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Wastewater Treatment in the Las Vegas Valley

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Las Vegas Wash and Boulder Basin



Las Vegas Valley Wastewater Treatment Entities

- City of Las Vegas
- Clark County Water Reclamation District
- City of Henderson
- City of North Las Vegas


North Las Vegas
Lake Mead
140
Washington
Hollywood
anza
141
Wastewater Treatment Plants
on the Las Vegas Wash
on
Sahara
Las Vegas
Desert Inn
159
161
Clark County
160
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Nellis
Lake Mead
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Broadbent
Boulder
95 95
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Gibson
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180
178
179

What Do the Plants Treat?

Wastewater discharged into the sanitary sewer from:

- Residences (toilets, sinks, showers/bath tubs, dishwashers, washing machines, etc.)
- Hotels/restaurants
- Businesses/industries

Our plants do not treat stormwater.

- Sanitary Sewers and Storm Sewers are separate.
- Stormwater and urban run off travel to the Las Vegas Wash and Lake Mead untreated.

Is Wastewater "Reclaimed"?

All wastewater discharged to the sanitary sewer in the Las Vegas Valley is reclaimed.

- most is returned to Lake Mead and the Colorado River System and we gain return flow credits
- some is directly reused by local golf courses, parks, and industries

Therefore, for us, direct reuse makes sense in many situations, but it is <u>not</u> water conservation.

Who Regulates the Discharges?

Nevada Division of Environmental Protection issues discharge permits to the entities

- National Pollutant Discharge Elimination System (NPDES) permits for discharges to the Las Vegas Wash under the Clean Water Act
- State "reuse" permits for "discharges to groundwater" for direct reuse

History Milestones

- 1911 - City of Las Vegas (CLV) incorporated, population 800, outhouses
- 1915 – First sewer system discharged untreated sewer into desert near Bonanza and 9th St.
- 1931 – Gambling is legalized (for good)
- 1931 – CLV builds 1 MGD Imhoff tank treatment plant at 15th St. and Harris
- 1942 – City of Henderson (CoH) builds tricking filter plant
- 1950s – CLV closes Imhoff plants; builds 7.5 MGD tricking filter plant at Harris and Manning
- 1956 – Clark County Sanitation District (CCSD) 1956 builds a 12 MGD plant trickling filter at Flamingo and the Las Vegas Wash
- 1956 – CLV builds a 15 MGD plant trickling filter at Vegas Valley and the Las Vegas Wash (1 mile north of CCSD plant)
- 1970s - Concerns grow about of excess nutrient flow into Lake Mead

History Milestones cont.

- 1982 – CCSD constructs the 90 MGD lime addition/filtration Advanced Wastewater Treatment (AWT) plant to remove phosphorus
- Late 80s – Water quality standards for ammonia and phosphorus are exceed in Las Vegas Bay
- 1990s – CCSD and CLV install activated sludge processes to convert ammonia to nitrate (nitrification) and filtration to remove more phosphorus to comply with State mandates
- 1994 – CoH completes its 10 MGD plant on Pabco Road and begins to discharge to Las Vegas Wash
- 2000 – CLV and CCWRD build the 10 MGD Durango Hills and 5 MGD Desert Breeze plants to provide reuse water to golf courses
- 2003 – CLV adds 30 MGD biological nutrient removal trains to remove more phosphorus and ammonia
- 2008 – CoH starts construction on a 8 MGD membrane bioreactor (MBR) reuse plant at Pecos and St. Rose Parkway
- 2009 – CNLV starts construction on a 25 MGD MBR plant on Nellis AFB
- 2011 – CNLV begins discharging to Las Vegas Wash

History of Wastewater Treatment

The history of wastewater treatment in the Las Vegas Valley is characterized by efforts by wastewater professionals to:

- Expand treatment capacities to stay ahead of rapid growth
- Enhance treatment capabilities to protect the beneficial uses (drinking water, irrigation, ecology, recreation) of our waters (Las Vegas Wash, Boulder Basin of Lake Mead)

City of Las Vegas

Water Pollution Control Facility (WPCF)

- Located at East Vegas Valley and the Las Vegas Wash
- 66 MGD capacity, currently treating about 46 MGD
- Most effluent flows go to the Las Vegas Wash
- Some effluent is directly reused by area golf courses and industries

Durango Hills Water Resource Center

- Located on Durango, just north of Cheyenne
- 10 MGD capacity, currently treating about 5 MGD
- Effluent flows (reuse water) go to northwest area golf courses
- Solids are returned to the sanitary sewer for removal at the WPCF

Bonanza Mojave Water Resource Center

- Located on Mojave, just north of Bonanza
- 1 MGD capacity, currently treating 1 MGD
- Effluent flows (reuse water) go solely to Desert Pines Golf Course
- Solids are returned to the sanitary sewer for removal at the WPCF





Clark County Water Reclamation District

The "Clean Water Team"

Central Plant

- East end of Flamingo
- 110 MGD capacity
- Currently treating about 101 MGD
- Expansion underway to bring capacity to 150 MGD
- Most effluent to Las Vegas Wash
- 3 - 4 MGD goes to Nature Preserve
- 2 MGD goes to Desert Rose Golf Course, Silver Bowl Park, Nevada Power Clark Station

Clark County Water Reclamation District

The "Clean Water Team"

Desert Breeze Water Resource Center

- Flamingo near Durango
- 8 MGD capacity "reuse" plant
- All effluent flows go to southwest area golf courses
- Solids are returned to sanitary sewer, sent to Central Plant

Treatment Plants outside Las Vegas Valley

- Laughlin
- Searchlight
- Blue Diamond
- Overton
- Coyote Springs



City of Henderson

Kurt R. Segler Water Reclamation Facility

- Primary wastewater treatment plant, constructed in 1994
- Near east end of Sunset Road and Pabco Road
- Just completed expansion to bring capacity to 32 MGD
- Current flows are 21 MGD
- During the summer, most effluent is directly reused on golf courses
- During the winter, most effluent goes to the Las Vegas

Southwest Water Reclamation Facility

- Satellite treatment plant under construction
- Will begin operation in 2010
- Capacity will be 8 MGD
- Solids will be returned to sewer for removal at primary plant

City of North Las Vegas

City of North Las Vegas Water Reclamation Facility

- Membrane bioreactor wastewater treatment plant, constructed in 2010
- Near corner of Betty Lane and Carey Avenue
- Started operations in 2011 with a design capacity to 25 MGD
- Current flows are 17.3 MGD
- Effluent goes to the Las Vegas Wash


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What is This Place?

The WPCF can be called a number of things:

- Sewage treatment plant
- Wastewater treatment plant
- Water reclamation facility
- POTW (Publicly Owned Treatment Works)
  - EPA Terminology

- Really, it is a complex factory that reclaims a very valuable resource – WATER.

How Does the Wastewater Flow to the WPCF?

Sanitary Sewer System

- 1700 miles of sanitary sewer in the City of Las Vegas
  - Maintained to prevent Sanitary Sewer Overflows (SSO)
- Pipe diameters range from 4 - 6 inches at residences to 84 inches near the WPCF
- Flow into the plant is called “influent”
- Current influent to CLV wastewater treatment plants is about 46 MGD (million gallons per day)
- Discharges into the sanitary sewer are regulated by the City’s Environmental Compliance Section

What Pollutants Are Removed?

- Organics, determined as BOD (Biochemical Oxygen Demand)
- Solids, determined as TSS (Total Suspended Solids)
- Phosphorus (limiting nutrient in Lake Mead)
- Ammonia (toxic to fish, so we convert it to nitrate)
- Microorganisms/pathogens (bacteria, viruses, protozoa, etc.)
- Fats, oils, greases
- Toxics (solvents, metals, pesticides)
- Emerging contaminants (pharmaceuticals, personal care products, endocrine disrupting compounds



INFLUENT



EFFLUENT

WPCF Influent/Effluent Data
Long Term Averages

Parameter	Units	Influent	Effluent
Biochemical Oxygen Demand (BOD)	mg BOD/L	330	< 2
Total Suspended Solids (TSS)	mg TSS/L	330	< 2
Total Phosphorus (TP)	mg P/L	7.0	0.20
Ortho-Phosphate-Phosphorus (o-PO_4-P)	mg P/L	4.1	0.15
Ammonia-Nitrogen (NH_3-N)	mg N/L	30	< 0.1
Nitrate/Nitrite-Nitrogen (NO_3/NO_2-N)	mg N/L	nil	15
Total Kjeldahl Nitrogen	mg TKN/L	42	< 1
Fecal Coliforms	MPN/100 mL	2-15 X 10^6	< 2.2
Total Dissolved Solids	mg TDS/L	1120	1150

How Do We Do It?

6 Parallel Trains (or plants within a plant)

Step by Step Processes

- Chemical processes – We add chemicals (like ferric chloride and alum) to precipitate, coagulate and flocculate. Also, we add sodium hypochlorite to disinfect.
- Physical processes – We let the solids settle to the bottom of big tanks. The clean water flows out the top and the solids are pumped off the bottom. Then, we run the water through sand to filter out the residual particles.
- Microbiological processes – We culture good bacteria to consume the organics, convert ammonia to nitrate, and remove phosphorus.

How Do We Do It? cont.

There are processes to treat the **liquid** portion and processes to treat the **solids**.

- Liquid treatment – With each process, we are removing solids from the liquid and the liquid becomes cleaner and cleaner.
- Solid treatment – The solids we collect are wet and must be stabilized and dewatered.

What Does the Plant Produce?

- 46 MGD of clean water called "effluent". Most of the effluent goes out to the Las Vegas Wash, then to Lake Mead. Some of the effluent is directly reused.
- 170 tons/day of sludge, which is hauled to the Apex Landfill and is mixed with all the LV Valley's garbage.
- 1.0 million ft^3 /day of digester gas (approx. 60% methane/40% CO_2, 600 BTU/dscf). Digester gas is productively combusted in engines to produce compressed air or boilers to heat water to keep digesters at 98 °F.
- Air pollutants (CO, NO_X, VOCs, HAPs, NH_3, H_2S)


Questions?