

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
FACT SHEET
(Pursuant to NAC 445A.236)

Permittee Public Works Dept
City of Carson City
3505 Butti Way
Carson City NV 89701-3498

Permit No. NV0023591

Facility Brunswick Reclaimed Water Storage Reservoir
East of Carson City in the Pine Nut Mountains
Latitude: 39° 10' 47" N
Longitude: 119° 42' 29" W

General The City of Carson City began pumping treated effluent from the Carson City Wastewater Treatment Facility (NEV90008) to the Brunswick Reservoir in 1989. The reservoir is unlined and effluent springs, which undergo additional natural polishing via transport through the underlying soil, subsequently began to surface and discharge into the Carson River.

Brunswick Canyon Spring surfaces along Brunswick Canyon Road approximately 0.57 miles southwest of the reservoir and approximately 1.5 miles above the river. Flow is measured and water quality samples are collected at the v-notch weir below the wetlands (Outfall 001). This flow usually infiltrates within approximately 0.75 miles, but can reach the river when the ground is frozen or saturated during extreme wet weather conditions.

Carson River Spring surfaces at several points along the north facing slopes near the river approximately 0.71 miles downstream from the mouth of Brunswick Canyon. The spring flow is continuous and enters into wetlands prior to being intercepted and brought to the river by ditches. The ditch flow is routed through a v-notch weir just prior to discharging to the river (Outfall 002). Flow is measured and samples are collected at the weir.

North Canyon Spring surfaces approximately 0.17 miles north of the reservoir. Spring flow is continuous. The flow is measured and water quality samples are collected at the v-notch weir below the wetlands (Outfall 003). From this point the flow continues approximately 0.37 miles before entering the river.

The springs' flow rates have been estimated at 2000 afy based on inflow/outflow readings for the reservoir. The average spring flow rates are presented in the table below and are based upon monthly data collected from September 2004 through June 2007.

Average Spring Flow

Spring	Discharge, MGD	Discharge, AFY
Brunswick Canyon Spring	0.2	217
Carson River Spring	1.44	1620
North Canyon Spring	0.16	181
Total	1.8	2018

The spring flow rates have been determined to rise and fall with the water surface elevation of the reservoir, lagging by approximately two months.

Receiving Water Characteristics Standards for this reach of the river are set at NAC 445A.156, Carson River at Dayton Bridge. This reach was listed in Nevada's 2004 Impaired Waters List as impaired for total iron, total mercury, dissolved zinc, total phosphorus (TP) and turbidity. The sources of elevated constituents are attributed largely to past mining/milling activities and non-point sources.

Effluent Limitations: During the period beginning on the effective date of this permit and lasting until the permit expires, the Permittee is authorized to discharge treated effluent stored in the Brunswick Reservoir that receives additional, natural polishing prior to discharge from:

- Outfall 001: Brunswick Canyon Spring
- Outfall 002: Carson River Spring
- Outfall 003: North Canyon Spring
- Outfall 004: Additional NDEP approved spring(s)

Samples taken in compliance with the monitoring requirements specified below shall be taken at: Formatted: Bullets and Numbering

- i. River Mile 42.16, Carson River, Downstream from the old Brunswick Canyon Road Bridge (Background);
- ii. Brunswick Canyon Springs weir;
- iii. Carson River Springs weir;
- iv. North Canyon Springs weir;
- v. River Mile 38.54, Carson River at End of Mixing Zone; and
- vi. USGS Station at Deer Run Road

The discharge shall be limited and monitored by the Permittee as specified below:

Table 1: Reservoir Discharge Limitations

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PARAMETER	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS		
	Annual Average	Daily Maximum	Sample Location	Measurement Frequency	Sample Type
Flow, MGD	Monitor & Report		ii ¹ , iii, iv, vi	Monthly	Discrete
Flow, cfs	Monitor & Report		vi	Monthly	Discrete
Total Kjeldahl Nitrogen, mg/L	Monitor & Report		i, ii ¹ , iii, iv	Monthly	Discrete
Total Ammonia as N, mg/L	Monitor & Report		i, v	Monthly	Discrete
Total Ammonia as N, mg/L ³	See Footnote 4.A (30 Day Average)	See Footnote 4.B	ii ¹ , iii, iv	Monthly	Discrete Calculate
Nitrite and Nitrate as N, mg/L	Monitor & Report		i, ii ¹ , iii, iv	Monthly	Discrete
Total Nitrogen, mg/L	Monitor & Report		i, ii ¹ , iii, iv	Monthly	Discrete
Total Nitrogen, mg/L	1.2 ^{2,3}	1.6 ³	v	Monthly	Discrete
TDS, mg/L	Monitor & Report		i, ii ¹ , iii, iv	Monthly	Discrete
TDS, mg/L	250 ^{2,3}	400 ³	v	Monthly	Discrete
Chloride, mg/L	Monitor & Report		i, ii ¹ , iii, iv	Monthly	Discrete
Chloride, mg/L	10 ^{2,3}	18 ³	v	Monthly	Discrete
Total Phosphorus as P	0.1 ²	----	ii ¹ , iii, iv	Monthly	Discrete
Temperature - °C	Monitor & Report ⁵		i	Monthly	Discrete
Temperature - °C	----	Nov-Mar: ≤ 11°C ⁵ Apr-Jun: ≤ 24°C ⁵ Jul-Oct: ≤ 28°C ⁵	v	Monthly	Discrete
pH, NTU	----	6.5 – 9.0	ii ¹ , iii, iv	Monthly	Discrete
Dissolved Oxygen, mg/L	----	≥ 5	ii ¹ , iii, iv	Monthly	Discrete
Sulfate, mg/L	----	250	ii ¹ , iii, iv	Monthly	Discrete
Sodium - SAR	Monitor & Report ⁶		i	Monthly	Discrete
Sodium - SAR	≤ 2 ^{2,6}	----	v	Monthly	Discrete
Alkalinity as CaCO ₃ , mg/L	----	≤ 25% natural conditions ⁷	v	Monthly	Discrete
WET Testing ⁸	See Part I.A.6	----	ii ¹ , iii, iv	Annually	Flow-weighted Combined Discrete
Priority Pollutants Full Scan, mg/L (Attachment A) ⁸	----	----	ii ¹ , iii, iv	Annually	Flow-weighted Combined Discrete

1. If the Brunswick Canyon Spring flow is completely absorbed into the soil and does not discharge into the river, then the Permittee shall report "No Discharge" from Sample Location ii.
2. Annual Average to be reported in the fourth quarter Discharge Monitoring Report, based upon a calendar year
3. For extreme low flows (*7 day, 10 year low flow* $Q_{7,10} \leq 3.7$ cfs at Sample Location vi) or if Sample Location i exceeds the daily maximum value for the respective parameter, compliance shall be determined based by the individual spring limitation as specified in Table 2.
4. For each sample event, formula terms contained in A and B below shall have the following meaning: ***pH and T are field measurements of discharge*** taken at the same time and location as the water sample destined for the laboratory analysis of ammonia.

A. The chronic criteria of water quality with regard to the concentration of total ammonia are subject to the following:

- (a) The facility discharge Monthly chronic concentration of total ammonia, in milligrams of nitrogen per liter, shall be calculated by the NAC 445A.118 Table 2 chronic concentration formula for the 30-Day Average for each discharge sample event as follows:

$$\left[\frac{0.0577}{1 + 10^{7.688 - pH}} \right] + \left[\frac{2.487}{1 + 10^{pH - 7.688}} \right] \times \text{MIN} [2.85, 1.45 \times 10^{0.028 \times (25 - T)}]$$

where : MIN = lesser of comma separated values; T = temp. Celsius deg.; x = multiply

- (b) The concentration of total ammonia, in milligrams of nitrogen per liter, expressed as a 30-day average must not exceed the applicable chronic criterion as calculated more than once every 3 years on average, and the highest 4-day average within the 30-day period must not exceed 2.5 times the applicable chronic criterion.

Measurement frequency of once per 30-day (Monthly) is an acceptable indicator for evaluating total ammonia chronic criterion and may be used in reporting to demonstrate compliance of discharge event calculated limit. However, if a sample analysis exceeds the allowed calculated chronic limit in part (a), the **measurement frequency** must be increased to a minimum of 4 consecutive days within the 30-day period so that chronic criterion part (b) can be applied for determining permit compliance.

B. The acute criteria for water quality with regard to the concentration of total ammonia are subject to the following:

- (a) The facility discharge Daily Maximum acute concentration of total ammonia, in milligrams of nitrogen per liter, for **warm water fisheries** shall be calculated by the NAC 445A.118 Table 1 acute concentration formula for the 1-hour average for each sample event as follows:

$$\left[\frac{0.411}{1 + 10^{7.204 - pH}} \right] + \left[\frac{58.4}{1 + 10^{pH - 7.204}} \right]$$

- (b) The concentration of total ammonia, in milligrams of nitrogen per liter, must not exceed the applicable acute criterion as calculated more than once every 3 years on average.

Measurement frequency for evaluating total ammonia acute criterion as daily maximum shall utilize the same **measurement frequency** required for that of evaluating the chronic criteria of water quality defined in A above. The total ammonia concentration determined by laboratory analysis for each sample event shall be compared to the same event's calculated acute criterion limit.

5. If Sample Location i (natural river background condition) exceeds the seasonal temperature limit, as specified in Table 1, the Permittee shall monitor and report the temperature at Sample Location v.
6. If Sample Location i (natural river background condition) exceeds the SAR annual average limit, as specified in Table 1, then the SAR at Sample Location v shall be monitored and reported only.
7. Sample Location v shall be $\leq 25\%$ difference of Sample Location i. If the river flow rate at Sample Location vi is ≤ 3.7 cfs, Alkalinity shall be monitored and reported only.
8. After the first 5-year permit cycle, the data shall be cumulatively reviewed to determine if a frequency and/or method reduction is warranted due to the lack of reasonable potential to cause a water quality violation.

Acronym Definitions:

mg/L: Milligrams per liter.
 MGD: Million gallons per day.
 cfs: Cubic feet per second
 -N: As nitrogen.
 -P: As phosphorus.
 CaCO₃: Calcium carbonate.
 °C: Degrees Celsius.
 x: Means multiplication.

For extreme low flow conditions, $Q_{7,10} \leq 3.7$ cfs or for sampling events where the upstream river sample, Sample location i, is greater than the daily maximum water quality standard, compliance shall be determined as specified below:

TABLE 2: $Q_{7,10} \leq 3.7$ CFS OR UPSTREAM SAMPLE GREATER THAN WATER QUALITY STANDARD

PARAMETER	DISCHARGE LIMITATIONS	MONITORING REQUIREMENTS		
	Daily Maximum	Sample Location	Measurement Frequency	Sample Type
Total Nitrogen, mg/L	3.5	ii	Monthly	Discrete
Total Nitrogen, mg/L	3.0	iii	Monthly	Discrete
Total Nitrogen, mg/L	5	iv	Monthly	Discrete
TDS, mg/L	630	ii	Monthly	Discrete
TDS, mg/L	490	iii	Monthly	Discrete
TDS, mg/L	590	iv	Monthly	Discrete
Chloride, mg/L	92	ii	Monthly	Discrete
Chloride, mg/L	33	iii	Monthly	Discrete
Chloride, mg/L	69	iv	Monthly	Discrete

The following secondary treatment limitations shall be reported utilizing the sampling data obtained from the **Carson City Wastewater Reclamation Plant, Permit NEV90008**:

Table 3

PARAMETER	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS	
	Daily Maximum	30 day Average	Measurement Frequency	Sample Type
BOD ₅ , mg/L	30	45	Quarterly	Composite
TSS, mg/L	30	45	Quarterly	Composite
pH, NTU	6.0 – 9.0		Quarterly	Discrete
BOD ₅ , percent removal	≥ 85 %		Quarterly	Composite
TSS, percent removal	≥ 85 %		Quarterly	Composite

Rationale for Permit Requirements The beneficial uses for this reach include “Aquatic Life,” and “Drinking Water” which are the most restrictive.

Flow: The flow for the Carson River, monitored at an upstream location, and the flow from each spring is to be monitored and reported.

Total Ammonia: The total ammonia as nitrogen limitation is based on the Carson River at Dayton Bridge Standards of Water Quality, NAC 445A.156 and is protective of aquatic life, the most restrictive beneficial use.

Total Phosphorus: The total phosphorus limitation is based on the Carson River at Dayton Bridge Standards of Water Quality, NAC 445A.156. The springs’ cumulative TP concentrations are less than the applicable water quality standard and are also less than the ambient river concentrations as demonstrated from upstream monitoring. The springs dilute the TP concentration in the river and consequently enhance the water quality with respect to TP. As a resultant trend, the water quality data demonstrates the river TP concentrations decrease over the reach. There are no other significant TP point source discharges to the river.

Temperature: The temperature limitation is based on the Carson River at Dayton Bridge Standards of Water Quality, NAC 445A.156. Because the natural river temperature varies greater than 0°C (RMHQ) routinely between monitoring stations, the Beneficial Use standard is applied. A mixing zone has been established for temperature. When the natural river conditions (upstream background sampling point (Sample Location i) exceed the seasonal water quality standard, the temperature at the end of the mixing zone shall be monitored and reported only. This is because the natural upstream river conditions will likely cause an unwarranted temperature standard violation at the downstream mixing zone boundary (Sample Location v).

pH: The pH limitation is based on the Carson River at Dayton Bridge Standards of Water Quality, NAC 445A.156.

Dissolved Oxygen: The dissolved oxygen limitation is based on the Carson River at Dayton Bridge Standards of Water Quality, NAC 445A.156.

Sulfate: The sulfate limitation is based on the Carson River at Dayton Bridge Standards of Water Quality, NAC 445A.156.

Sodium SAR: The sodium SAR annual average limitation is based on the Carson River at Dayton Bridge Standards of Water Quality, NAC 445A.156. The RMHQ water quality standard has been applied. A mixing zone has also been applied for SAR. When the natural river conditions (upstream background sampling point (Sample Location i) exceed the SAR water quality standard or the flow is ≤ 3.7 cfs, the SAR value at the end of the mixing zone shall be monitored and reported only. This is because the natural upstream river condition will likely cause an unwarranted SAR standard violation at the downstream mixing zone boundary (Sample Location v).

Alkalinity as CaCO₃: The alkalinity as CaCO₃ limitation is based on the Carson River at Dayton Bridge Standards of Water Quality, NAC 445A.156.

TN, TDS and Chloride: These parameters require a zone of mixing. The applicable water quality standards will be achieved at the downstream boundary of the zone of mixing, pursuant to NAC 445A.295 – NAC 445A.302. Upon evidence of low river flow, $Q_{7,10} \leq 2.4$ MGD, which is the 7 day 10 year low flow, or if the upstream background sample demonstrates concentrations for TN, TDS and/or chloride that exceed the river water quality standards prior to impacts from the discharge, the Permittee will be responsible for the meeting the specified concentrations at each spring's sampling location only, pursuant to NAC 445A.121.8. The spring limitations in Table 2 have been developed utilizing a 99 % level of confidence.

WET and Priority Pollutants: These sample analyses shall be conducted on an annual basis. Upon completion of the first 5-year permit cycle, the data shall be cumulatively reviewed to determine if a frequency and/or method reduction is warranted due to the lack of reasonable potential to cause a water quality violation.

TSS, Fecal Coliform and E Coli: Limitations for TSS, fecal coliform and E coli are established at the wastewater treatment facility end-of-pipe pursuant to Permit NEV90008.

Zinc, Iron and Mercury: Spring sampling data have demonstrated no reasonable potential to cause a water quality standard excursion. These parameters will be monitored on an annual basis pursuant to Part I.A of this permit and be cumulatively evaluated on an annual basis for Whole Effluent Toxicity pursuant to Part I.A.6 of this permit.

Table 3: Wastewater Treatment Facility secondary standard effluent limitations and effluent quality (NEV90008) will be required to be reported quarterly to demonstrate treatment compliance.

Data sources:

River flow was obtained from the USGS Carson River at Deer Run Rd station. From daily flow measurements taken from 1980 - 2005, the 7 day 10 yr low flow is 3.7 cfs or 2.4 mgd.

Spring flow data was obtained from the Carson City sampling program cited above.

Monthly analytical data generated by Carson City from June 2005 through May 2007 was applied for river and spring TN, TDS, and chloride concentrations.

Plant effluent data was utilized to estimate spring alkalinity and sodium absorption ratio.

The Nevada Division of Environmental Protection's routine monitoring data from the Deer Run Rd site was used for river alkalinity and SAR estimates.

The mixing zone length was calculated from the following equation:
Length = $k(\text{velocity})(\text{stream width})^2/(\text{stream depth})$

Two mixing zone lengths are required. A mixing zone length of 1,100 feet downstream from each spring discharge location is authorized for compliance with average annual and daily maximum discharge limitations for total nitrogen, TDS and alkalinity. This distance was computed based on achieving complete mixing in the Carson River during a 7-day, 10-year low flow of 3.7 cfs.

A second mixing zone of 2,600 feet downstream from each spring is authorized for compliance with the average annual discharge limitations for chloride and SAR and the maximum daily discharge limitation for chloride. This distance is based on achieving complete mixing utilizing a Carson River flow of 13 cfs.

Compliance with the discharge limitations shall be demonstrated by monitoring the Carson River downstream of the mixing zones at River Mile 38.54 as required in Table 1. The sampling point is approximately 3.5 miles from the Brunswick Canyon Spring confluence due to it being the closest location in the river that is safely accessible during all weather conditions throughout a given year.

Procedures for Public Comment Notice of the Division's intent to issue discharge permit NV0023591 as described here is being sent to the Nevada Appeal for publication and mailed to interested persons on our mailing list. Anyone wishing to comment on the proposed permit must submit written comments to the Division within (30) days of the publication date. The comment period can be extended at the discretion of the Administrator. The deadline for comments is 5:00 pm **Friday, February 20, 2009**, although letters postmarked on that date will also be accepted.

A public hearing on the proposed determination can be requested by the applicant, any affected state or interstate agency, the Regional Administrator, or any interested agency, person, or group of persons. The request must be filed within the comment period and indicate the interest of the person filing the request and the reasons why a hearing is warranted. Public hearings granted by the Division are conducted in accordance with NAC 445A.238.

The final determination of the Division may be appealed to the State Environmental Commission pursuant to NRS 445A.605.

Proposed Determination The Division has made the tentative determination to issue the proposed discharge permit for a five year term.

Prepared by: Valerie King
January 14, 2009

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