hydrographic basins is shown in Figure C-7, along with a table noting the hydrographic and planning areas each Clark County community falls into. Throughout this project, the following planning area numbers and names will be used to identify the planning areas within Clark County:

Planning Area 1: Sand Spring - Tikaboo Valleys
Planning Area 2: Muddy River - Meadow Valley Wash
Planning Area 3: Lower Virgin River
Planning Area 4: Grand Wash - Lake Mead
Planning Area 5: Las Vegas Wash
Planning Area 6: Ivanpah - Pahrump Valleys
Planning Area 7: Havasu - Mohave Lakes
Planning Area 8: Paiute Wash

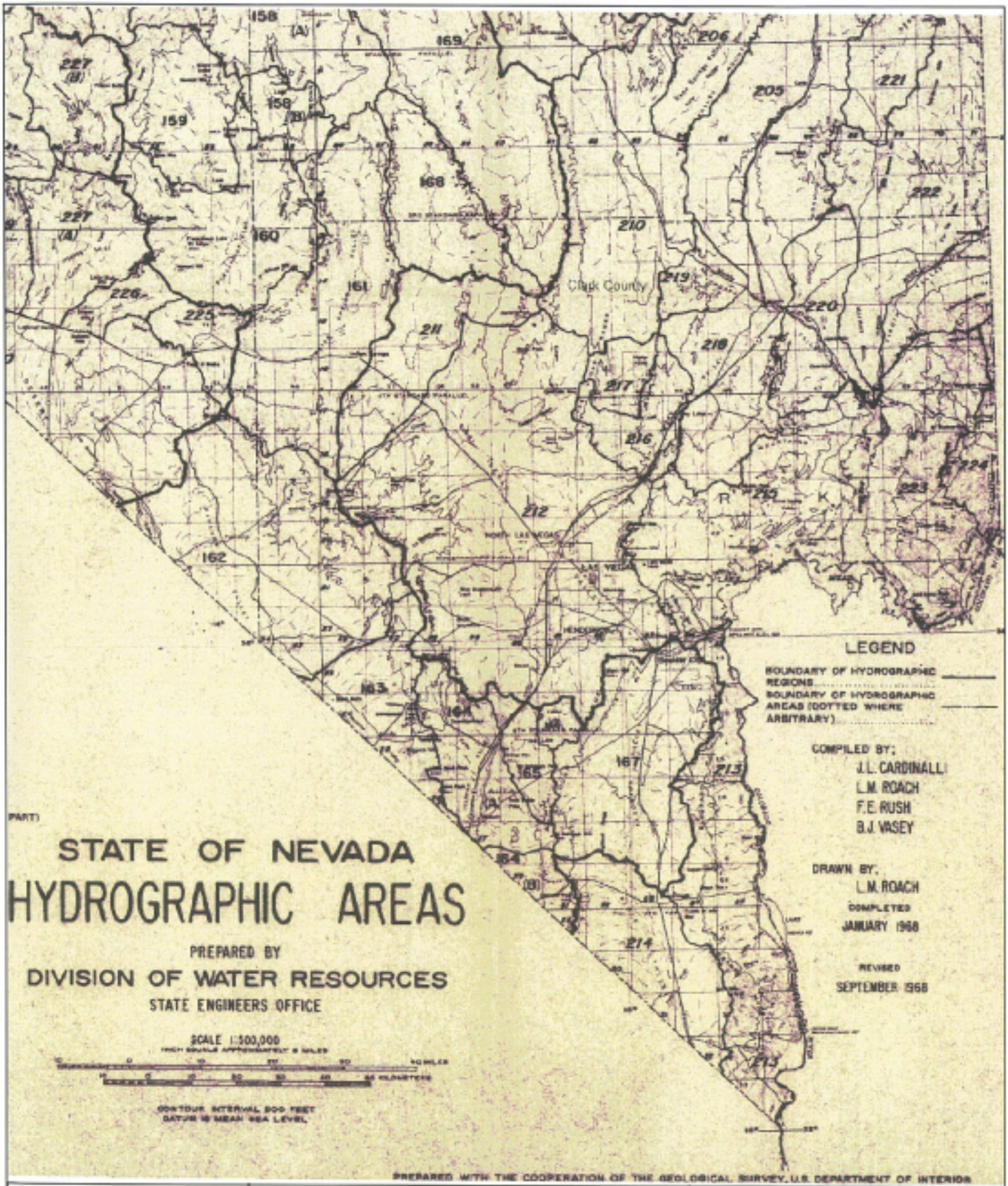
These eight (8) planning areas were created to combine five previous WQMPs into one comprehensive document. A map showing the geographical boundaries for these 5 previous plans can be found in Appendix A, Figure A-1.

REFERENCES

Southern Nevada Water Authority (SNWA). Hydrographic Areas GIS file. November 17, 2006.

State of Nevada Division of Water Resources. Hydrographic Areas. September 1968.

United States Geological Survey (USGS). October 26, 2006. Available at: http://water.usgs.gov/GIS/huc.html.



MWH

226 State of Nevada Hydrographic Areas

N

0 3 6 12 Miles

Figure C-1: State of Nevada Hydrographic Areas

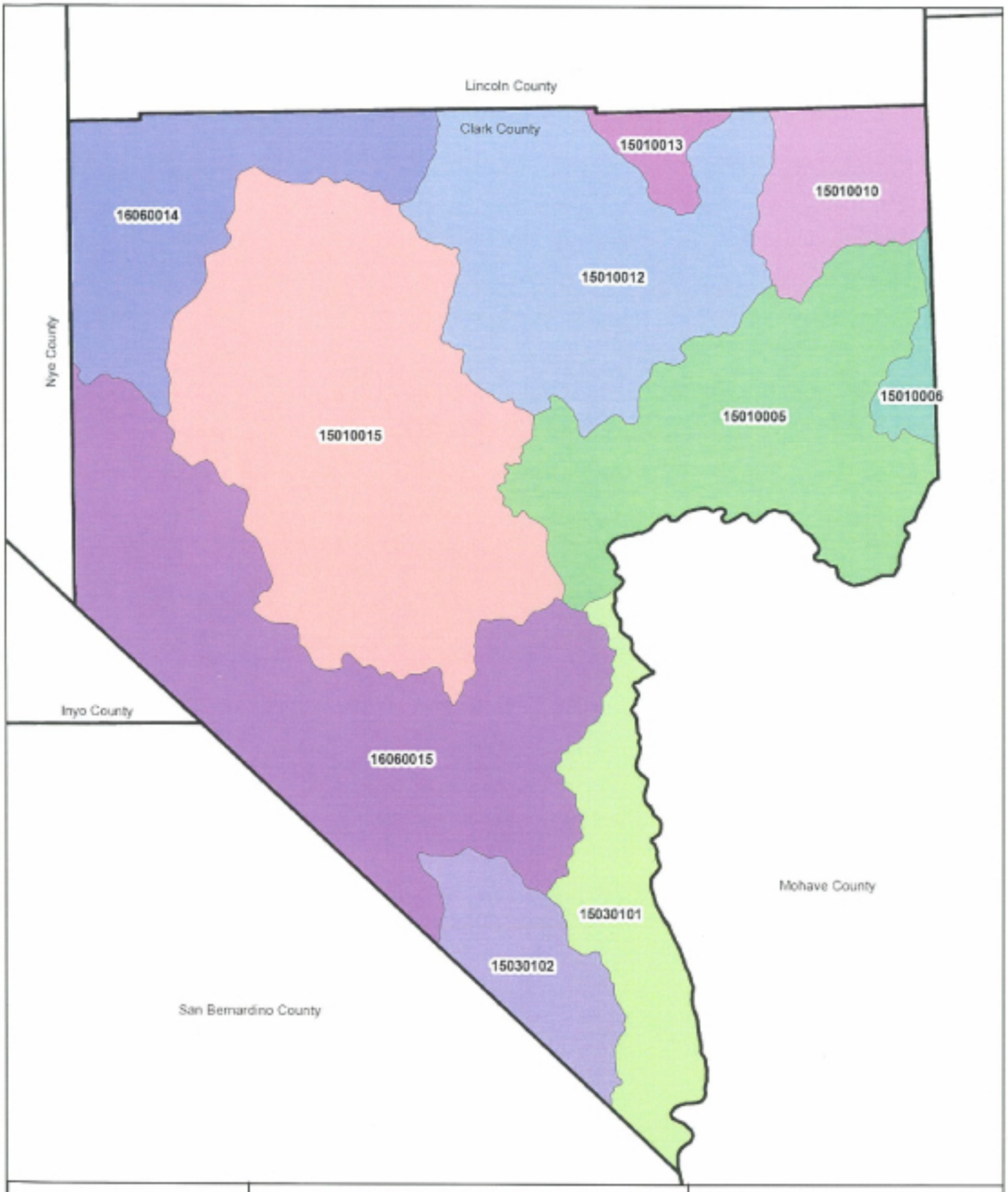
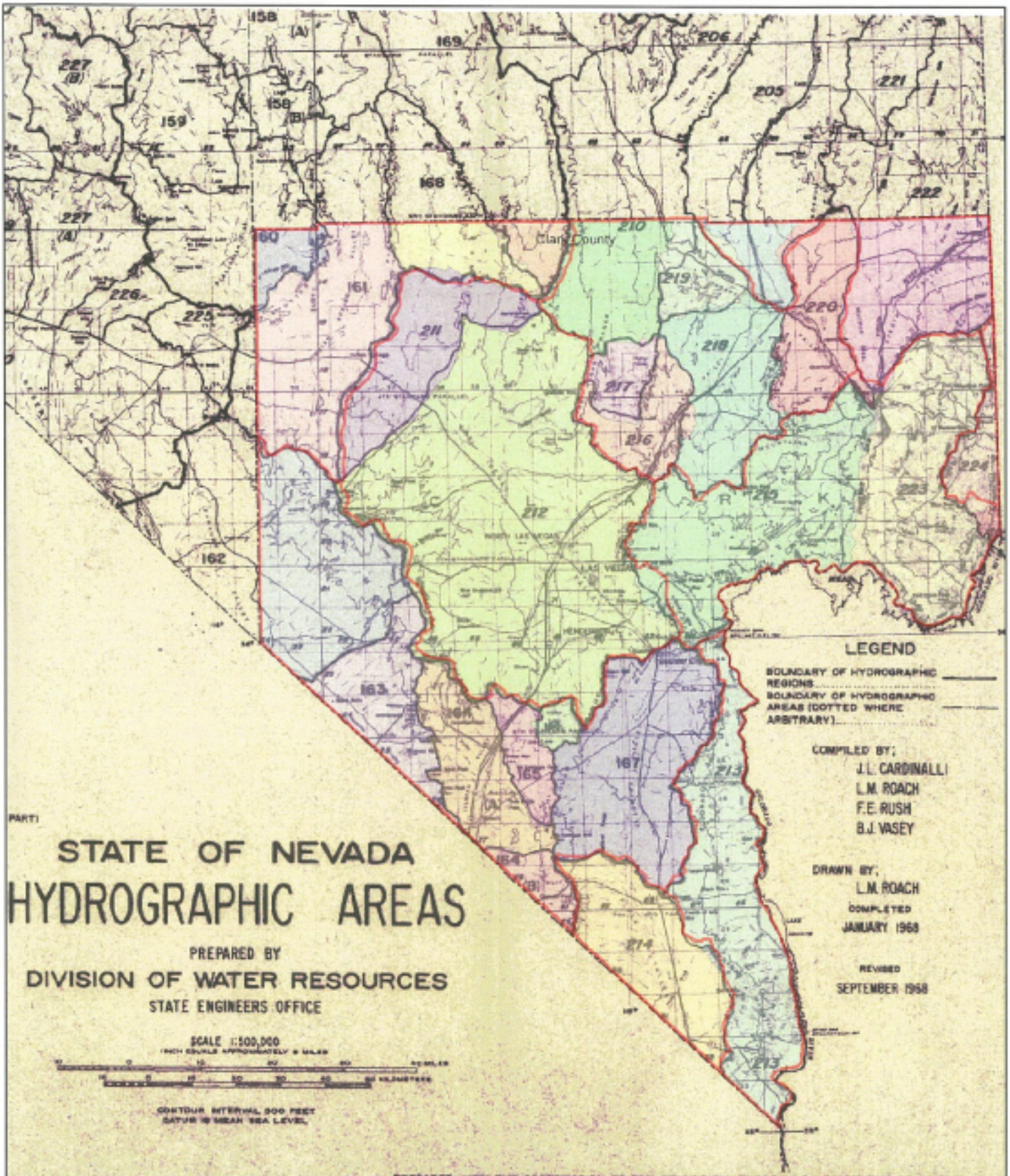


Figure C-2: USGS Delineation with Hydrologic Unit Codes



MWH

USGS Delineation of Hydrologic Cataloging Units

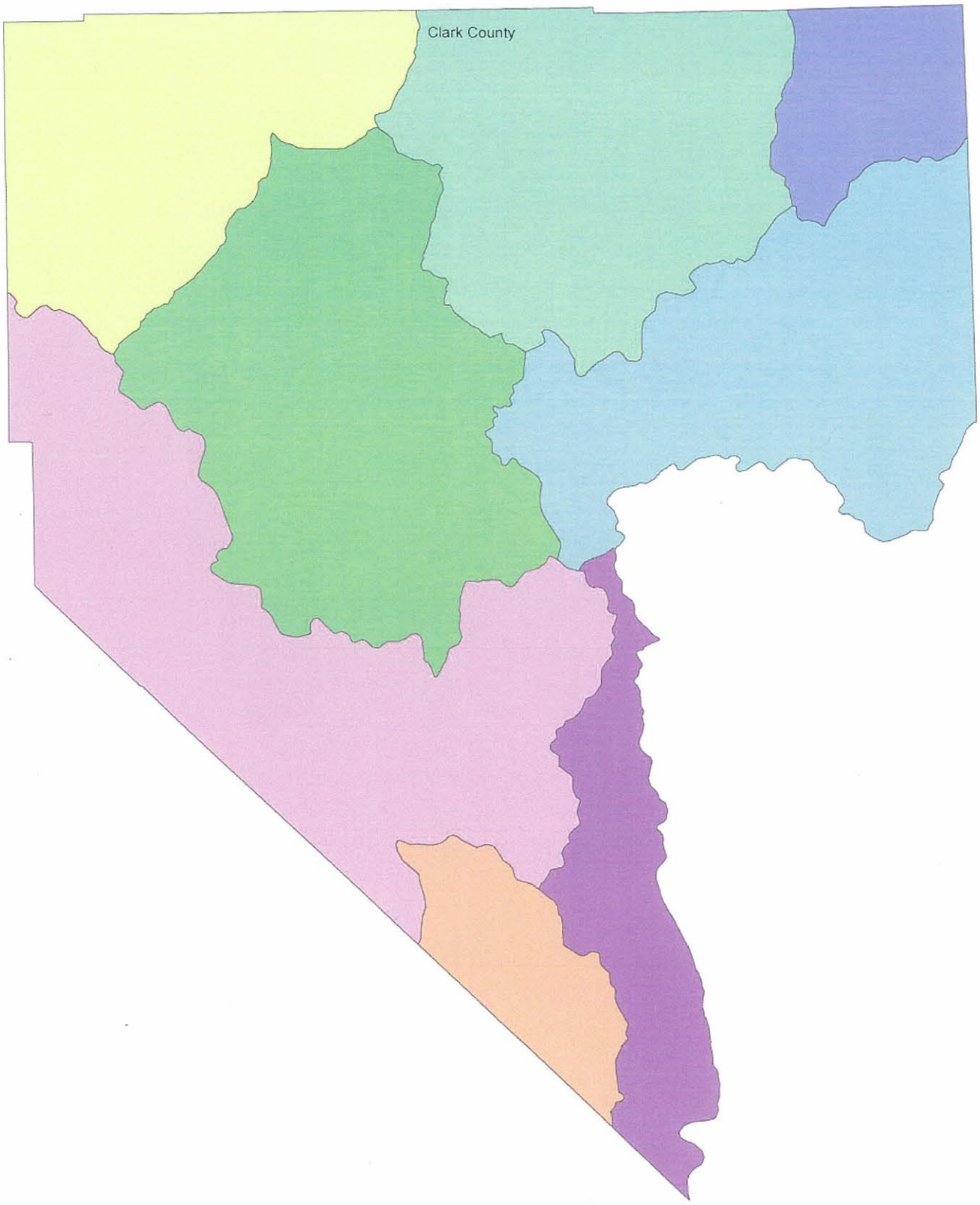
State of Nevada Hydrographic Areas

SNWA GIS File of State of Nevada Hydrographic Areas

0 3 6 12 Miles

N

Figure C-3: Comparison of Boundaries of USGS Delineation, State of Nevada Delineation and SNWA GIS File of Hydrographic Areas



MWH

PBS&J

CLARK COUNTY NEVADA

Planning Areas

N

0 3.75 7.5 15 Miles

Figure C-4

Eight Planning Areas

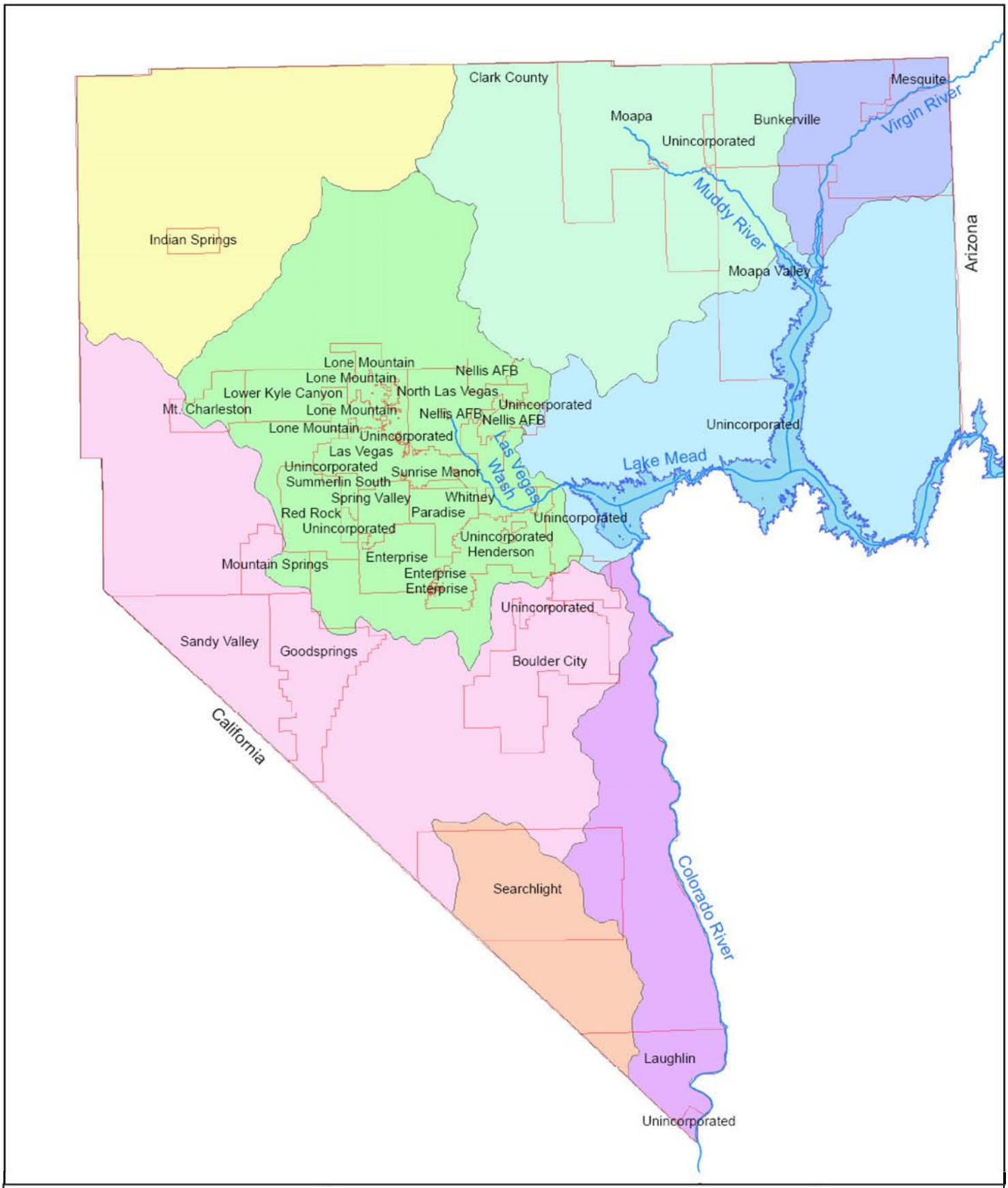
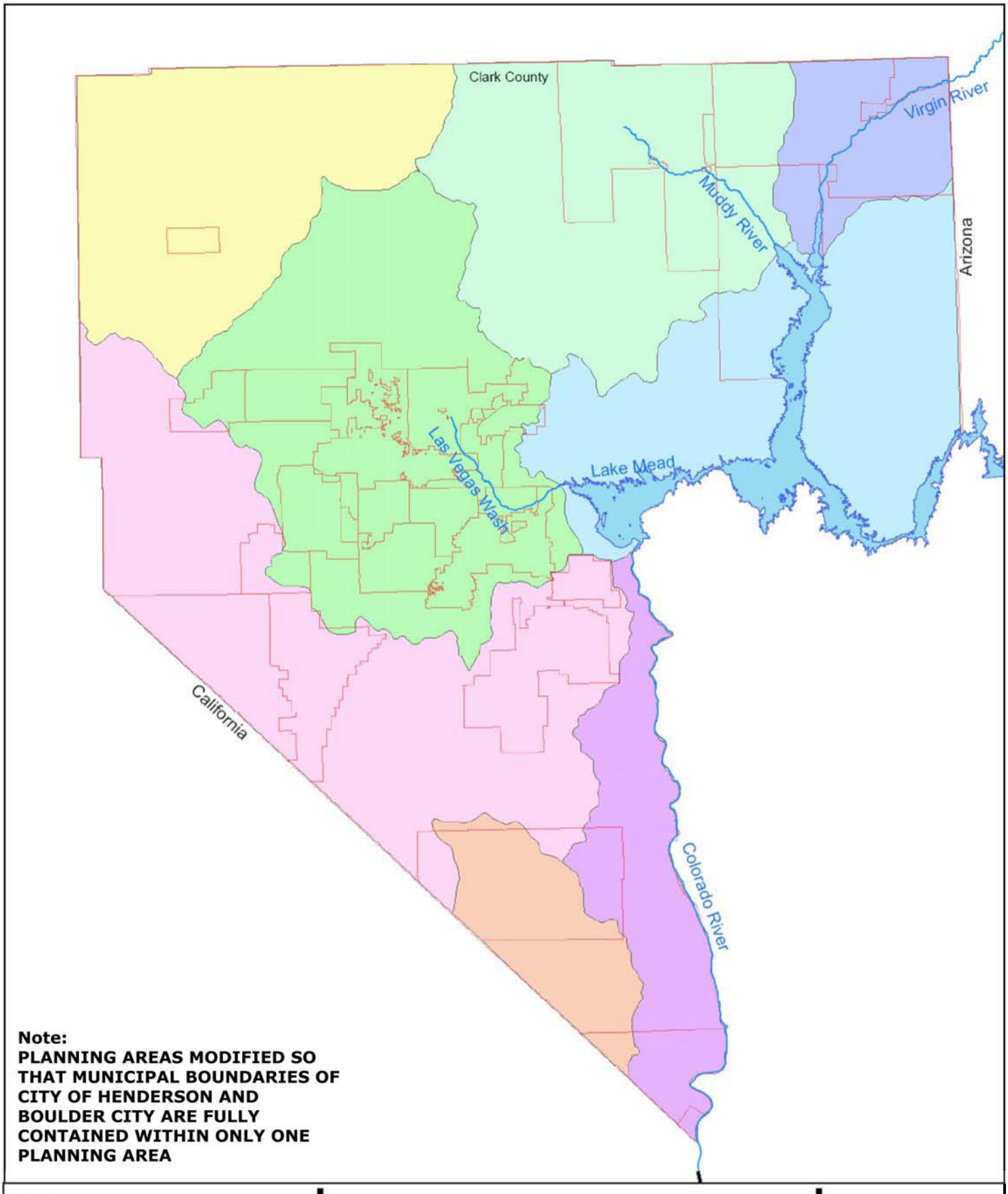


Figure C-5
Eight Planning Areas and Municipal Boundries within Clark County



Note:
PLANNING AREAS MODIFIED SO THAT MUNICIPAL BOUNDARIES OF CITY OF HENDERSON AND BOULDER CITY ARE FULLY CONTAINED WITHIN ONLY ONE PLANNING AREA

MWH
PBS&J
CLARK COUNTY NEVADA

Planning Areas
Municipal Boundaries

N
0 3.75 7.5 15 Miles

Figure C-6
Modified Eight Planning Areas with Municipal Boundries in Clark County

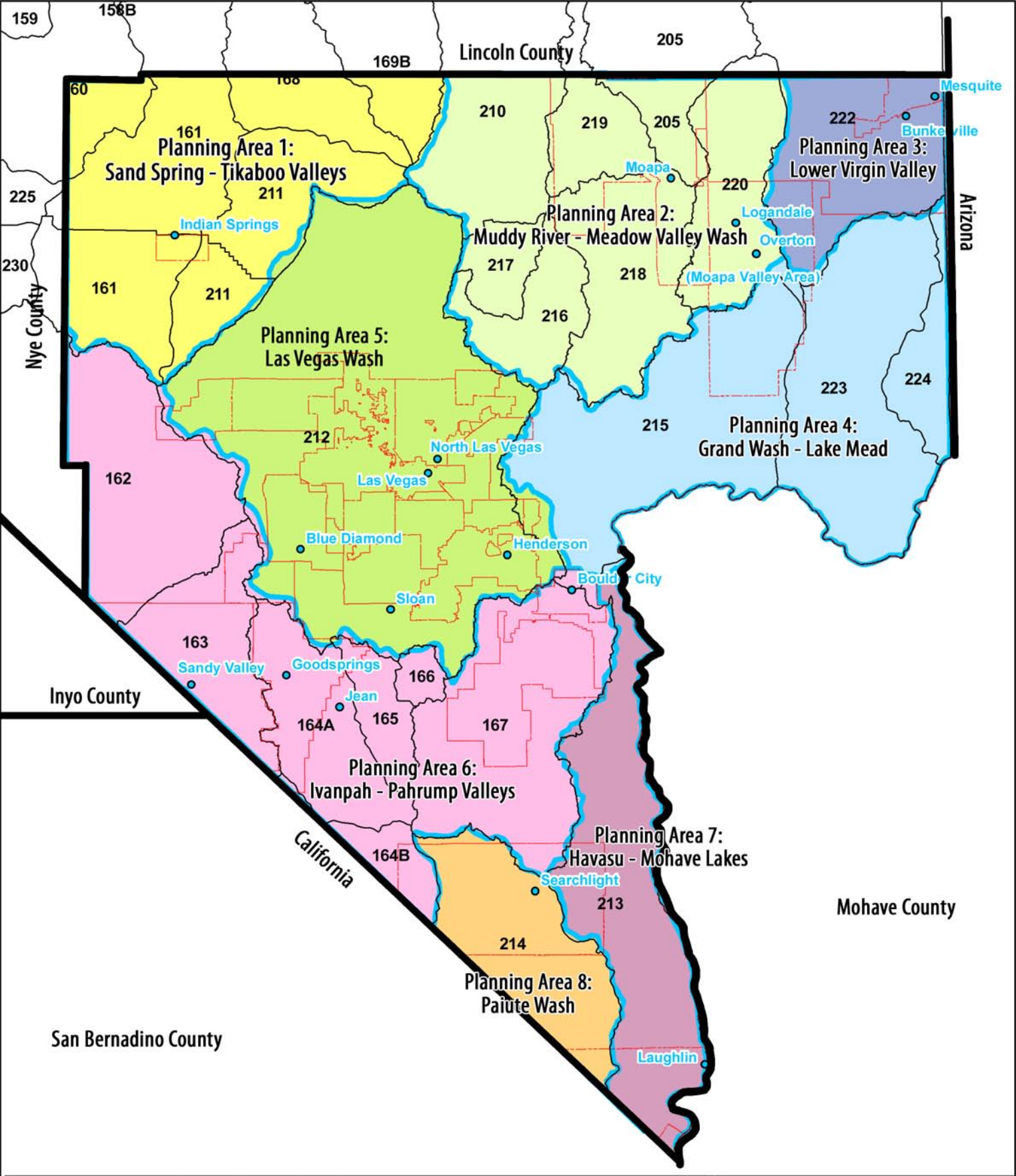


Figure C-7

Communities and Hydrographic Areas associated with WQMP Planning Areas

Communities and Hydrographic Areas associated with WQMP Planning Areas

Community	Planning Area	Hydrographic Areas
Indian Springs	1	161, 211
Moapa	2	218, 219, 205, 220, 210
Moapa Valley	2	220, 222, 215, 223
Bunkerville	3	222, 220, 205, 224
Lower Kyle Canyon	5	212
Lone Mountain	5	212
Red Rock	5	212
Mountain Springs	5	212
Mt. Charleston	5	212
Sandy Valley	6	163, 162, 164A
Goodsprings	6	164A, 165, 212, 163
Boulder City	6	167, 212
Laughlin	7	213, 214
Searchlight	8	214, 213, 167, 164B

Appendix D

Las Vegas Valley Watershed Advisory Committee Regional Water Quality Plan

DAQEM
DEPARTMENT OF AIR QUALITY & ENVIRONMENTAL MANAGEMENT

LAS VEGAS VALLEY WATERSHED ADVISORY COMMITTEE

REGIONAL WATER QUALITY PLAN



Lake Mead, Nevada

2009

- THIS PAGE INTENTIONALLY LEFT BLANK -

LAS VEGAS VALLEY WATERSHED ADVISORY COMMITTEE
REGIONAL WATER QUALITY PLAN
2009

Acknowledgements 5
Acronyms 7
Executive Summary 11

CHAPTER 1

Introduction 15

Mission, Goals and Strategies 24

Regional Water Quality Plan 25
- Goal 1
- Goal 2
- Goal 3
- Goal 4
- Goal 5
- Goal 6
- Goal 7

CHAPTER 2

Policy Direction 57
Economic and Social Impacts 59

APPENDICES

References 65
Glossary 67

- THIS PAGE INTENTIONALLY LEFT BLANK -

LAS VEGAS VALLEY WATERSHED ADVISORY COMMITTEE MEMBER AGENCIES

City of Henderson

City of Las Vegas

City of North Las Vegas

Clean Water Coalition

Clark County

Clark County Regional Flood Control District

Clark County Water Reclamation District

Las Vegas Valley Water District

Southern Nevada Water Authority



- THIS PAGE INTENTIONALLY LEFT BLANK -

ACRONYMS

AFY	Acre-feet per year
BBAMP	Boulder Basin Adaptive Management Plan
CAMP	Las Vegas Wash Comprehensive Adaptive Management Plan
CCL	Contaminant Candidate List
CCRFCD	Clark County Regional Flood Control District
CCWRD	Clark County Water Reclamation District
CMT	Core Management Team
CWA	Clean Water Act
CWC	Clean Water Coalition
DAQEM	Clark County Department of Air Quality and Environmental Management
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
GMP	Las Vegas Valley Groundwater Management Program
LVVWAC	Las Vegas Valley Watershed Advisory Committee
LVVWD	Las Vegas Valley Water District
LVWCC	Las Vegas Wash Coordination Committee
MAC	Las Vegas Wash Management Advisory Committee
MCL	Maximum Contaminant Level
MS4	Municipal Separate Storm Sewer Systems
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRS	Nevada Revised Statutes
RMHQ	Requirement to Maintain Existing Higher Quality
ROD	Record of Decision
SCOP	Systems Conveyance and Operations Program
SDWA	Safe Drinking Water Act
SNWA	Southern Nevada Water Authority
SNWS	Southern Nevada Water System
SQMC	Stormwater Quality Management Committee
SWAG	Sewage Wastewater Advisory Group
TMDL	Total Maximum Daily Load
TT	Treatment Technique
USGS	U.S. Geological Survey

- THIS PAGE INTENTIONALLY LEFT BLANK -

EXECUTIVE SUMMARY



- THIS PAGE INTENTIONALLY LEFT BLANK -

EXECUTIVE SUMMARY

In 2007, water and wastewater agencies in Southern Nevada came together establishing the Las Vegas Valley Watershed Advisory Committee (LVVWAC). The committee was formed to enhance overall watershed management efforts and to develop a regional water quality plan for the Las Vegas Valley watershed. Members include:

- City of Henderson
- City of Las Vegas
- City of North Las Vegas
- Clark County
- Clark County Regional Flood Control District
- Clark County Water Reclamation District
- Clean Water Coalition
- Las Vegas Valley Water District
- Southern Nevada Water Authority

The 2009 Regional Water Quality Plan represents these efforts and recognizes the dynamic and interrelated nature of human and environmental influences on the valley's watershed. The plan also details the important role water and wastewater agencies have in protecting critical watershed resources including municipal drinking water supplies, wildlife habitat and recreation.

There are a number of state and federal laws that govern water management practices and safeguard important natural resources in Southern Nevada. Some of these include the Clean Water Act, Safe Drinking Water Act, Nevada Administrative Code, Endangered Species Act, National Historical Preservation Act and Migratory Bird Treaty Act.

As it has in the past, meeting these laws will require that water and wastewater agencies coordinate efforts closely for the benefit of the community. This plan serves as a roadmap for continued collaboration among the agencies and establishes goals and strategies to help the LVVWAC meet its mission to:

"Protect, preserve and enhance the quality and quantity of water resources in the Las Vegas Valley Watershed and to sustain economic well-being and protect the environment for present and future generations."

To achieve its mission, the LVVWAC has developed seven goals (below) and a number of supporting strategies. A detailed discussion on each goal and goal strategies is provided in Chapter 1.

LVVWAC regional watershed goals include the following:

1. Protect Lake Mead as a source of water for Southern Nevada and downstream users.
2. Meet or surpass federal, state and local standards and regulations.
3. Preserve and enhance the natural, cultural, historic and recreational values of the watershed and Lake Mead.
4. Coordinate water resource management.
5. Manage flood risks.
6. Sustain water and energy resources for future generations.
7. Build community awareness and support for regional watershed management.

This Plan details these implementation efforts for these seven goals and associated strategies. The implementation plans will be incorporated into future operation plans of the LVVWAC regional agencies. In addition, this Plan contains candidate policy concepts for evaluation and future action by LVVWAC members.

By working together, the LVVWAC can address watershed management efforts in a more coordinated manner. Doing so will help to protect vital public, environmental and recreational resources and help to ensure these resources are maintained for generations to come.

- THIS PAGE INTENTIONALLY LEFT BLANK -

CHAPTER ONE

Introduction

Mission, Goals and Strategies

Regional Water Quality Plan



- THIS PAGE INTENTIONALLY LEFT BLANK -

INTRODUCTION

The Las Vegas Valley Watershed Advisory Committee (LVVWAC) was formed in 2007 among Southern Nevada water and wastewater agencies to develop a regional water quality plan, establish regional water quality goals and coordinate planning efforts among participating agencies. Membership is comprised of the following:

- City of Henderson
- City of Las Vegas
- City of North Las Vegas
- Clark County
- Clark County Regional Flood Control District
- Clark County Water Reclamation District
- Clean Water Coalition
- Las Vegas Valley Water District
- Southern Nevada Water Authority

The LVVWAC serves as a forum for partnering water and wastewater agencies to define and present a unified direction for addressing water quality and its impact on quantity issues in the Las Vegas Valley and Lake Mead, as well as for integrating individual water management approaches into a comprehensive regional plan.

In accordance with the 2007 enabling agreement among participating entities, the LVVWAC assumed all functions of the Las Vegas Wash Management Advisory Committee (MAC), a former stakeholder committee that provided direction on water quality and resource issues associated with the Las Vegas Wash. The LVVWAC will take on this role with an expanded scope, considering the regional watershed as a whole.

The LVVWAC has developed this 2009 Regional Water Quality Plan (Plan) in an effort to coordinate all existing plans, policies, documents and efforts related to water quality in the Las Vegas Valley watershed. The Plan integrates regional water quality goals and strategies that were developed by the LVVWAC during the year following its formation.

These goals set a roadmap for future efforts and guide its members toward developing operating plans necessary to better manage important community water resources for the public.

LVVWAC MEMBERSHIP

Each of the nine LVVWAC members has a responsibility for protecting and preserving regional watershed resources for the community. Specific duties are detailed below.

City of Henderson

The City of Henderson was incorporated in 1953 and is governed by a Mayor and a four-member City Council. The City is responsible to provide water, wastewater and reclaimed water service to its residents, and build infrastructure projects to collect and manage stormwater.

City of Las Vegas

The City of Las Vegas was founded in 1905 and is governed by a Mayor and a six-member City Council. It is responsible for managing wastewater treatment for its residents and parts of North Las Vegas, and building infrastructure projects to collect and manage stormwater. Domestic water service and recycled water distribution are provided by the Las Vegas Valley Water District.

City of North Las Vegas

The City of North Las Vegas was incorporated in 1946 and is governed by a Mayor and a four-member City Council. The City is responsible for providing water and wastewater service to its residents, and building infrastructure projects to collect and manage stormwater. It also provides water service to portions of Las Vegas and unincorporated Clark County.

Clark County

Clark County (County) was formed in 1909 and is governed by a seven-member board of County Commissioners (Commission). The County provides

local and regional services for more than two million residents and approximately 40 million visitors annually.

In accordance with the Clean Water Act, the state of Nevada designated Clark County to serve as the lead agency responsible for all water quality planning activities associated with water pollution and management of regional wastewater treatment plans. In compliance with Clean Water Act planning requirements, Clark County has prepared the Clark County Area-Wide Water Quality Water Management Plan (208 Plan).

Clark County Regional Flood Control District

The Clark County Regional Flood Control District (CCRFCD) was created in 1985 to develop a coordinated and comprehensive master plan to solve flooding problems, regulate land use in flood hazard areas, fund and coordinate the construction of flood control facilities, and develop a maintenance program for master plan flood control facilities. The CCRFCD is named the lead agency for the Las Vegas Valley National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer (MS4) permit. The agency is governed by an eight-member Board of Directors that is comprised of two representatives each from Clark County and the City of Las Vegas, and one representative each from Moapa Valley and the cities of Boulder City, Henderson and North Las Vegas.

Clark County Water Reclamation District

The Clark County Water Reclamation District (CCWRD) was formed in 1954 and is governed by a seven-member Board of Trustees whose members also serve as the elected Clark County Commission. It is responsible for wastewater treatment and reclamation in all of the unincorporated areas of Clark County, including the outlying areas of Blue Diamond, Indian Springs, Laughlin, Searchlight and Overton.

Clean Water Coalition

The Clean Water Coalition (CWC) was formed in 2002 among local wastewater agencies to implement the Systems Conveyance and Operations Program (SCOP). When complete, the program will transport highly treated wastewater from point sources to Lake Mead. CWC members include the Clark County Water Reclamation District, City of Las Vegas, City of Henderson and the City of North Las Vegas. The CWC is governed by a four-member Board of Trustees, comprised of one member from each member agency.

Las Vegas Valley Water District

The Las Vegas Valley Water District (LVVWD) was formed in 1954 and is governed by a seven-member Board of Directors whose members also serve as the elected Clark County Commission. The LVVWD provides water service to the City of Las Vegas and portions of unincorporated Clark County. The agency also serves as the managing entity for the Southern Nevada Water Authority.

Southern Nevada Water Authority

The Southern Nevada Water Authority (SNWA) was formed in 1991 among seven water and wastewater agencies in Southern Nevada to serve as the region's wholesale water provider. Specific functions of the SNWA are to acquire and manage long-term water resources for Southern Nevada, manage existing and future water resources, construct and manage regional facilities and promote water conservation. The agency is governed by a seven-member Board of Directors, comprised of one member from each partnering agency. SNWA members include Big Bend Water District, City of Boulder City, City of Henderson, City of Las Vegas, City of North Las Vegas, Clark County Water Reclamation District and Las Vegas Valley Water District.

LAS VEGAS VALLEY WATERSHED

The Las Vegas Valley watershed includes the entire Las Vegas Valley Hydrographic Basin and Lake Mead (see page 22).

Las Vegas Valley Hydrographic Basin

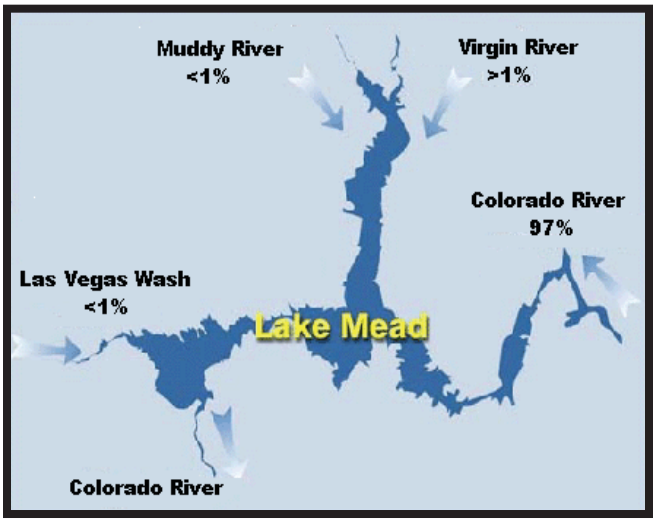
The Las Vegas Valley Hydrographic Basin measures approximately 2,200 square miles. The basin is recharged through precipitation and snowmelt within the surrounding mountain ranges. The basin is bordered by Spring Mountains (West), Frenchman Mountains (East), McCullough Range (South) and the Sheep Range (North). The entire basin is drained by the Las Vegas Wash.

Lake Mead and Associated Inflows

In addition to local groundwater, other watershed sources include the Colorado River, which is primarily

fed by precipitation and snowmelt in the Rocky Mountains. The Colorado River drainage runs through seven western states including Wyoming, Colorado, Utah, New Mexico, Nevada, Arizona and California. Nevada's Colorado River allocation is stored in Lake Mead.[1]

For planning purposes, the LVVWAC considers all water sources within the Las Vegas Valley Hydrographic Basin (including groundwater, shallow groundwater, urban runoff, stormwater and treated wastewater flows) as components of the Las Vegas Valley watershed. As described earlier, the Colorado River is included for planning purposes, as well as its tributaries including the Muddy and Virgin Rivers. The Virgin River originates in southwestern Utah, flows through Arizona and into Nevada where it joins the Colorado River at Lake Mead. The Muddy River is a perennial river fed by a series of springs in Southern Nevada. The river originates in Nevada and flows into Lake Mead.



Lake Mead inflows.

The Las Vegas Wash is another tributary to Lake Mead, and primarily serves as an "urban river." Its flows are comprised of urban runoff, shallow groundwater, recycled water and stormwater. These flows are discharged into Lake Mead where they help to extend Southern Nevada's Colorado River allocation. In Southern Nevada, water that is withdrawn from the system but later returned as treated wastewater flows, is effectively refunded. These "return-flows" allow Southern Nevada to extend the use of its Colorado River apportionment by approximately 70 percent.

The Las Vegas Wash provides wetland habitat for numerous species of wildlife. Clark County manages the Clark County Wetlands Park and Nature Preserve, a comprehensive management effort to enhance wetlands habitat, restore the larger wetlands environment, and provide recreational and educational opportunities for the Las Vegas Valley.

WATER SOURCES

There are three distinct water sources in the Las Vegas Valley watershed. These include the Colorado River, local groundwater and non-point water sources (including urban runoff, shallow groundwater and stormwater).

Colorado River

Under the 1922 Colorado River Compact and associated agreements, Nevada has the right to the consumptive use of 300,000 acre-feet of Colorado River water per year (afy). Agreements among the seven basin states that share the Colorado River have afforded Southern Nevada additional flexibility along the Colorado River. For example, Southern Nevada has the ability to develop specific water resources and convey them to the Colorado River in exchange for credits. In addition, Southern Nevada has received credits in exchange for funding a water system efficiency project on the Colorado River. Southern Nevada also has water banking agreements with California and Arizona to bank Colorado River water in exchange for storage credits for SNWA to withdraw in the future.

In 1999 and continuing today, the Colorado River basin began to experience drought conditions that have significantly impacted storage volumes in Lake Powell and Lake Mead, the two primary storage reservoirs on the Colorado River system. Less obvious impacts of the drought include altered Lake Mead water quality. These challenges and interim solutions are discussed in detail later in the chapter.

Local Groundwater

The Las Vegas Valley Water District and the City of North Las Vegas have permanent groundwater rights totaling 40,629 afy and 5,711 afy, respectively. This groundwater is permitted by the Nevada State Engineer and is withdrawn from the principal aquifer in the Las Vegas Valley Hydrographic Basin.

Non-Point Water Sources

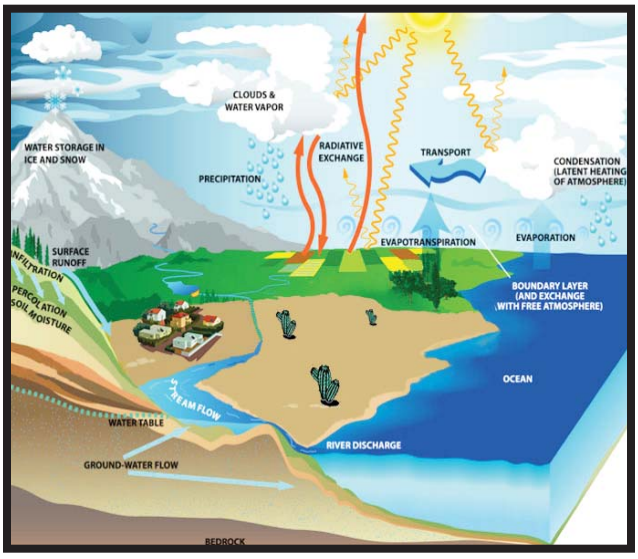
There are three non-point source flow components of the Las Vegas Wash, the primary drainage source for all of Southern Nevada's non-point sources:

- Urban runoff
- Shallow groundwater
- Stormwater

Urban Runoff. Urban runoff is typically associated with water runoff that begins in street gutters, and travels through the storm drain system and enters Lake Mead untreated. A number of conservation programs, including water waste restrictions, adopted in the Las Vegas Valley are designed to reduce urban runoff and the pollutants it transports.

Shallow Groundwater. Shallow groundwater is histocially naturally occurring, but is also fed by excess irrigation. Shallow groundwater runoff is trapped near the land surface by an impermeable layer of clay and caliche, and typically lies within 50 feet of land surface. In some areas of the Las Vegas Valley, higher levels in the principal aquifer can contribute to the shallow groundwater system. In the southeast portion of the Valley, the shallow aquifer is near the ground surface and discharges to stream channels.

Stormwater. Rain events in the Las Vegas Valley create stormwater. This water is conveyed untreated through the Las Vegas Valley to the Las Vegas Wash through an extensive network of flood control structures and natural washes. Southern Nevada does not receive return-flow credits for stormwater that enters Lake Mead.



Hydrologic cycle.

WATER QUALITY REGULATIONS

All qualities of water in the Las Vegas Valley – including drinking water, wastewater and stormwater – are regulated by a series of federal and state regulations. These regulations serve to protect drinking water and source water quality, and ensure that the watershed's environmental and recreational uses are preserved. Key water quality regulations in place to safeguard Southern Nevada's water resources include:

- Clean Water Act
- Safe Drinking Water Act
- Nevada law

Clean Water Act

As amended, the 1972 federal Clean Water Act (CWA) regulates water pollution and ensures that surface waters meet certain standards necessary for appropriate beneficial uses, while restoring and maintaining the chemical, physical and biological integrity of the nation's waters.[2] Discharge of point and non-point sources are covered under the act.

The CWA includes a number of regulatory and non-regulatory tools to manage water pollution. For example, the National Pollutant Discharge Elimination System, or NPDES, is a permitting process to limit the discharges of pollutants to surface waters. The NPDES is managed by the United States Environmental Protection Agency (EPA) in partnership with state environmental agencies to regulate point and non-point sources of pollution. In Nevada, the Nevada Division of Environmental Protection (NDEP) is responsible for implementation and enforcement efforts associated with the Act. In addition to NPDES permitting activities, the NDEP sets water quality standards, identifies impaired water bodies and establishes Total Maximum Daily Loads (TMDLs) for water bodies. NPDES permits must be reviewed and reissued every five years.

Safe Drinking Water Act

As amended, the 1974 federal Safe Drinking Water Act (SDWA) serves as the principal federal law that ensures safe drinking water for the public and applies to all public water systems.[3] Pursuant to the SDWA, the EPA is responsible to set drinking water quality standards and oversee implementation.[4] As part of

this work, the EPA has established regulations for certain contaminants that may cause adverse public health effects. The EPA protects public health by establishing Maximum Contaminant Levels (MCLs) for enforceable contaminants.

The SDWA contains provisions that must be met for both regulated and unregulated organic, inorganic and microbial contaminants, which come from a variety of sources. In addition, there are a number of chemical compounds and organisms on the EPA's Contaminant Candidate List (CCL) that may be regulated in the future, as well as pharmaceuticals and compounds of concern.

Nevada Law

The state of Nevada is responsible for coordinating and implementing federal water quality regulations throughout the state. In addition to federal regulations, Nevada Revised Statutes (NRS)[5] and Nevada Administrative Code (NAC)[6] include water quality standards to protect the beneficial uses of waters, including municipal water supply and warm water fisheries in Lake Mead.

The NAC includes anti-degradation standards based on the "Requirement to Maintain Existing Higher Quality" (RMHQ) where existing water quality is higher than the standards required for beneficial uses (such as in Lake Mead).

Other Regulations

Meeting anti-degradation standards also addresses the National Park System's (NPS) non-impairment guidelines for water quality constituents, as well as recreation, fish and wildlife.

The NDEP also regulates remediation programs, which work to oversee cleanup activities and determine mitigation activities for contaminated water bodies throughout the state. Beyond NPDES permits, the NDEP may also issue general or temporary wastewater discharge permits based on the type of discharge, duration and impacted waters.

The Colorado River serves seven western states and the country of Mexico. Water quality in and out of Nevada is regulated by the federal government (EPA). Nevada also works with the states of Arizona and California to set standards that work to protect interstate waters.

WATER QUALITY

This Plan addresses water quality parameters and management efforts of three distinct water types: source water, treated wastewater and non-point water sources (stormwater, urban runoff and shallow groundwater). Below is a description of each, as well as a discussion of treatment issues and management strategies to ensure all water types meet or exceed established federal and state water quality standards.

This section is intended to provide readers with a broad overview of regional water quality issues, as well as a context for enhanced communication and collaboration efforts occurring among partnering water and wastewater agencies in Southern Nevada.

Source Water

Source water is the term used to describe waters that have not been treated for drinking and other domestic uses. In Southern Nevada, source water is comprised of Colorado River system inflows, wastewater returns, urban runoff, shallow groundwater and stormwater.

Ongoing drought conditions in the Colorado River Basin have affected water quality in Lake Mead. For example, concentrations of bromide and total organic carbon, two naturally occurring constituents have increased, primarily due to reduced inflows and concentration from water evaporation. These constituents are relatively harmless by themselves. However, when they undergo mixing with water treatment processes (such as chlorine or ozone) or are influenced by factors such as temperature, undesirable water quality issues arise. Partnering LVVWAC agencies are working together to ensure that long-term drinking water quality is maintained. Some actions include coordinating planned facilities (outfall and intakes) and modifying treatment techniques based on current and future conditions.

Surface Water. Water stored in Lake Mead is treated at the Southern Nevada Water System (SNWS), which has two advanced water treatment facilities designed to provide drinking water that meets all SDWA standards. Water undergoes ozone treatment and multi-stage filtration, and is further disinfected to protect drinking water in the distribution system.

Every month, scientists collect and analyze hundreds of water samples from throughout the Las Vegas

Valley. The SNWS tests more frequently and extensively than the SDWA requires. Water delivered by the SNWS, as well as local groundwater supplies, meet or surpass all state and federal drinking-water standards.



SNWS Water Quality Laboratory.

Groundwater. Because it is naturally filtered, water drawn from the principal groundwater aquifer is simply treated with chlorine as it enters the water distribution system.

In 1997, the Nevada State Legislature directed the SNWA to develop the Las Vegas Valley Groundwater Management Program (GMP) to protect and manage the valley's groundwater resources found within the principal aquifer. The program works to protect the groundwater supply from contamination, improve management of resources to prevent overdrafting and increase cooperation among groundwater users and agencies. In addition, the program works to recharge the principal aquifer by injecting treated surface water from the drinking water distribution system in the Las Vegas Valley into the groundwater aquifer. On behalf of the SNWA member agencies, this large-scale surface water recharge is used to "bank" water for future use and supplement the natural recharge of the aquifer. The surface water that is injected into the principal aquifer is subject to all drinking water standards.

Treated Wastewater

Treated wastewater accounts for 90 percent of Las Vegas Wash flows at Lake Mead. Because Nevada depends on wastewater recycling for return-flow credits, meeting federal and state regulations for wastewater discharge not only protects Lake Mead water quality, it also extends the region's water resources.

The valley's four wastewater agencies (CCWRD and the cities of Henderson, Las Vegas and North Las Vegas) discharge highly-treated effluent into the Las Vegas Wash where it enters Lake Mead. Wastewater discharge is regulated by federal and state policies. The LVVWAC wastewater agencies are in full compliance with these established regulations for wastewater discharge.

The wastewater treatment process includes biological and chemical treatment systems. Solids are removed from the wastewater stream and then dissolved biological matter is converted into sludge. After wastewater has undergone initial treatment activities, it undergoes tertiary treatment. Tertiary treatment raises the water quality of the effluent before it is discharged to the Las Vegas Wash. There are a number of tertiary treatment processes used in Southern Nevada, including the removal of nitrogen and phosphorus. The wastewater is then filtered and disinfected before being discharged.



City of Henderson water recycling facility expansion.

Wastewater agencies perform more than 100,000 process control and laboratory tests each year to meet strict NDEP regulations and ensure that water quality standards are met or surpassed at all times.

To manage future projected wastewater discharges, the Clean Water Coalition (CWC) was formed to implement the Systems Conveyance and Operations Program (SCOP). The project will reduce wastewater

flows to the Las Vegas Wash and deliver them directly to Lake Mead. As part of this effort, the CWC developed the Boulder Basin Adaptive Management Plan (BBAMP)[7] to address SCOP operations, water quality monitoring and decision-making processes to protect Lake Mead's water quality. The BBAMP outlines an extensive monitoring program and a comprehensive management process to ensure that project goals related to water quality and resource protection are met. The BBAMP is managed by a core management team consisting of the CWC, SNWA, U.S. Bureau of Reclamation, National Park Service and U.S. Fish and Wildlife Service.

Non-Point Sources

Non-point sources account for approximately 10 percent of Las Vegas Wash flows at Lake Mead on an annual basis. Non-point sources include urban runoff, shallow groundwater and stormwater.

Agencies in Southern Nevada work together to monitor these flows and ensure that they do not adversely impact the environment. The NDEP and the EPA, as authorized by the CWA, regulate non-point source discharges. To support these efforts, the Nevada Division of Environmental Protection (NDEP) manages the NPDES and requires a permit for all entities that discharge water to Lake Mead. NPDES is a permitting mechanism that requires the implementation of controls designed to prevent harmful pollutants from being washed by stormwater runoff into local water bodies.

The Clark County Regional Flood Control District (CCRFCD) is the lead entity for a multi-jurisdictional stormwater permit issued to the cities of North Las Vegas, Las Vegas, Henderson and Clark County. The CCRFCD coordinates permit compliance activities among these stormwater system operators. In addition, the Stormwater Quality Management Committee (SQMC) was formed among Las Vegas Valley stormwater permittees to help manage program development and compliance activities under the state-issued NPDES Municipal Separate Storm Sewer System (MS4) permit. The permit authorizes stormwater discharge to the Las Vegas Wash from storm sewer systems owned and operated by the cities of Las Vegas, North Las Vegas, Henderson and Clark County in return for implementation of certain storm water pollution reducing activities by the permittees.

The following provides an overview of non-point sources and respective water quality challenges.

Urban Runoff. Urban runoff can pose a risk to water quality because of its potential for carrying various pollutants (including bacteria, oil, grease, pesticides, herbicides and nutrients) from the urban landscape into Lake Mead through the storm drain system. In addition, urbanization can increase the quantity and pollutant load of dry weather flows in the drainable system as a result of landscape watering, vehicle washing and other miscellaneous activities.

Shallow Groundwater. Local groundwater sources are known to contain elevated selenium and total dissolved solids (TDS), two watershed contaminants of concern that occur naturally in groundwater sources. Other shallow groundwater flow inputs are affected by sub-surface flows from industrial activities in Henderson, Nevada, and dewatering discharges.

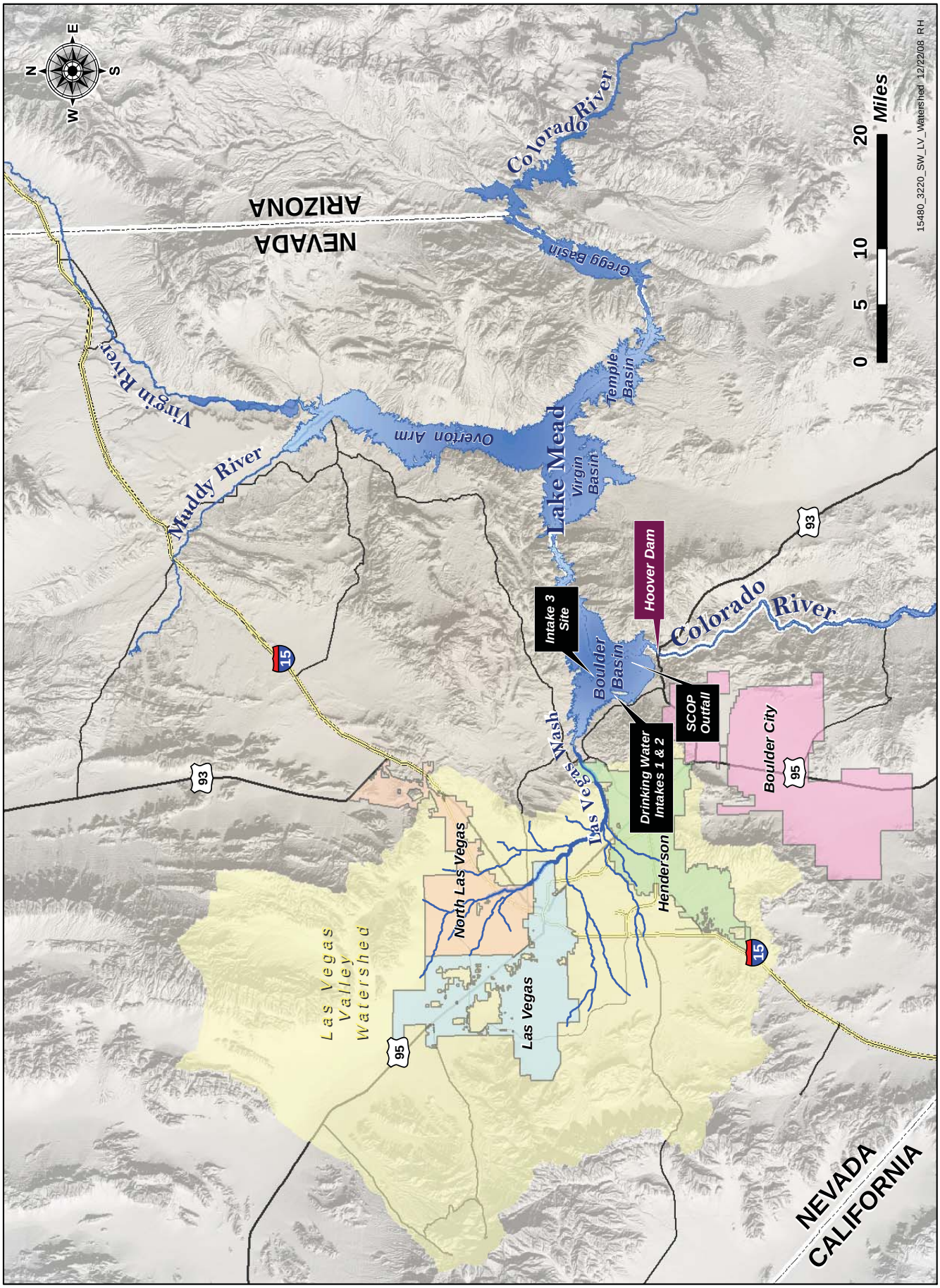
Stormwater. Sediment, debris and bacteria are the most common contaminants found in stormwater. These contaminants are washed into storm drains, which ultimately lead to Lake Mead via the Las Vegas Wash. During rain events, runoff may contain pollutants in quantities that could adversely affect water quality.

CONCLUSION

A host of federal and state regulations exist to protect local source water and drinking water quality for the public. Drought impacts on major water supplies will require even more significant efforts, both in terms of treatment and facilities management, to protect public resources.

Proactive management of the Las Vegas Valley watershed is necessary to ensure that the quality of Southern Nevada's drinking water supply is maintained and to protect regional water resources for environmental, and human and recreational uses. This coordinated effort is critical to protect public health, as well as important water resources for community.

To facilitate the implementation of the goals and strategies set forth in this Plan, the committee's regional members including the SNWA, CWC and CCRFCD will begin development of respective annual work plans. These annual work plans will detail actions taken on behalf of the Committee's member agencies to meet this Plan's prescribed objectives.



Las Vegas Valley Watershed

FOOTNOTES

1. A series of laws and court cases known as the "Law of the River" governs how and where Colorado River water is used. The 1922 Colorado River Compact and the 1928 Boulder Canyon Project Act defined all apportionments of Colorado River water. The 1964 Supreme Court Decree in Arizona v. California verified the lower basin apportionment of 7.5 million acre-feet among Arizona, California and Nevada, including Nevada's consumptive-use apportionment of 300,000 acre-feet per year (afy) of Colorado River water.

2. 1972 "Clean Water Act," a primary federal law governing water pollution, gives the states responsibility for setting, reviewing and revising water quality standards. Introduced a permitting system for regulating point sources of pollution.

3. 1974 "Safe Drinking Water Act," amended in 1986 and 1996; requires actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs and groundwater wells.

4. Ibid. Authorizes United States Environmental Protection Agency (EPA) to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water.

5. "Nevada Revised Statutes (NRS)." State of Nevada requirements for water quality standards, NRS 445A.425 and 445A.565.

6. "Nevada Administrative Code (NAC)." Water quality standards for Nevada, NAC 445A.119 through 445A.225.

7. "Boulder Basin Adaptive Management Plan," March 2008, Clean Water Coalition.

MISSION:

PROTECT, PRESERVE AND ENHANCE THE QUALITY AND QUANTITY OF WATER RESOURCES IN THE LAS VEGAS VALLEY WATERSHED TO SUSTAIN ECONOMIC WELLBEING AND PROTECT THE ENVIRONMENT FOR PRESENT AND FUTURE GENERATIONS.

GOALS AND ASSOCIATED STRATEGIES

1. Protect Lake Mead as a source of water for Southern Nevada and downstream users.

- Monitor and respond to upstream inflows to Lake Mead.
- Manage non-point sources from the Las Vegas Valley.
- Manage the operations and facilities of the System Conveyance and Operations Program (SCOP).
- Manage, coordinate and optimize water reclamation facilities.

2. Meet or surpass federal, state and local standards and regulations.

- Endeavor to protect Lake Mead, Las Vegas Wash and tributaries to meet or surpass environmental water quality standards.
- Continue to ensure drinking water standards are met or surpassed.

3. Preserve and enhance the natural, cultural, historic and recreational values of the watershed and Lake Mead.

- Manage wildlife and habitats.
- Minimize impacts to cultural and historic values.
- Endeavor to prevent and control invasive species.
- Support recreational uses and the health of fisheries and other water dependant wildlife.

4. Coordinate water resource management.

- Balance ecosystem, flows and other functions of the Las Vegas Wash and Lake Mead.
- Optimize the use of reclaimed water.
- Ensure the development of and compliance with the Clark County 208 Water Quality Management Plan for the Las Vegas Valley watershed.

5. Manage flood risks.

- Minimize the loss of life and property from the impacts of flooding.

6. Sustain water and energy resources for future generations.

- Optimize use of renewable energy.
- Consider the net environmental benefit.
- Enhance energy and water conservation programs.

7. Build community awareness and support for regional watershed management.

- Develop communication and education programs.
- Integrate existing stakeholder programs to specifically address watershed issues.

GOAL ONE: PROTECT LAKE MEAD AS A SOURCE OF WATER FOR SOUTHERN NEVADA AND DOWNSTREAM USERS.

BACKGROUND

The Colorado River is the primary source for Southern Nevada's overall water resource needs. Nevada receives 300,000 acre-feet for consumptive use each year from the Colorado River.

Other downstream users include Mexico, which receives 1.5 million acre-feet per year (mafy), and the states of California and Arizona, which receive 4.4 mafy and 2.85 mafy, respectively.

The Las Vegas Valley accesses Nevada's Colorado River allocation through existing facilities at Lake Mead. Other Lake Mead inflows come from the Muddy River, the Virgin River and the Las Vegas Wash. Las Vegas Wash flows are comprised of wastewater discharge, stormwater runoff, shallow groundwater and urban runoff[1]. The latter three are referred to as non-point sources.

There are a number of factors that can and will likely continue to influence water quality in the future, these include:

- Drought conditions in the Colorado River Basin. Reduced inflows limit dilution and mixing of existing storage and contribute to lower surface elevations and associated temperature variations.
- Increased volumes of treated wastewater discharged to Lake Mead.
- New discharges of treated wastewater to the Virgin and Muddy rivers by upstream users such as Southern Utah and other growing Nevada cities.
- Plans by the U.S. Bureau of Reclamation to release warmer water from the Glen Canyon Dam for endangered species recovery.
- Changes to upstream reservoir operations (Lake Powell).
- Imported groundwater from the SNWA's proposed Clark, Lincoln and White Pine Counties Groundwater Development Project.
- Increased non-point source inflows due to continued development in the watershed.

Climate change is one example of an emerging issue that will warrant monitoring to determine future impacts. Climate change and its resulting impacts will likely influence water resource availability and consequently influence water quality.

The following pages provide an overview of strategies and implementation plans designed to protect Lake Mead as a water source for Southern Nevada and downstream users.



Lake Mead, Nevada.

STRATEGY: MONITOR AND RESPOND TO UPSTREAM INFLOWS TO LAKE MEAD.

BACKGROUND

Monitoring and management of Lake Mead inflows are critical to protecting the region's overall water quality.

Today, wastewater is monitored daily by the wastewater dischargers. In addition, Lake Mead inflows are monitored monthly for nutrients and drinking water contaminants by CWC member agencies, as well as the SNWA and the U.S. Bureau of Reclamation through a contract with the National Park Service (NPS). The U.S. Geological Survey (USGS) also monitors reservoir inflows on a quarterly basis. The CCRFCD, on behalf of the Stormwater Quality Management Committee (SQMC), monitors stormwater flows.

Lake Mead's outflows are monitored monthly for nutrients, drinking water contaminants and endocrine disrupting compounds. These activities are coordinated by the SNWA in cooperation with the CWC. Furthermore, the USGS also monitors the water quality of Lake Mead outflows.

In addition, the NPS, CWC and SNWA have jointly funded the Estuary and Lake Computer Model (ELCOM) three-dimensional model to analyze data collected and to better understand how inflow changes will affect Lake Mead water quality in the future.

Ongoing water monitoring efforts are needed to help ensure that water managers can effectively respond to current and emerging water quality issues.

IMPLEMENTATION PLANS

- Continue to monitor Lake Mead inflows for nutrients and drinking water contaminants.
- Monitor the progress of changes in upstream wastewater discharges and address any water quality impacts resulting from increased wastewater flows.
- Evaluate potential impacts and implement necessary response measures to changes in Las Vegas Wash inflows.
- Monitor and address any potential water quality impacts resulting from SCOP to Lake Mead and downstream users.
- Use the ELCOM model as a tool to inform future water planning and management efforts.
- Continue to utilize the Lake Mead Water Quality Forum to assess issues related to upstream inflows.
- Monitor temperature changes and nutrient loads as a result from changes in Lake Powell and address resulting water quality impacts.



Upstream inflows.

STRATEGY: MANAGE NON-POINT SOURCES FROM THE LAS VEGAS VALLEY.

BACKGROUND

In accordance with the Clean Water Act, the EPA regulates non-point source discharges to storm sewer systems under its NPDES program. The NDEP is responsible for implementing and regulating this program locally. As part of EPA guidelines, NDEP developed three programs that address non-point source pollution in the municipal storm system:

- Construction Site Permit Program[2]
- Industrial Site Permit Program[3]
- Municipal Separate Storm Sewer System (MS4) Permit Program[4]

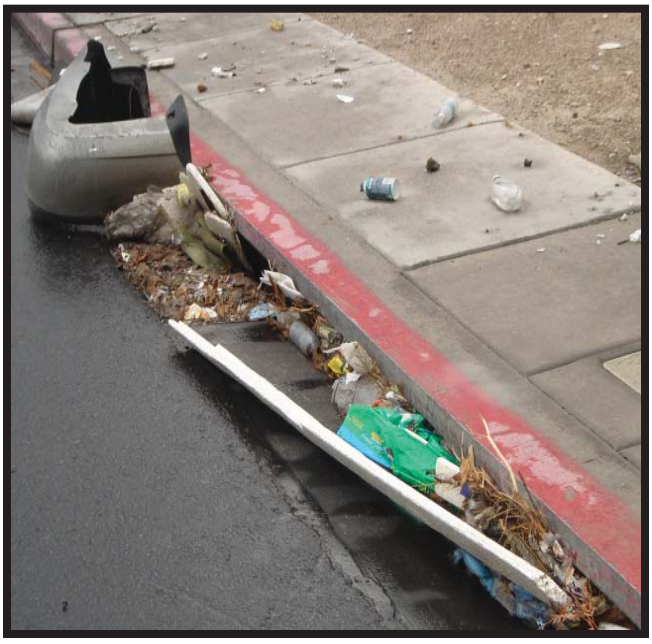
Selenium and total dissolved solids are two natural constituents found in local shallow groundwater. Planned flow reductions in the Las Vegas Wash, as a result of the SCOP project, may increase selenium concentrations. In addition to NDEP regulations, local entities are developing plans to address these constituents. The CWC is in the process of developing a Selenium Management Plan to manage selenium concentrations in the Las Vegas Wash following implementation of SCOP.

In terms of stormwater, preventing contaminant inflow is easier and more cost effective than mitigating impacts. To this end, the cities of Henderson, Las Vegas and North Las Vegas and Clark County, have adopted stormwater management ordinances and discharge controls that prohibit pollutant discharge directly into the storm drain system or local surface water. Through the Stormwater Quality Management Committee, stormwater stakeholders work together to develop and implement stormwater pollution monitoring, control and outreach efforts within the Las Vegas Valley.

As discussed in the Introduction, existing conservation programs work to limit the amount of urban runoff entering the storm drain system.

IMPLEMENTATION PLANS

- Implement and enforce stormwater ordinances to ensure the storm drain systems are protected from pollutants.
- Continue water waste investigations to limit the amount of polluted urban runoff into surface water systems.
- Continue to support NDEP permit programs through implementation of LVVWAC management programs.
- Complete and implement the Selenium Management Plan.
- Continue to coordinate and manage a stormwater program and outreach efforts in the Las Vegas Valley through the Stormwater Quality Management Committee.
- Complete the Las Vegas Wash Stabilization Plan to minimize erosion in the Las Vegas Wash and sediment transport to the Las Vegas Bay and Lake Mead.



Stormwater pollutants.

STRATEGY: MANAGE THE OPERATIONS AND FACILITIES OF THE SYSTEMS CONVEYANCE AND OPERATIONS PROGRAM (SCOP).

BACKGROUND

In accordance with the National Environmental Policy Act (NEPA), the U.S. Bureau of Reclamation and the National Park Service (NPS) developed an Environmental Impact Statement (EIS) to assess environmental impacts and alternatives associated with SCOP, a regional system that will transport highly-treated wastewater from local wastewater facilities to an outfall location in Lake Mead.

In 2007, these agencies each issued a Record of Decision for the project, accepting the EIS and granting the CWC authority to construct SCOP. The EIS calls for the Boulder Basin Adaptive Management Plan (BBAMP) to monitor and manage operations of SCOP to protect water quality in Boulder Basin in Lake Mead, as well as the lower Colorado River system.

The BBAMP requires the formation of technical and management committees. To this end, a Core Management Team[5] was formed to oversee the development of long-term efforts outlined in the BBAMP for project operations within Boulder Basin.

The Core Management Team provides a forum for interagency coordination for the overall use of Boulder Basin and works to achieve basic objectives including meeting regulatory requirements, protecting Boulder Basin as a drinking water source and protecting the recreational values in Lake Mead.

All BBAMP stakeholders identified items of concern that warrant additional monitoring and management efforts.

IMPLEMENTATION PLANS

- Utilize the BBAMP as a planning and management tool to coordinate and implement efforts related to water quality.
- Utilize the BBAMP's Core Management Team and other technical and management committees set forth in the document as a clearinghouse for information related to ongoing water quality efforts in Boulder Basin.
- Implement the BBAMP Core Management Team and other technical and management committee decisions.
- Identify items of concern and develop management action plans.
- Manage Boulder Basin inflows, including wastewater inflows and SCOP discharges, with intake operations to control potentially harmful constituents that can affect Lake Mead water quality.



Systems Conveyance and Operations Program project map.

STRATEGY: MANAGE, COORDINATE AND OPTIMIZE WATER RECLAMATION FACILITIES.

BACKGROUND

The Clark County Water Reclamation District and the cities of Henderson and Las Vegas operate and maintain wastewater treatment facilities in Southern Nevada. The City of North Las Vegas also has plans to construct its own facility. Some of these facilities discharge highly-treated wastewater to Lake Mead via the Las Vegas Wash, while others treat water for direct reuse at golf courses, parks, etc.

NPDES permits allow for wastewater discharges to surface water bodies, including Lake Mead. Wastewater agencies must ensure that water quality standards are met, including NPDES limits for effluent flow, Total Suspended Solids, Biochemical Oxygen Demand, pH, fecal coliform and total residual chlorine. NPDES permits also require compliance with Total Maximum Daily Loads (TMDLs), or the maximum amount of a pollutant that a body of water can receive and still safely meet water quality standards. In the Las Vegas Bay, there is a TMDL restriction of phosphorus and ammonia to protect the water quality and support beneficial uses.

Optimizing treatment facilities to surpass water quality standards entails operating at greater removal efficiencies than required while considering costs. Collective optimization may involve individual facilities operating at a higher removal efficiency rate for a particular constituent, such as phosphorus or nitrogen, while meeting the combined allocation. Currently, wastewater facilities discharge significantly below the allowable loads.

The Sewage and Wastewater Advisory Committee (SWAC) is comprised of representatives from water and wastewater agencies or facilities in Clark County. SWAC remains current on issues that affect sewage and wastewater treatment and disposal, and makes recommendations to the Clark County Commissioners.

Coordination and optimization of water reclamation facilities will require purveyors to assess the appropriate balance of operating costs and control of other factors affecting Lake Mead water quality.

IMPLEMENTATION PLANS

- Coordinate the operation of Southern Nevada's water reclamation facilities to meet water quality objectives.
- Coordinate wastewater treatment facility operations to achieve optimization.
- Develop annual operating plans for water reclamation facilities.
- Identify and participate in research efforts related to optimizing treatment.



Clark County Water Reclamation District's main treatment facility.

- THIS PAGE INTENTIONALLY LEFT BLANK -

GOAL TWO: MEET OR SURPASS FEDERAL, STATE AND LOCAL STANDARDS AND REGULATIONS.

BACKGROUND

As discussed in Chapter 1, all qualities of water in the Las Vegas Valley are regulated by a series of federal, state and local regulations. Key water quality laws in place to safeguard local and regional water sources include the Clean Water Act, the Safe Drinking Water Act and Nevada Administrative Code.

The Nevada Division of Environmental Protection (NDEP) is responsible for implementation and enforcement efforts in Nevada associated with the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA). The CWA generally applies to municipal sources, wastewater, industrial wastewater, urban storm drainage systems and construction site runoff management efforts. The SDWA applies to drinking water sources.

In Nevada, water control standards are regulated by Nevada Administrative Code (NAC). Specific constituents regulated in the Colorado River below Hoover Dam, Lake Mead, inner Las Vegas Bay and the Las Vegas Wash include toxic materials, phosphates, and dissolved oxygen, as well as temperature and pH levels. The NAC has anti-degradation standards to ensure existing water quality is higher than the standards required for beneficial use.

The Nevada Division of Environmental Protection (NDEP) established the Lake Mead Water Quality Forum to protect public health and preserve water quality in the Las Vegas Wash and Las Vegas Bay, as well as Lake Mead. A number of federal, state and local stakeholders are involved in this process and work together to identify issues regarding water quality and impacts on the water supply, coordinate study efforts, disseminate information, serve as a clearinghouse on water quality issues and formulate further study work on water quality issues.

In 1999, the Colorado River Basin began to experience drought conditions that, during the next few years, became the worst drought in the recorded history of the basin. As a result, water levels in the two primary storage reservoirs on the lower Colorado River (Lake Mead and Lake Powell) declined to levels not observed since Lake Powell began filling in the early 1960s. Due to continued periods of reduced inflow, Lake Mead and Lake Powell water levels have declined substantially. Low water levels affect water temperature, a key variable in drinking water quality management, as well as the concentration of other constituents such as total organic carbon and bromide.

While Southern Nevada's water treatment facilities are capable of addressing many source water quality challenges, proactive management of the Las Vegas Valley watershed remains key to protecting the region's overall supply. To this end, research and monitoring efforts are underway by LVVWAC member agencies to remain current on emerging issues including endocrine disrupting compounds, pharmaceuticals and personal care products. Together, these emerging issues consist of human and veterinary drugs and consumer products, such as fragrances, lotions, sunscreens and household cleaning products. These compounds have been detected in trace amounts in surface water, drinking water and wastewater effluent samples. Although impacts on human health have not been demonstrated, water treatment operators are evaluating the effectiveness of current treatment techniques on their removal.

Moving forward, water managers must be aware of sensitivities towards the existence of emerging chemicals and compounds found in drinking water supplies. Furthermore, these compounds may be regulated in the future, which will impact current treatment techniques and operating costs.

The following pages provide an overview of strategies and implementation plans designed by LVVWAC to meet or surpass federal state and local standards and regulations.

STRATEGY: ENDEAVOR TO PROTECT LAKE MEAD, THE LAS VEGAS WASH AND ASSOCIATED TRIBUTARIES TO MEET OR SURPASS ENVIRONMENTAL QUALITY STANDARDS.

BACKGROUND

The SQMC works to develop best management practices to prevent the mobilization of pollutants from non-point water sources throughout the Las Vegas Valley. Furthermore, the SQMC also works to protect the water quality of the Las Vegas Wash through the coordination of stormwater management efforts.

Existing water quality laws and regulations set standards for effluent discharges for all National Pollutant Discharge Elimination System agencies. These agencies surpass the established limits by providing year-round phosphorus and ammonia reduction. Furthermore, the agencies reduce the levels of pathogens and other pollutants far below established limits.

Other plans to improve water quality include construction of the CWC's Systems Conveyance and Operations Program (SCOP), which will redirect some wastewater flows in the Las Vegas Wash to an alternate discharge point in Lake Mead, near Boulder Island. As part of the permitting process, the CWC developed the Boulder Basin Adaptive Management Plan (BBAMP) to ensure project operations will meet or exceed all environmental water quality standards.

Operations of the CWC's SCOP and SNWA's Intake No. 3 project will be coordinated to protect water quality and ensure drinking water and environmental water quality standards are met.

IMPLEMENTATION PLANS

- Make adjustments to SCOP operations based on research and monitoring efforts required under the BBAMP to ensure all environmental water quality standards are met or exceeded.
- Coordinate all wastewater, urban runoff, shallow groundwater and stormwater inflows from the Las Vegas Valley to avoid water quality impacts to Lake Mead through the operation of SCOP.
- Optimize water quality of SCOP project flows and other flows to protect water quality at Lake Mead intakes.
- Continue to meet or surpass effluent limits.
- Coordinate the operations of SCOP discharges with the operations of SNWA intakes.



Water quality monitoring in Lake Mead.

STRATEGY: CONTINUE TO ENSURE DRINKING STANDARDS ARE MET OR SURPASSED.

BACKGROUND

The Safe Drinking Water Act (SDWA) contains provisions that must be met for regulated and unregulated inorganic, organic and microbial contaminants that come from a variety of sources. In addition, there are a number of chemical compounds and organisms on the Environmental Protection Agency's (EPA) Contaminant Candidate List that may be regulated in the future.

The EPA has established a Maximum Contaminant Level (MCL) for total coliforms, fecal coliforms and *E. coli*. Other microbial constituents are regulated by Treatment Techniques (TT), a required process intended to reduce contaminant levels in drinking water. The TT provide for the reduction of viruses, parasites and bacteria. The SNWA uses filtration, disinfection and disinfection contact time to meet water quality standards for organisms found in source water including Legionella, Hetrotrophic Plate Count and enteric viruses.

Ongoing Colorado River drought conditions have impacted Lake Mead water levels and raw water quality. In 2005, the SNWA began implementing plans for a new raw water intake to maintain SNWA's ability to draw Colorado River water even at extremely low Lake Mead elevations (1,000 feet) to protect municipal customers from water quality issues associated with declining lake levels. The project is expected to be complete in 2013.

Proactive management of the Las Vegas Valley watershed remains key to protecting the region's overall water supply. To this end, research and monitoring efforts are underway by LVVWAC member agencies to remain current on emerging issues including endocrine disrupting compounds (EDCs) and pharmaceuticals.

As part of the SDWA, groundwater in the Las Vegas Valley is routinely monitored and tested for drinking water contaminants. Groundwater disinfection occurs at the well site or reservoir facility.

IMPLEMENTATION PLANS

- Conduct extensive monitoring and research to identify existing and future contaminants in Lake Mead, as well as contaminant source and control methods.
- Collect additional phosphorus monitoring data at the Hoover Dam outlet and develop appropriate management actions to maintain levels that protect downstream water quality.
- Analyze current drinking water constituents of concern through water quality monitoring and modeling efforts for future operations and/or management plans.
- Monitor and research emerging contaminants of concern and conduct a triennial review of new information related to emerging contaminants.
- Develop goals to monitor and reach non-detectable concentrations for all chemicals listed on the EPA Contaminate Candidate List.
- Maintain treatment levels to ensure EPA's microbial classification for the drinking water treatment facilities are maintained.
- Continue to research optimization opportunities.
- Continue groundwater and disinfection efforts to maintain drinking level standards.



Water quality samples.

- THIS PAGE INTENTIONALLY LEFT BLANK -

GOAL THREE: PRESERVE AND ENHANCE THE NATURAL, CULTURAL, HISTORIC AND RECREATIONAL VALUES OF THE WATERSHED AND LAKE MEAD.

BACKGROUND

The Las Vegas Valley watershed includes the Lake Mead National Recreation Area and the Las Vegas Wash. These water sources and open lands present opportunities for both active and passive recreation, and support important environmental resources including wildlife and habitat.

The Lake Mead National Recreational Area is managed and operated by the National Park Service (NPS). The 1.5 million-acre area was once occupied by early Native American cultures, pioneers and explorers. The area now serves more than seven million annual visitors and supports a variety of recreational activities such as boating, swimming, hiking, fishing and motorized water sports. The area also serves as habitat for a variety of land and aquatic species.

The Las Vegas Wash, as it travels through the Clark County Wetlands Park, offers a number of recreational opportunities for its visitors including hiking, biking, nature walking, bird viewing and equestrian uses. The habitat surrounding the Las Vegas Wash supports a number of migratory birds, including federally listed bird species such as the Yellow-billed cuckoo, Southwestern willow flycatcher and the Yuma clapper rail.

Reductions to Las Vegas Wash flows are planned as part of the Clean Water Coalition's Systems Conveyance and Operations Program (SCOP). Water quality impacts to fish, water dependent birds and other wildlife that are affected by water quality in the Las Vegas Wash and Lake Mead are being considered.

Federal, state and local laws and plans are in place to protect these important resources for the benefit of all users. Federal regulations include:

- Endangered Species Act
- National Historic Preservation Act
- Migratory Bird Treaty Act

Endangered Species Act

Species that are endangered or are likely to be endangered are "listed" by the federal Endangered Species Act (ESA). The act protects listed species and conserves the ecosystems that they depend on for survival. Currently, there are a number of listed species found in Southern Nevada such as the desert tortoise and southwestern willow flycatcher.

Mitigation may be required if a project impacts a listed species or its habitat. The ESA requires federal agencies to consult with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service on potential impacts.

National Historic Preservation Act

The federal National Historic Preservation Act (NHPA) and other state and local laws prescribe certain mandates to preserve cultural and historic sites so that they are not needlessly lost. Among other things, the NHPA created the National Register of Historic Places. There are more than 45 sites near the Las Vegas Wash eligible for listing on the National Register of Historic Places.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act codifies various treaties and conventions between the U.S., Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Nearly every bird species found in Nevada is listed as a migratory bird. Among other things, the act protects migratory birds by prohibiting hunting, capturing, possessing, selling or affecting birds, nests and eggs.

STRATEGY: MANAGE WILDLIFE AND HABITATS.

BACKGROUND

In addition to federal regulations, there are a number of other plans and efforts in place to protect Las Vegas Valley watershed resources. Some of these include the Las Vegas Wash Comprehensive Adaptive Management Plan, Las Vegas Wash Wildlife Management Plan and Clark County Multiple Species Habitat Conservation Plan.

Comprehensive Adaptive Management Plan

The Las Vegas Wash Coordination Committee (LVWCC) was formed in 1998 to develop management solutions for the Las Vegas Wash. The committee's work resulted in the development of the Las Vegas Wash Comprehensive Adaptive Management Plan (CAMP), which identified 44 actions necessary to stabilize, enhance, and provide for long-term management of the Las Vegas Wash. The SNWA was designated as the lead agency for these efforts and continues to work with its member agencies to implement CAMP recommendations.

Wildlife Management Plan

The Las Vegas Wash Wildlife Management Plan was developed to conserve native wildlife species found along the Las Vegas Wash, protect and enhance wildlife habitats and increase environmental awareness of these resources in the community. The plan was approved by the LVVWAC in 2008.

Multiple Species Habitat Conservation Plan

Clark County is responsible for compliance with the federal Endangered Species Act and oversees implementation of the Multiple Species Habitat Conservation Plan (MSHCP) for Clark County and the cities of Las Vegas, Henderson, North Las Vegas, Boulder City, Mesquite and the Nevada Department of Transportation. In this capacity, Clark County manages an incidental take permit, issued by the U.S. Fish and Wildlife Service, which authorizes take of protected species so long as the take is incidental to otherwise lawful activities. The MSHCP outlines the minimization and mitigation measures that will be implemented to offset the impacts of the authorized take.

IMPLEMENTATION PLANS

- Conduct water quality planning efforts in a way that complies with existing local, state and federal policies.
- Coordinate wildlife and habitat management efforts through existing wildlife management plans and documents.
- Share all studies and associated findings related to habitat and wildlife among LVVWAC entities to avoid duplicating efforts and ensure better informed decision-making among member agencies.
- When setting flow rates in the SCOP operations plan, consider wastewater flows that support Las Vegas Wash vegetation and habitat.
- Consider the need to maintain the Las Vegas Wash as a conduit for treated wastewater and stormwater when setting habitat and wildlife goals.



Migratory birds in the Las Vegas Wash.

STRATEGY: MINIMIZE IMPACTS TO CULTURAL AND HISTORIC VALUES.

BACKGROUND

Federal laws and other policies prohibit actions that permanently impair Lake Mead National Recreation Area resources unless specifically and directly authorized by law.

For example, the 1916 National Park Service Organic Act created the National Park Service (NPS) and established its mission to provide for the enjoyment of scenery, natural and historic objects and wildlife in a manner that will leave such resources unimpaired for future generations. In addition, federal legislation enabling the Lake Mead National Recreation Area in 1964 requires that the area be managed to specifically provide for water based recreation in a manner that will preserve the scenic, historic, scientific and other important features of the area.

The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. To meet NEPA requirements, federal agencies prepare an Environmental Assessment or an Environmental Impact Statement (EIS) . As part of the EIS process, impacts to cultural and historical values are evaluated. The EIS process is a valuable tool to ensure that the resource values of the Lake Mead National Recreational Area will not be impaired. Current and future water and wastewater projects must comply with NEPA requirements for all facilities on public lands.

The National Historic Preservation Act requires that federal agencies take into account the effects of activities and programs on historic resources. Section 106 of the act refers to the review process that is required. The review process can be administered at both the state and federal levels.

IMPLEMENTATION PLANS

- Consider impacts to sites worthy of preservation when developing design, construction and operation plans for future facilities.
- Mitigate lost values through existing and future local, state and federal regulations when complete preservation is not feasible.



Archaeological site in the Las Vegas Wash.

STRATEGY: ENDEAVOR TO PREVENT AND CONTROL INVASIVE SPECIES.

BACKGROUND

Typically, invasive species are not native to an area and cause economic or environmental harm to established ecosystems. In the Las Vegas Valley, several invasive species are affecting the watershed, including quagga mussels and several varieties of weeds.

Quagga Mussels

Quagga mussels are an invasive mussel species that can live deep below the water's surface, and were first discovered in Lake Mead in January 2007. The species can significantly alter water ecosystems by causing toxic algal blooms and a reduction in water oxygen levels, thus killing other aquatic species. Furthermore, the species can clog water delivery infrastructure and poses a number of other issues for municipal water supplies (for example, treatment, cost of treatment, etc.). Because the introduction of the species to Southern Nevada is relatively new, long-term impacts in Lake Mead are unknown.

To prevent the westward spread of invasive mussels found elsewhere in the United States where quagga mussels likely originated from, state, provincial and federal agencies developed the 100th Meridian Initiative to control invasive species.

Invasive Weeds

The Nevada Department of Agriculture maintains a list of invasive or noxious weeds that are found to most likely be detrimental, destructive or difficult to control or eradicate. A number of these noxious weeds are found alongside the Las Vegas Wash and could alter or, if left unmanaged, destroy its fragile ecosystem.

The Las Vegas Wash Weed Partnership was formed in 2002 and developed the Las Vegas Wash Integrated Weed Management Plan. The plan details a process for monitoring and managing weeds along the Las Vegas Wash. To date, the partnership has successfully eradicated the noxious weed, giant reed and has removed hundreds of acres of salt cedar.

IMPLEMENTATION PLANS

- Monitor the effects from quagga mussels on water quality to mitigate the impacts of changes in water quality in Lake Mead.
- Continue to use the Las Vegas Wash Weed Partnership and similar groups to prevent and control invasive species along the Las Vegas Wash.
- Coordinate with the 100th Meridian Initiative to track invasive mussels in Lake Mead.
- Continue investigation of methods to control growth of quagga mussels on infrastructure.



Quagga mussels clogging a grate.

STRATEGY: SUPPORT RECREATIONAL USES AND THE HEALTH OF FISHERIES AND OTHER WATER DEPENDENT WILDLIFE.

BACKGROUND

Protecting Lake Mead water quality is important to maintain its ecosystem and provide for current and future recreational opportunities at the Lake Mead National Recreational Area.

Recreation

To protect the public and maintain opportunities for active recreation in Lake Mead, water quality standards have been established for full body contact recreation. These standards are set by the Nevada Division of Health and other applicable laws.

Fisheries and Wildlife

Lake Mead's native and sport fish populations rely on algal and zooplankton production as food sources. In turn, zooplankton and algal production are dependent upon nutrients in the water. As a result, impacts to these nutrients can ultimately reduce fish populations and weaken Lake Mead's ecosystem.

Current facility plans, such as the SCOP in Lake Mead's Boulder Basin, are being designed and constructed to meet established water quality standards to maintain current recreational and wildlife uses.

The razorback sucker is an endangered fish endemic to the Colorado River basin. The species has suffered substantial population declines across its range due to the introduction of non-native species and construction within the basin. The razorback sucker in Lake Mead have been found near Las Vegas Bay, Echo Bay and the Muddy and Virgin Rivers inflow area of Lake Mead.

IMPLEMENTATION PLANS

- Manage water quality and nutrient inputs to support appropriate levels of algal and zooplankton production to maintain forage production for sport and native fisheries.
- Ensure efforts to maintain or improve Lake Mead's water quality do not come at the expense of water dependent wildlife.
- Continue to meet established water quality standards to maintain recreational water uses that involve full body contact recreation with water.
- Continue to conduct research of water impacts on fish and wildlife populations.



Endangered razorback sucker.

- THIS PAGE INTENTIONALLY LEFT BLANK -

GOAL FOUR: COORDINATE WATER RESOURCE MANAGEMENT.

BACKGROUND

Each LVVWAC member agency has individual responsibilities that contribute to management of the Las Vegas Valley watershed. For more than a decade, the agencies have worked closely to address a number of specific issues (for example, coordinating the location of future intake and discharge facilities and management of the Las Vegas Wash); however, the LVVWAC recognizes the need for coordination of water, wastewater and non-point source water management efforts on a larger, more comprehensive scale to:

- Reduce duplication of efforts.
- Ensure that individual projects and activities do not cause unintended consequences for other projects and management efforts.
- Ensure that necessary plans and activities are taking place to protect and enhance the Las Vegas Valley watershed.

By working together, the LVVWAC agencies can address watershed management efforts in a more coordinated manner and ensure that all factors and consequences of individual agency actions are fully understood and addressed. The LVVWAC member agencies have committed to working together to achieve the overall goals established through the LVVWAC interagency process, including coordinated resource management.

To support this work, the LVVWAC has developed this Plan to help coordinate all existing plans, policies, documents and efforts related to water quality in the Las Vegas Valley watershed. The next step requires the SNWA, CWC and CCRFCD to develop a work plan on behalf of their member agencies which will outline their respective efforts to meet the goals established in this Plan.



Las Vegas Wash restoration efforts.

STRATEGY: BALANCE ECOSYSTEM, FLOWS AND OTHER FUNCTIONS OF THE LAS VEGAS WASH AND LAKE MEAD.

BACKGROUND

Balancing the ecosystem, flows and functions of the Las Vegas Wash and Lake Mead will require a coordinated effort among the LVVWAC member agencies and other stakeholders.

Achieving this goal is necessary to protect plant and animal systems that depend on Las Vegas Wash flows and habitat; maintain discharge water quality standards in the Las Vegas Wash and potable drinking water standards at Lake Mead; protect wastewater flows for reuse; and ensure continued passive and active recreational opportunities at the Las Vegas Wash and Lake Mead.

Specific management efforts underway include water quality monitoring, habitat restoration and enhancements, and development of erosion control structures to stabilize the Las Vegas Wash. These efforts are overseen by the Las Vegas Wash Coordination Committee, which has made substantial progress to stabilize and enhance the ecological function of the Las Vegas Wash, the sole drainage point of the Las Vegas Valley watershed to Lake Mead.

Ongoing efforts are required and will be coordinated among existing stakeholders and the LVVWAC to ensure that specific plans and goals intended to protect these water sources are achieved.

IMPLEMENTATION PLANS

- Balance flows to the Las Vegas Wash and Boulder Basin through coordination of LVVWAC member agencies.
- Maintain the structural integrity of the Las Vegas Wash channel to prevent further erosion.



Upper Division Weir, Las Vegas Wash.

STRATEGY: OPTIMIZE USE OF RECYCLED WATER.

BACKGROUND

In the 1960s, water recycling was first introduced to Southern Nevada when recycled water was used to supply cooling water for local generation facilities and irrigation for a few local golf courses. At that time, recycled water was used when the geographic location of a business was located near major, centralized treatment facilities, which were located in the southeast portion of the Las Vegas Valley.

Since that time, Southern Nevada has developed the ability to recycle a majority of its water through direct and indirect reuse by utilizing existing facilities, such as Colorado River return-flow credits. During the 1990s, construction began on "satellite" water recycling facilities near the west side of the Las Vegas Valley. These facilities save costs associated with moving water to higher elevations in the area.

Collecting and treating Colorado River water for direct reuse does not extend Southern Nevada's Colorado River allocation. Because Nevada's rights to the Colorado River are based on "consumptive use," any water that is withdrawn and later returned to the system, primarily as treated wastewater flows, is effectively refunded. When water is treated and used for direct reuse (for example, a golf course), Southern Nevada does not receive any return-flow credits. However, recycling water for direct reuse can be a better alternative for outlying areas for economic reasons.

In 2000, the cities of Las Vegas, North Las Vegas and Henderson, the Clark County Water Reclamation District and the Las Vegas Valley Water District completed the Southern Nevada Regional Water Recycling Study. The study was updated in 2008 to reflect current conditions and to identify opportunities for additional satellite reuse facilities in the Valley.

IMPLEMENTATION PLANS

- Adopt the Southern Nevada Water Recycling Policy by affected LVVWAC member agencies.
- Implement recommendations set forth in the Southern Nevada Regional Water Recycling Study.
- Continue to utilize existing and planned water reclamation facilities to supply recycled water in the Las Vegas Valley.



Aerial image of Desert Breeze Water Resource Center.

STRATEGY: ENSURE THE DEVELOPMENT OF AND COMPLIANCE WITH THE CLARK COUNTY 208 WATER QUALITY MANAGEMENT PLAN.

BACKGROUND

The Clean Water Act controls all sources of water pollution to meet federally established water quality goals. Section 208 of the act requires that all activities associated with water pollution be planned and managed through an integrated, area-wide program. Clark County has been designated as the lead agency to manage and administer all 208-related water quality planning in Southern Nevada.

In 1978, Clark County developed the Clark County Water Quality Management Plan. As amended, the plan presents objectives, policies and programs for managing water quality in the County, including the Las Vegas Wash. The County's Department of Air Quality and Environmental Management has an active role in plan development and implementation.

The plan considers:

- Population projections
- Wastewater flow projections
- Water quality standards/planning
- Wastewater collection, treatment and disposal
- Water reclamation/reuse
- Point sources
- Non-point sources
- Best Management Practices, alternative treatment methods and disposal
- Wellhead protection
- Colorado River and Lake Mead
- Environmental / integrated planning coordination
- Planning recommendations / implementation

IMPLEMENTATION PLANS

- Continue to coordinate all regional water quality planning and management efforts among regional entities

GOAL FIVE: MANAGE FLOOD RISKS.

BACKGROUND

While the Las Vegas Valley receives an average rainfall of approximately four inches per year, the area often experiences periods of intense rainfall and subsequent flash flood events.

Recorded reports of flooding in Clark County date back more than 100 years.[6] Between 1905 and 1975, 184 different flood events occurred in Clark County, resulting in damage to private property and public facilities. Since 1960, the area has experienced at least 11 floods that caused more than a million dollars in damages to public and private property each.

While floods can and have occurred in almost every month of the year, the most damaging storms typically occur between July and September. During warm summer months, moist unstable air from the Gulf of Mexico is rapidly forced upward by hot air currents. These weather patterns often cause severe thunderstorms with intense rainfall on steep mountain slopes and armored desert surfaces. The rainwater runs off rapidly and concentrates in the urbanized areas at lower elevations in the valley. Among other things, flood events can adversely impact public safety, the local economy and water quality.

The CCRFCD is responsible for implementing a regional flood control program throughout Clark County to address flood risks, and has developed a master plan to identify infrastructure needed to manage flood risks in Clark County. The agency works together with local entities in the valley, including Clark County and the cities of Las Vegas, North Las Vegas and Henderson, to:

- Establish flood management policies
- Develop flood reduction plans and designs
- Construct and manage regional flood control facilities

Flood control infrastructure is owned and operated by the local entities with funding and oversight provided by the CCRFCD. To date, significant progress has been made to reduce flood risks including the construction of hundreds of miles of conveyance facilities and several detention and debris basins.

The CCRFCD is required to follow all federal, state and local environmental compliance regulations related to construction and maintenance of flood control facilities in the Las Vegas Valley. To ensure compliance, the CCRFCD has developed regulations and design criteria that identify flooding risk management requirements that meet or surpass these standards.[7]

The following strategies and implementation plans have been developed to minimize the loss of life and property from major flood events.



Flood event in downtown Las Vegas.

STRATEGY: MINIMIZE THE LOSS OF LIFE AND PROPERTY FROM THE IMPACTS OF FLOODING.

BACKGROUND

While preparedness measures have effectively minimized flood hazards, no amount of planning can completely eliminate the risk of impacts to public safety or property.

Rainfall and flood water depths are monitored throughout the Las Vegas Valley through a network of hydrologic gages. This program provides both local entities and the National Weather Service information on rainfall and flood events, which enhances their ability to issue flood warnings or watches.

To manage flood risks in the Las Vegas Valley, the CCRFCD:

- Prepares and updates master plans
- Constructs flood control facilities identified in master plans[8]
- Operates flood control infrastructure
- Develops regulations and design criteria for flood risk management
- Maintains and monitors hydrologic gages
- Coordinates floodplain management activities and participates in the National Flood Insurance Program[9]

The CCRFCD also conducts public education to minimize public risks and to decrease the number of life-threatening flood related emergencies.

IMPLEMENTATION PLANS

- Continue to update and prepare master plans that identify methods needed to minimize flood risks for development.
- Identify future opportunities for the construction of flood control infrastructure.
- Monitor rainfall and flood water depths.
- Maintain current floodplain development ordinances.
- Continue public education.



Stormwater detention basin at Doc Romeo Park, Las Vegas.

GOAL SIX: SUSTAIN WATER AND ENERGY RESOURCES FOR FUTURE GENERATIONS

BACKGROUND

Climate change poses a potential threat of changes in the supply and quality of water in the United States, as well as an increased burden on the infrastructure that supports water management.

To this end, water and energy conservation, and renewable energy development are invaluable tools for extending the valley's natural resources. Sustainable development of water and energy resources in the Las Vegas Valley will help minimize impacts to the environment and sustain these resources for future uses.

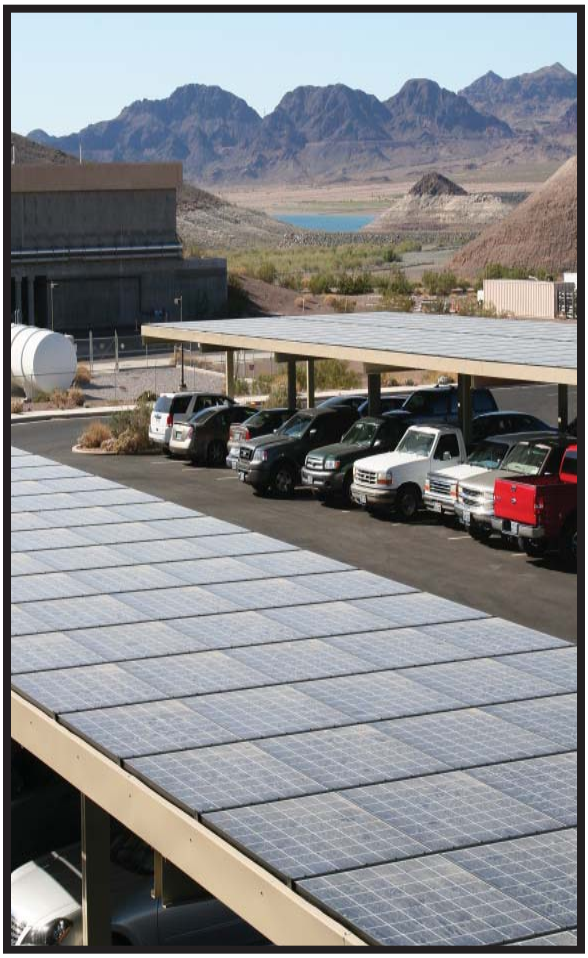
In Southern Nevada, outdoor water use accounts for 60 percent of total water use; much of that is used inefficiently or wasted. In contrast, nearly all indoor water use is collected by the sanitary sewer system where it is treated by wastewater purveyors to meet federal, state and local standards and then recycled to Lake Mead. All of the LVVWAC water purveyors have comprehensive conservation programs to promote water efficiency and reduce water waste.

Renewable energy is generated from natural resources including sunlight, wind, rain, hydropower and geothermal heat, which are naturally replenished through regular weather events. This type of energy can be cost-effective over the long-term. In addition, benefits of using renewable energy sources include reducing regional environmental impacts and reducing energy dependence from foreign sources. Developing renewable energy sources will also help to promote regional economic development through the creation of green jobs.

Hydropower generation is energy derived from the force of moving water. It is extremely efficient because it produces essentially no carbon dioxide or other harmful emissions. The movement of water through Hoover Dam generates significant amounts of hydropower.

Because not all entities have available locations to construct facilities or the resources to develop substantial systems, developing and managing renewable energy resources on a regional scale creates a number of opportunities for renewable energy sharing. Combining efforts and pooling resources can lead to greater efficiencies, both in terms of financial investment and energy gains.

Sustaining these resources will require cooperative efforts among the LVVWAC members and other entities in Southern Nevada. The following strategies identify opportunities for the sustainable use and development of water and energy resources in Nevada.



Solar facilities at Alfred Merritt Smith Water Treatment Facility.

STRATEGY: OPTIMIZE USE OF RENEWABLE ENERGY.

BACKGROUND

The State of Nevada requires that all investor-owned utilities comply with a Renewable Portfolio Standard, which requires that 20 percent of energy sales come from renewable energy by 2015. While not required to do so, many of the LVVWAC entities are complying voluntarily with this standard.

In past years, LVVWAC member agencies have undertaken a number of renewable energy projects that reduce dependence on non-renewable and less efficient energy sources. These include development of hydropower and solar energy facilities, investments in "dry-cooled" power facilities, as well as the use of alternative fuels (diesel, biodiesel, hydrogen) and hybrid technologies.

One example of ongoing efforts to identify and optimize the use of renewable energy includes designs for the Clean Water Coalition's Systems Conveyance and Operations Program (SCOP). The project design includes a hydropower generating station that will recover energy from wastewater flows carried to Lake Mead.

IMPLEMENTATION PLANS

- Seek opportunities for sharing renewable energy, thereby optimizing the regional development of the resource.
- Seek opportunities for using renewable energy in current and future management and operations activities.
- Develop and maintain renewable energy goals.
- Implement hydropower generating systems when appropriate.
- Consider energy recovery in setting flow rates.



Hydrogen Fueling Station at Las Vegas Valley Water District.

STRATEGY: CONSIDER THE NET ENVIRONMENTAL BENEFIT.

BACKGROUND

Development of energy and water resources are linked for a number of reasons. Water and wastewater treatment and delivery processes require significant energy resources, and higher levels of treatment to meet and surpass water quality objectives requires more energy. This use of some energy resources may cause impacts to air quality and the climate.

Impacts from human activities on the environment can be quantified through a measurement termed a carbon footprint. A carbon footprint is a measurement of all greenhouse gasses that are produced individually (or by entity) in units of kilograms of carbon dioxide equivalent. Many of the LVVWAC agencies are working to calculate and reduce their carbon footprints to reduce impacts to the environment.

IMPLEMENTATION PLANS

- Balance the development of natural resources to minimize environmental impacts.
- Develop a standardized means to quantify carbon footprints, and report progress to reduce carbon footprints on an annual basis.
- Establish an environmental impact baseline for 2009 to track progress.



Solar panels at Las Vegas Valley Water District.

STRATEGY: ENHANCE ENERGY AND WATER CONSERVATION PROGRAMS.

BACKGROUND

The ability to increase the efficient use of water and power resources has a direct impact on the amount of resources that will be needed in the future. To this end, Southern Nevada has taken aggressive steps to conserve these important resources. Moving forward, the Southern Nevada Regional Planning Coalition will coordinate efforts of valley-wide sustainable efforts. Below is a summary of recent accomplishments.

Water Conservation

Water conservation programs in the Las Vegas Valley include policy, pricing, incentives and education. Over the years, city and county governments have adopted a variety of land use codes and water use ordinances to promote effective use of water resources in Southern Nevada. Some of these include watering restrictions; water waste rules; and turf limitations for public facilities, new residential development, golf courses and commercial properties.

In 2007, Southern Nevada consumed approximately 15 billion gallons less water than in 2002, despite the addition of 400,000 new residents and approximately 40 million annual visitors.

Energy Conservation

Because water delivery is energy intensive, the reduction of water use affects the consumption of energy resources. Water conservation efforts in Southern Nevada have saved approximately 188,000 megawatt hours of power. This is significant considering that an acre-foot of water requires approximately 2.1 megawatt hours for treatment and pumping. These energy savings also have allowed Southern Nevada to reduce its discharge into the region by an estimated 116,000 metric tons of carbon.

Currently, wastewater operators track energy usage in their treatment and pumping facilities to optimize energy efficiency.

IMPLEMENTATION PLANS

- Conduct annual reviews of current energy and water consumption.
- Identify methods to reduce consumption of resources and evaluate their associated costs.
- Develop a sustainability plan for each LVVWAC member agency.
- Continue to develop, implement and support water conservation programs.
- Continue to develop, implement and support energy conservation programs.
- Develop an inventory of energy resources to effectively track and utilize energy resources efficiently.



Turf replacement efforts in Southern Nevada.

GOAL SEVEN: BUILD COMMUNITY AWARENESS AND SUPPORT FOR REGIONAL WATERSHED MANAGEMENT.

BACKGROUND

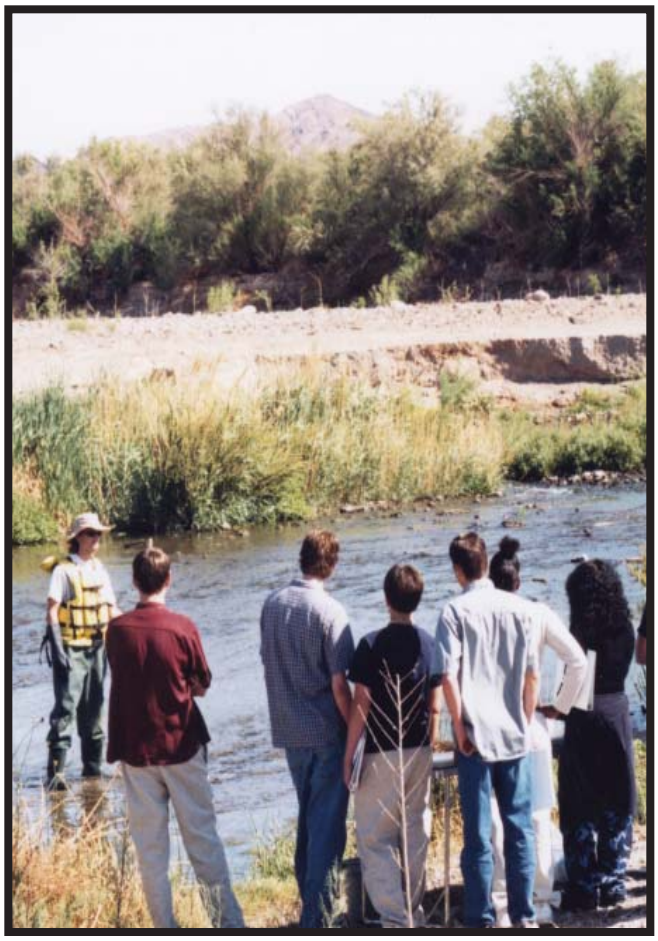
While a number of factors outside public control (such as drought) can exacerbate water quality challenges, in most cases, the public has a direct impact on the overall quality of its watershed resources. For example, salt loads from the use of water softeners, the quality of stormwater flows and even the introduction of the quagga mussel into Lake Mead are all effects that stem from public use.

Managing, maintaining and improving water quality in the Las Vegas Valley's watershed requires the public to better understand its direct impacts on the water system and to participate in efforts to ensure a safe and reliable water supply for the future. Education and outreach are critical components of meeting water quality goals for these reasons.

The public's perception of the risk and aesthetics of drinking water are significant issues faced by most water suppliers. While there are a number of existing water quality controls in place (such as local, state and federal water quality regulations), these controls need to be closely coordinated among water managers and water users to ensure that water quality is maintained for the benefit of the public and the environment.

The Southern Nevada Water Authority, Clean Water Coalition and the Clark County Regional Flood Control District have each utilized citizen advisory committee processes to solicit public input on facilities, treatment and cost issues associated with water quality in Southern Nevada. The LVVWAC will continue to engage the community to enhance awareness and support for regional watershed management.

Strategies for building community awareness and support for regional watershed management are discussed on the following pages.



Students visit the Las Vegas Wash.

STRATEGY: DEVELOP COMMUNICATION AND EDUCATION PROGRAMS.

BACKGROUND

Most of the individual LVVWAC member agencies conduct extensive public education and outreach programs associated with their respective water quality management efforts. However, the LVVWAC recognizes the value in presenting a unified public education program that will support these individual efforts.

To this end, the LVVWAC will develop and maintain a comprehensive education and outreach program for the community and has formed a public information subcommittee to support these efforts.

The LVVWAC will identify critical stakeholders and other interested parties to share information and progress relating to this LVVWAC Plan. The LVVWAC invites the public to participate in the development of an implementation plan for these water quality goals and strategies.

IMPLEMENTATION PLANS

- Identify appropriate communication tools to complement specific phases of regional water quality planning efforts.
- Coordinate regional education programs among LVVWAC entities.



Outreach programming at the City of Henderson.

STRATEGY: INTEGRATE EXISTING STAKEHOLDER PROGRAMS TO SPECIFICALLY ADDRESS WATERSHED ISSUES.

BACKGROUND

Most of the LVVWAC agencies maintain public information offices responsible for disseminating information to the community on their respective duties and issues. The LVVWAC agencies will continue to utilize these vehicles to communicate with their respective stakeholders, as well as to develop materials necessary to support LVVWAC's overall regional water quality goals and management plans.

When possible, the LVVWAC member agencies will utilize existing reporting structures to communicate progress on the LVVWAC's Regional Water Quality Plan goals. This includes presentations to the Lake Mead Water Quality Forum, Las Vegas Wash Coordination Committee and similar committees, boards of directors, city councils, town advisory boards and others. The agencies will also share this information with their employees to achieve broad dissemination of information among the public in the communities that they serve.

IMPLEMENTATION PLANS

- Identify opportunities for stakeholder input throughout the development and approval phases of this Plan.
- Utilize existing stakeholder groups for information sharing.
- Disseminate information to employees to ensure they remain informed about current issues.



Water conservation outreach presentation.

FOOTNOTES

1. During regular weather events, Las Vegas Wash inflows are comprised of wastewater (85%), shallow groundwater (7-8%) and urban runoff (7-8%). During storm events, stormwater runoff greatly influences this distribution of inflows.

2. The "Construction Site Permit Program" addresses discharge of pollutants from construction sites; requires owners/operators of construction sites that disturb over one acre to obtain a general construction permit. Special provisions require development and implementation of a Stormwater Pollution Prevention Plan.

3. The "Industrial Site Permit Program" addresses the discharge of pollutants from industrial sites; requires specific owners/operators of businesses (as determined by the EPA to have a substantial potential to discharge pollutants without proper controls) to obtain a general industrial permit. Special provisions require development and implementation of a Storm Water Pollution Prevention Plan.

4. The "Municipal Separate Storm Sewer System (MS4) Permit Program" addresses general discharges of pollutants to the storm water system in the Las Vegas Valley. The MS4 permit designates the Clark County Regional Flood Control District as the lead agency and Clark County and the cities of Henderson, Las Vegas and North Las Vegas as co-permittees. The permit authorizes the discharge of storm water to flow to the Las Vegas Wash from storm sewer systems owned and operated by the co-permittees in return for implementation of specific stormwater pollution reduction activities. These activities include limiting the amount of discharge of pollutants to storm drains when possible, reducing discharges to the Las Vegas Wash that would affect water quality standards, monitoring stormwater to characterize the quality of wet weather and dry weather flows in the Las Vegas Wash and its major tributaries and develop, implement and enforce a Stormwater Management Plan that will reduce the discharge of pollutants and satisfy water quality requirements of the Clean Water Act.

5. The "Core Management Team" is comprised of representatives of the National Park Service, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, Southern Nevada Water Authority and the Clean Water Coalition.

6. "History of Flooding," Clark County, Nevada, 1905-1975, U.S. Soil Conservation Service.

7. Clark County Regional Flood Control District (CCRFCD), "Uniform Regulations for the Control of Drainage" and "Hydrologic Criteria and Drainage Design Manual."

8. Las Vegas Valley Master Plan Update, July 2008; identifies approximately 745 miles of existing and proposed conveyance facilities and 94 existing and proposed detention basins.

9. "National Flood Insurance Program," administered by the Federal Emergency Management Agency (FEMA) which makes the communities responsible for adopting and enforcing a floodplain development ordinance designed to prevent unsafe development in flood-prone areas.

CHAPTER TWO

Policy Direction

Economic and Social Impacts



- THIS PAGE INTENTIONALLY LEFT BLANK -

POLICY DIRECTION

This Plan is intended to serve as a forward-looking document. It contains projections and recommends policy direction on emerging water quality and quantity issues, as well as constituent treatment options.

The LVVWAC has identified a number of issues that require further consideration and may warrant policy development in the future.

In addition to the following candidate policy concepts, sustainability continues to be an effort that all LVVWAC members are working to address. Implementation of this Plan and sustainability concepts will be considered when implementing the goals and strategies outlined in this Plan.

The LVVWAC will continue to discuss and research these candidate policy issues, and may present them in future updates to its Regional Water Quality Plan.

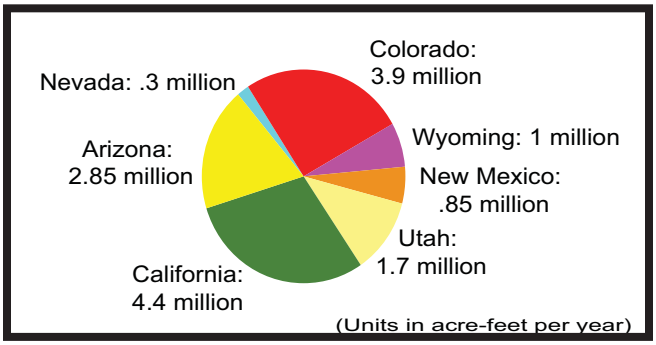
CANDIDATE POLICY CONCEPTS

Candidate Water Resources Policies	
Groundwater	• Groundwater quality (principal aquifer) protection • Groundwater uses and management • Imported water effects on Las Vegas Valley watershed water quality • Low quality, shallow groundwater resources uses and effects
Colorado River Water	• Responses to water quality effects from upstream sources
Recycled Water	• Out-valley recycling • In-valley recycling • Groundwater injection • Return flows to Colorado River • Graywater uses • Salt management
Water Conservation	• Water conservation program implementation • Recycled water opportunities for wasted water (water that is being lost from percolation, evaporation, etc.)

CANDIDATE ENVIRONMENTAL RESOURCES POLICIES	
Environment and Wildlife	• Balance wildlife goals, and water quality and quantity goals • Cooperative opportunities to control and eradicate invasive species
Sustainability	• Balance economic, social, cultural and environmental goals
CANDIDATE OPERATIONS POLICIES	
Water and wastewater treatment optimization	• Agreements for wastewater optimization • Water treatment goals that surpass regulatory requirements • Coordinated water management efforts • Water quality protection through stormwater management
Water quality monitoring and modeling	• Coordinated monitoring and modeling efforts among agencies • Sharing costs and data for research opportunities among agencies
CANDIDATE PUBLIC OUTREACH POLICIES	
Agency Programs	• Downstream users communication efforts • Regional Water Quality Plan public input • Las Vegas Valley watershed user outreach

ECONOMIC AND SOCIAL IMPACTS

The Colorado River serves as a lifeblood supply to the seven basin states it serves including Wyoming, Utah, New Mexico, Colorado, Nevada, Arizona and California and the country of Mexico. Together, the states rely on the river to meet a portion of their industrial, municipal and agricultural needs. Nevada diverts a majority of its Colorado River apportionment from Lake Mead. Protecting Lake Mead's water quality is essential to ensure a safe drinking water supply and other water supply needs for the reservoir's downstream users.



Colorado River apportionments among basin states.

There are a number of emerging issues that will likely affect water quality and water resources in the future. These issues include the control and management of invasive species, increased water quality regulations, economic conditions and climate change. Moving forward, these issues will be closely monitored and any resulting economic and social impacts will be appropriately addressed.

The LVVWAC provides a forum for water managers to coordinate planning and funding efforts. This communication and coordination will likely yield significant economic opportunities in the future.

This section discusses current and future economic and social impacts associated with the implementation of this Regional Water Quality Plan.

ECONOMIC IMPACTS

Las Vegas Wash

- In response to public health concerns over downstream water quality in Lake Mead, there has been significant efforts in the Las Vegas Wash. Furthermore, improving the Las Vegas Wash provides critical habitats to a number of native species in Southern Nevada. To date, activities in the Las Vegas Wash include the construction of 11 erosion control structures, over 5 miles of bank stabilization and nearly 200 acres of wetlands revegetation. Total expenditures to date associated with these activities is $69,723,000. Projected expenditures through 2017 is estimated to be $99,424,000.

Invasive Species Control

- The SNWA will spend over $24 million in capital expenditures to control quagga mussel impacts on new water infrastructure at Lake Mead. Annual operating expenses are also expected to rise by $500,000 to reduce impacts through chemical treatment.

- Downstream users are also affected. For example, the Metropolitan Water District of Southern California is currently investing several million dollars in infrastructure improvements for invasive species management.

Water Quality

- Salinity control has been an integral part of Colorado River management for over thirty years. A minute to the bi-national treaty between the U.S. and Mexico was established in 1973 to limit Colorado River salinity levels for Mexico deliveries. One factor that contributes to higher salinity concentrations in Southern Nevada is the use of residential water softeners. These have gained popularity over the last decade as a method to reduce the naturally high mineral hardness in Colorado River water supplies. Local municipalities are responsible for costs associated

with salinity control.

- The production of total organic carbon from algae growth can also elevate treatment costs. For example, it would cost between $200 million and $400 million to treat an accelerated algae growth at Lake Mead to control total organic carbon concentrations. An estimated $10 million would be required for annual operations.

- Recent technology improvements have allowed water managers to detect certain constituents at extremely low concentrations. For example, Southern Nevada has been able to identify trace levels of pharmaceuticals and endocrine disrupting compounds found within the water supply. Although these constituents are not currently regulated by the EPA, they may be in the future. If these constituents are regulated and water treatment is required, water treatment operators will incur additional costs.

- Approximately $800 million will be spent on the design and construction of the SCOP project, a 19-mile pipeline connecting infrastructure for the region's four wastewater treatment agencies. Development of the SCOP project will provide wastewater agencies with improved flexibility in treatment and discharge methodologies. The project is being funded through a combination of user fees (rates) and connection charges.

- A new intake is being constructed near Boulder Basin to protect municipal water customers from water quality issues and declining Lake Mead water levels. Intake No. 3 will maintain the SNWA's ability to draw upon Colorado River water at lake elevations above 1,000 feet above sea level. This will help ensure system capacity is maintained even if Intake No. 1 is not operational. This project is estimated to cost $843 million.

Monitoring Efforts

- The Southern Nevada Public Lands Management Act (SNPLMA) provides for the orderly disposal of federal lands in the Las Vegas Valley and uses proceeds from those sales to perform conservation actions within the state. Over $3 million of land sales proceeds was awarded to the National Park Service (NPS) for water quality monitoring efforts in Lake Mead. This funding is available through 2009. Recent economic changes will likely affect future land sales in Southern Nevada, therefore reducing available SNPLMA funding. Without SNPLMA funding, participating water and wastewater agencies will be asked to cover costs related to current monitoring efforts. The benefits of ongoing water quality monitoring and resulting fiscal impacts will require evaluation.

Planning Efforts

- In accordance with the Clean Water Act, the state of Nevada designated Clark County to serve as the lead agency responsible for all water quality planning activities associated with water pollution and management of regional wastewater treatment plans. Costs associated with the planning efforts are between $500,000 and $550,000. In the future, these costs are proposed to be shared by local jurisdictions based on population.

Renewable Energy Efforts

- An element of the SCOP project includes development of the largest hydropower project in Southern Nevada since the construction of Hoover Dam. A pressure reduction/power generation station will be located near the end of the outfall pipeline to capture energy and generate 10-15 megawatts of electrical power each day. The retail value of this power and associated green energy credits will cover the operation and maintenance cost of the entire SCOP project, and also help pay the debt service for the capital associated with the program.

Flood Control

In March 1999, the Clark County Regional Flood Control District (CCRFCD) performed its first region-wide cost analysis to determine the benefit of regional drainage facilities in Clark County. The report concluded the benefit to cost ratio was 2.2 to 1. Since then, various updates to the CCRFCD Master Plan have been adopted. The 2005 analysis validated the benefits versus cost factor of 2 to 1 for economic benefits of building flood control infrastructure in the Las Vegas Valley. Findings of this report include:

- For each public dollar expended to improve flood protection, a public benefit of $2.00 has been realized.

- Historically, less than 10 percent of the CCRFCD's expenditures have been dedicated to administrative and operating costs.
- Public benefits associated with the CCRFCD's capital program include both quantifiable and non-quantifiable benefits. Quantifiable benefits include inundation reduction, savings in floodproofing costs, transportation cost savings, and flood insurance overhead savings. Benefits that are more difficult to quantify include reductions in flood-related injuries and deaths, protection of Southern Nevada's tourism industry, direct and indirect economic benefits arising from the CCRFCD's construction program, protection and enhancement of property value, and economic opportunities arising from alternative land planning and usage.
- Capital projects undertaken by the CCRFCD's have resulted in removing land from federally identified Federal Emergency Management Agency (FEMA) flood zones (for example, residential dwellings and non-residential land such as commercial, manufacturing, gaming, schools and religious establishments, etc.). Removing property from the floodplain can provide for increased property value, savings in flood insurance premiums, the creation of enhanced land use planning opportunities and a broader tax base.

Stormwater Quality Management

- Most costs for stormwater quality management are borne by public agencies that are the permittees under the MS4 stormwater permit program. Costs include: stormwater monitoring, construction and industrial site inspections, staff training, street sweeping, drainage system maintenance, public outreach and program administration.
- Proposed expansion of programs for construction and industrial site inspection and enforcement, as required by NDEP, will increase staff and financial resources required by the MS4 permittees to implement these programs.
- The development community is responsible for funding Best Management Practices (BMP) installation at construction sites and contractor training. The development community and contractors will be subject to increased local inspection and enforcement.
- The industrial community is responsible for funding BMP installation on private industrial properties within certain business types identified by NDEP.
- The State of Nevada has permit programs for construction and industrial sites that parallel those of the local entities. State costs for these permit programs are covered primarily by permit fees paid by developers and industrial site owners.

SOCIAL IMPACTS

Pharmaceuticals

- Improved technologies have allowed researchers to detect constituents at levels that could not previously be detected using older technology. Despite the lack of known impacts, the presence of pharmaceuticals and endocrine disrupting compounds in the drinking water supply has created national media coverage. To date, there has not been any demonstrated impacts to human health at existing concentrations. Despite the lack of impacts, the general public remains wary of their presence in the drinking water supply. This demonstrated concern may pressure water quality regulators to require addition treatments by water and wastewater treatment operators. Research studies related to these impacts on human health, the environment and water quality are preliminary and ongoing.

Stormwater

- Social changes could occur as a result of public outreach activities that are designed to change behaviors that may adversely impact non-point source water quality. These include managing pet waste, pesticide/herbicide use, vehicle maintenance, household hazardous waste disposal, over-watering of landscaped areas, and proper pool maintenance.

Flood Control

- Implementation of floodplain management policies to reduce flood risks can affect land uses on public and private properties adjacent to the

Las Vegas Wash and its major tributaries.

- THIS PAGE INTENTIONALLY LEFT BLANK -

APPENDIX

References

Glossary



- THIS PAGE INTENTIONALLY LEFT BLANK -

REFERENCES

Bureau of Reclamation, U.S. Department of the Interior (Lower Colorado River Operations Schedules and 2008 Annual Operating Plan for Colorado River Reservoirs).
www.usbr.gov

Clark County, Nevada (Area-Wide Water Quality Management Planand Multiple Species Habitat Conservation Plan)
www.accessclarkcounty.com

Clark County Regional Flood Control District (Flood Control Master Plans)
www.ccrfcd.org

Clean Water Coalition (Systems Conveyance and Operations Program: Boulder Basin Adaptive Management Plan)
www.cleanwatercoalition.com

Las Vegas Wash Coordination Committee (Las Vegas Comprehensive Adaptive Management Plan and Las Vegas Wash Wildlife Management Plan)
www.lvwash.org

Las Vegas Wash Weed Partnership (Las Vegas Wash Integrated Weed Management Plan)
www.lvwash.org

Nevada Division of Environmental Protection, State of Nevada (Source Water Assessment Plan)
ndep.nv.gov

Southern Nevada Water Authority (Southern Nevada Water System Annual Operating Plan and 2008 Southern Nevada Water Authority Water Resource Plan)
www.snwa.com

Southern Nevada Regional Water Recycling Study
www.cleanwatercoalition.com

Stormwater Quality Management Committee (NPDES Municipal Separate Storm Sewer System - MS4 permit)
www.lvstormwater.org

United States Geological Survey (Real Time Water Quality Monitoring and Water Quality Monitoring Quality Assurance Plan)
nevada.usgs.gov

LVVWAC MEMBER WEBSITES

City of Henderson

www.cityofhenderson.com

City of Las Vegas

www.lasvegasnevada.gov

City of North Las Vegas

www.cityofnorthlasvegas.com

Clean Water Coalition

www.cleanwatercoalition.com

Clark County

www.accesclarkcounty.com

Clark County Regional Flood Control District

www.regionalflood.org

Clark County Water Reclamation District

www.cleanwaterteam.com

Las Vegas Valley Water District

www.lvvwd.com

Southern Nevada Water Authority

www.snwa.com

GLOSSARY

ALFRED MERRITT SMITH WATER TREATMENT FACILITY

One of the Southern Nevada Water System's two raw water treatment facility.

BIOCHEMICAL OXYGEN DEMAND

A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water.

BOULDER BASIN ADAPTIVE MANAGEMENT PLAN (BBAMP)

Management document for Systems Conveyance and Operations Program (SCOP) and coordinates activities to protect drinking water, recreation and wildlife in Lake Mead and downstream.

BOULDER CITY

Local governmental entity located southeast of the Las Vegas Valley.

BROMIDE

Any compound of bromine with another element or radical. Can form bromate, a SDWA-regulated contaminant in the presence of ozone.

BUREAU OF RECLAMATION (BOR)

A Department of the Interior bureau, which works to manage, develop and protect water and related resources.

CARBON FOOTPRINT

Measure of the impact caused by human activities on the environment, measured in units of carbon dioxide.

CITY OF HENDERSON (COH)

Local government entity that provides water, wastewater and reclaimed water services to the Henderson community.

CITY OF LAS VEGAS

Maintains city public use facilities, roadway and traffic network, wastewater and stormwater management systems and regulates private development.

CITY OF NORTH LAS VEGAS

Local government entity that provides water and sewer service to the City of North Las Vegas.

CLARK COUNTY

Regional government entity responsible for economic, recreational and social services for Southern Nevada residents.

CLARK COUNTY DEPARTMENT OF AIR QUALITY AND ENVIRONMENTAL MANAGEMENT (DAQEM)

Monitors and maintains air quality and develops programs for the protection of natural resources in Southern Nevada.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD)

Local government entity responsible for the regional management and comprehensive planning of flood activities.

CLARK COUNTY WATER RECLAMATION DISTRICT (CCWRD)

Regional government entity responsible for treating wastewater in areas of Clark County.

CLEAN WATER ACT (CWA)

The primary federal law in the United States governing water pollution.

CLEAN WATER COALITION (CWC)

A joint powers authority responsible for implementing the Systems Conveyance and Operations Program.

COLORADO RIVER

A 1,400 mile-long river that supplies approximately 90% of Southern Nevada's drinking water supplies.

CONSUMPTIVE USE

Water that is used, and not available for return to the Colorado River.

CONTAMINANT CANDIDATE LIST (CCL)

List of water contaminants published by the Environmental Protection Agency.

CRYPTOSPORIDIUM

A microscopic organism found in untreated surface water.

EFFLUENT

Another term for wastewater.

ENDANGERED SPECIES ACT

Federal act which protects animal and plant species from extinction, and identifies those species that are threatened or endangered.

ENVIRONMENTAL PROTECTION AGENCY

Leads the nation's environmental science, research, education and assessment efforts to protect the environment and human health.

FECAL COLIFORM

Bacteria found in the intestinal tracts of mammals. Their presence in water is an indicator of pollution.

GIARDIA LAMBLIA

A microscopic organism found in untreated surface water.

HETEROTROPHIC PLATE COUNT

A procedure for estimating the number of live Heterotrophic bacteria in water. It may be used to measure the changes in water treatment, in swimming pools, or as a monitoring method for treatment efficiency in bottled water plants.

HOOVER DAM

A concrete arch-gravity dam in the Black Canyon of the Colorado River. The construction of Hoover Dam created the Lake Mead reservoir.

INVASIVE SPECIES

A species not naturally occurring in a specific area and whose introduction does or is likely to cause economic or environmental harm to human health.

INVASIVE WEEDS

Weeds that are found to be detrimental, destructive or difficult to control or eradicate.

LAKE MEAD

The largest man-made reservoir in the U.S. It stores Colorado River water and has a storing capacity of 26 million acre-feet.

LAKE MEAD NATIONAL RECREATION AREA

Recreational area containing Lake Mead and Lake Mojave. The area is managed under a cooperative agreement between the National Park Service and the Bureau of Land Management.

LAKE MEAD WATER QUALITY FORUM

Supports the protection of human health and the environment and preserves and improves water quality in the Las Vegas Wash, Las Vegas Bay and Lake Mead.

LAS VEGAS VALLEY GROUNDWATER MANAGEMENT PROGRAM

Works to protect the valley's groundwater supply from contamination, improve management of resources to prevent overdrafting and increase cooperation among groundwater users and agencies.

LAS VEGAS VALLEY WATER DISTRICT

Provides water to Las Vegas Valley residents and also services Big Bend Water District (Laughlin), Blue Diamond, Coyote Springs, Searchlight, Kyle Canyon and Jean.

LAS VEGAS VALLEY WATERSHED ADVISORY COMMITTEE

Forum for partnering water and wastewater agencies to address water quality and its impact on quantity issues in the Las Vegas Valley and Lake Mead.

LAS VEGAS WASH

The primary channel through which the Las Vegas Valley's excess water returns to Lake Mead.

LAS VEGAS WASH COMPREHENSIVE ADAPTIVE MANAGEMENT PLAN

A document produced by the Las Vegas Wash Coordination Committee designed to outline long-term stabilization, enhancement and management of the Wash.

LAS VEGAS WASH COORDINATION COMMITTEE

A 29-member committee working to bring together all interested parties to address issues related to the Las Vegas Wash.

LAS VEGAS WASH MANAGEMENT ADVISORY COMMITTEE

A former collection of key stakeholders that provided

direction on issues associated with the Las Vegas Wash.

LAS VEGAS WASH WILDLIFE MANAGEMENT PLAN (LVWMP)

Comprehensive management plan that addresses wildlife along the Wash and describes the technical, environmental and administrative parameters within which management can be accomplished.

MAXIMUM CONTAMINANT LEVELS (MCL)

Highest allowable concentration of certain contaminants in water delivered to a user of public drinking water supply.

MIGRATORY BIRD TREATY ACT

Federal legislation that protects specific birds.

NATIONAL HISTORIC PRESERVATION ACT

Federal legislation intended to preserve historical and archaeological sites in the U.S. and created the National Register of Historic Places.

NATIONAL PARK SERVICE ORGANIC ACT (1916)

Federal legislation through which the National Park Service was created.

NATIONAL PARK SERVICE

Department of Interior bureau responsible for the care and management of national parks.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

Regulations that control water pollution by regulating point sources that discharge pollutants into U.S. waters.

NATIONAL REGISTER OF HISTORIC PLACES

A federal list of districts, sites, buildings, structures and objects deemed worthy of preservation.

NEVADA ADMINISTRATIVE CODE (NAC)

Administrative regulations of the Nevada State government, which regulates water pollution.

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP)

Division of the Nevada Department of Conservation and Natural Resources that maintains programs for water quality, water pollution and safe drinking water. Responsible for the implementation and enforcement efforts of the Clean Water Act.

NEVADA REVISED STATUTES (NRS)

Nevada State laws, some which govern water pollution and water quality.

NON-POINT SOURCE FLOWS

A source of water pollution that cannot be traced to a specific source, such as stormwater or urban runoff.

PHOSPHORUS

An essential plant nutrient that is commonly found in wastewater treatment plant effluent and urban runoff. It can limit algal growth in Lake Mead.

POINT SOURCES

A source of water pollution that can be traced back to its source, such as a stream or pipe.

POTABLE WATER

Water that is free of pollution, harmful organisms and impurities and is therefore safe to drink.

QUAGGA MUSSELS

Invasive mussels that inhabit depths of Lake Mead. The species can quickly colonize, causing harm to water quality and infrastructure.

RENEWABLE PORTFOLIO STANDARD

Nevada standard requiring that 20 percent of energy sales come from renewable energy by 2015.

REQUIREMENT TO MAINTAIN EXISTING HIGHER WATER QUALITY (RMWQ)

Requirement established when monitoring data show that existing water quality for individual parameters is significantly better than the standard necessary to protect the beneficial uses.

RETURN-FLOW CREDITS

Colorado River water returned to the Colorado River, primarily consisting of highly-treated wastewater returns.

RIVER MOUNTAINS WATER TREATMENT FACILITY

One of the Southern Nevada Water System's two raw water treatment facility, located on Lake Mead.

SAFE DRINKING WATER ACT (SDWA)

The main federal law that protects and mandates the quality of America's drinking water.

SELENIUM

A metal found in natural deposits and ores. It is toxic in large amounts, but trace amounts of the metal are necessary for cellular function in animals.

SOUTHERN NEVADA WATER SYSTEM (SNWS)

System of treatment and transmission facilities that divert Colorado River water from Lake Mead and delivers treated and raw water to municipal water purveyors

SOUTHERN NEVADA WATER AUTHORITY (SNWA)

A cooperative agency formed to address Southern Nevada's water needs on a regional basis.

TOTAL COLIFORM

E-coli and similar gram negative bacteria that are normal inhabitants of fecal discharges.

TOTAL DISSOLVED SOLIDS (TDS)

A measure of inorganic and organic materials dissolved in water.

TOTAL MAXIMUM DAILY LOAD (TMDL)

A calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards.

TOTAL ORGANIC CARBON (TOC)

The entire quantity of carbon that exists in a measured sample, and is used as a measure of the amount of organic pollution in a water sample.

TOTAL SUSPENDED SOLIDS (TSS)

A measure of solid pollutants in wastewater, effluent or water bodies.

TREATMENT TECHNIQUE (TT)

A required process intended to reduce the level of a contaminant in drinking water.

U.S. GEOLOGICAL SURVEY (USGS)

A federal agency that develops and researches sciences, including natural disasters, water, energy and mineral resources.



DAQEM
DEPARTMENT OF AIR QUALITY & ENVIRONMENTAL MANAGEMENT

Clark County
500 S. Grand Central Pkwy.
Las Vegas, NV 89155
702-455-4011