MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

Permit Fact Sheet

Permittee:	Town of Manhattan
Permit No.:	MT0021857
Receiving Water:	Dita Ditch (aka Backlin Ditch) to the Gallatin River
Facility Information:	
Name	Water Reclamation Facility
Location	250 Bettingill Rd Manhattan, MT Gallatin County
Facility Contact:	Mayor Glen Clements, Lead Operator
	PO Box 96 Manhattan, MT 59741
Fee Information:	
Number of Outfalls	One
Type of Outfall	Minor Publicly Owned Treatment Works

I. Permit Status

This is a renewal of Montana Pollutant Discharge Elimination System (MPDES) permit MT0021857. The current permit became effective September 1, 2010 and expired August 31, 2015 (2010-issued permit).

The Montana Department of Environmental Quality (DEQ) received a renewal application and fees from the Town of Manhattan (Manhattan) on February 26, 2015. DEQ issued a Notice of Deficiency, and Manhattan submitted updated forms on March 19, 2015. DEQ deemed the application complete, and the 2010-issued permit was administratively extended in a letter dated April 15, 2015.

DEQ proposes the following changes from the 2010-issued permit with this renewal:

1. Total Suspended Solids (TSS) and 5-Day Biochemical Oxygen Demand (BOD_5) load limits changed.
2. Ammonia effluent limit was updated.

3. Seasonal total nitrogen (TN) and total phosphorus (TP) load limits and Pollutant Minimization Program requirements are established.
4. The monitoring and reporting requirement for influent flow is removed.
5. Effluent monitoring frequency has changed.
6. Ambient monitoring requirements have been added.

II. Facility Information

A. Facility Description

In 2008, Manhattan replaced their two-cell lagoon wastewater treatment plant with a biological nutrient removal (BNR) hybrid activated sludge - fixed film system with rotating bio-wheels. This mechanical facility is located approximately 2,000 feet north of the previous lagoon location (see **Figure 1**). The rotating bio-wheels failed in the summer of 2017. By the end of November 2018, Manhattan had replaced the rotating bio-wheels with two fine bubble-diffused aeration units and rebuilt both clarifiers. The current Water Reclamation Facility (WRF) treatment train (see **Figures 2 and 3**) includes:

- Parshall flume influent flow meter with SCADA logging and influent sampling (45.87581, -111.33329).
- Headworks Facility – Solids and grit removal occur via a screen (replaced brushes in 2018) and cyclone-style grit tank, after which the grit stream is further dewatered and sent to a landfill.
- Equalization Basin – 115,000-gallon covered basin.
- Denitrification Basins – two 28,000-gallon covered basins where wastewater is mixed with return activated sludge (RAS).
- Aeration Basins – two trains of fine bubble-diffused aeration units to aerate the mixed liquor, installed in 2018.
- Secondary Clarifiers – rebuilt in 2018, there are two 1,200-square feet rectangular clarifiers used to settle biological solids before returning RAS to the denitrification basins, Waste Activated Sludge (WAS) to solids handling, and effluent to the UV building for disinfection.
- UV Disinfection – Effluent sampling occurs at the end of the UV trough, at 45.87676, -111.33299.

Manhattan WRF discharges continuously. After passing through the UV system, the effluent travels down a 200-foot rip rap-lined swale, prior to discharge into the Dita Ditch at approximately 45.87708, -111.33242.

Table 1 summarizes the current design:

Table 1: Current Design Criteria Summary	
Facility Description: Biological Nutrient Removal (BNR) system with UV disinfection; continuous discharge to Dita Ditch.	
Original Construction Date: 2008 (1)	Modifications: 2018 aeration basin (2)
Design Flow, Average Daily (mgd): 0.37 (1)(3)	Design Flow, Maximum Daily (mgd): 0.6 (3)
Current Population: 2,350 (2017) (3)	Design Population: 2,710
Design BOD_5 Removal: 85% (1)	Design TSS Removal: 85% (1)
Collection System Combined [ ] Separate [X]	Estimated I/I (mgd): seasonal 0.1 to 0.28 (3)
Sanitary Sewer Overflow (SSO) Events (Y/N): Y	One event (May 28, 2019)
Disinfection (Y/N): Y	Disinfection Type: Ultraviolet (UV)

Footnotes:
(1) *Town of Manhattan, MT Operation & Maintenance Manual for the Wastewater Treatment Plant*, 2008, Stahly Engineering.
(2) September 2017 bio-wheels failed; by the end of November 2018 fine-diffused aeration installed.
(3) *Final – Manhattan Water Reclamation Facility Preliminary Engineering Report*, TD&H, May 2020.

Projected Growth

The WRF average daily design flow is 0.37 million gallons per day (mgd) based on a design population of 2,710; over the last two years (November 2018 – November 2020) the actual average daily flow was 0.22 mgd. All available wastewater treatment capacity for the WRF has been committed; however, the area's population is growing at an estimated 3.5% per year. Manhattan submitted a May 2020 Preliminary Engineering Report to DEQ's State Revolving Fund (2020 PER), to address capacity, nutrients, and enhanced denitrification issues. **Table 2** provides an overview of population and average daily flow comparisons, based on the 2020 PER:

Table 2: Summary of Average Daily Flow and Population (1)				
	2017 Actual		Projections (2040)	
	Population	Flow (mgd)	Population	Flow (mgd)
Manhattan	1,750	0.13	3,464	0.47
Pending Developments (2)	0	0	397	0.19
Amsterdam-Churchill (ACSD)	600	0.06	983	0.095 (3)
Total	**2,350**	**0.19**	**5,241**	**0.80**

Footnotes:
(1) 2020 Preliminary Engineering Report and June 2020 Uniform Application.
(2) Pending Developments include the following subdivisions: Manhattan Orchards; Farmstead (partially hooked up); and Pioneer Crossing/Centennial Village (partially hooked up by December 2020).
(3) ACSD is currently allotted up to 0.075 mgd; however, they have initiated a formal request to increase their allocation to 0.095 mgd. The PER assumed 0.098 mgd for the design rate.

The 2020 PER proposes the following upgrades to the Manhattan WRF, with construction to begin in May 2022:

- Phase I:
  - Treatment Alternative T-2: Immediate critical improvements
  - Disposal Alternative D-6: Combined Discharge (Groundwater and Dita Ditch)
- Phase II: Treatment Alternative T-3: Four Train Modified Ludzack Ettinger (MLE) Expansion. The MLE process is designed to remove BOD_5, ammonia, and nitrate/nitrite.
- Phase III: Treatment Alternative T-4: Six Train MLE Treatment

Infiltration/Inflow

In addition to increasing flows driven by population growth, Manhattan has significant seasonal inflow and infiltration (I/I) rates that impact the WRF capacity.

Sanitary sewer mains surrounding the railroad crossing at 4th street and the Clinton Addition were television (TV) inspected in September 2015. The inspection revealed issues including sags, penetrations, debris, exposed gaskets, and leaking at service connections. The TD&H Manhattan Wastewater System Preliminary Engineering Report dated April 2016 (2016 PER) stated that the TV inspection showed groundwater pouring in from service connections and penetrations.

Depending on the source and the averaging time, the estimate of I/I into the Manhattan WRF system ranges from:

- 0.10 mgd average I/I in September, October, and November of 2017 and 2018 (TD&H Memo *Influent Flows and Loads*, August 8, 2019);
- 0.17 mgd in the summer/fall (2016 PER); and
- 0.28 mgd during times of high groundwater, specifically during late summer and fall (2016 PER).

Since the completion of the 2016 PER, the existing sewer main from Gallatin Avenue, traveling north through the town toward the WRF, was replaced and upsized. The Town has established an aggressive goal that will replace and rehabilitate all identified collection system deficiencies by 2030. An I/I study is proceeding, but the report has not been completed as of February 2021.

B. Effluent Characteristics

Table 3 summarizes effluent quality from facility Discharge Monitoring Reports (DMR) in the Period of Record (POR) from December 2018 (after the recent upgrade was complete) through December 2020. DEQ excluded earlier data from this summary table due to equipment failures that were corrected by the end of November 2018.

Table 3: Effluent Characteristics – December 2018 through December 2020

Parameter	Units	2010 Permit Limit	Minimum Value	Maximum Value	Average Value	Number of Records (1)
Flow, 30-Day Average	mgd	(2)	0.16	0.53	0.22	25
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	30/45 (3)	3	52	11	25
	% removal	85	74	99	95	25
	lb/day	63/95 (3)	5	81	19	25
Total Suspended Solids (TSS)	mg/L	30/45 (3)	3	86	24	25
	% removal	85	79	99	90	25
	lb/day	100/150 (3)	4	240	45	25
pH	s.u.	6.0-9.0	6.5	8.9	--	25
Escherichia coli Bacteria - summer (4)(5)	cfu/100 mL	126/252 (3)	2	312	22	16
Escherichia coli Bacteria - winter (4)(6)	cfu/100 mL	630/1,260 (3)	2	656	43	11
Total Ammonia as N	mg/L	10/17 (3)	0.1	20	3.6	66 (7)
	lb/day	21.5	0.2	39	5.6	66 (7)
Total Kjeldahl Nitrogen	mg/L	(2)	2	23	10	12 (7)
Nitrate + Nitrite as N	mg/L	10	0.1	14.5	3.9	65 (7)
Total Nitrogen as N	mg/L	(2)	8.1	23	13	12 (7)
	lb/day	(2)	11.4	36	21	12 (7)
Total Phosphorus as P	mg/L	(2)	0.2	7.1	1.3	53 (7)
	lb/day	(2)	0.4	10	2.5	52 (7)
Oil and Grease	mg/L	10	0	1.0	0.5	25

Footnotes:
(1) Data based on DMR records unless otherwise indicated.
(2) No limit in 2010 permit, monitoring requirement only.
(3) Limit shown as 30-day average/7-day average.
(4) Geometric mean.
(5) Sample period is April 1 to October 31.
(6) Sample period is November 1 through March 31.
(7) Data from DMRs (2019) and Manhattan 2020 Energy Labs Summary workbook (provided to DEQ February 2021).

C. Compliance History

DEQ performed one MPDES compliance inspection since 2015 (December 7, 2018). The following findings were identified during this inspection:

1. The facility was not collecting *E. coli* bacteria samples at the required frequency.
2. The facility was not calculating split weeks data correctly for DMR reporting (October/November 2017).
3. Values were not transferred to the discharge monitoring report accurately for December 2017.

4. Discharge monitoring reports were submitted late for two reporting periods.
5. Numeric effluent limitations were exceeded:
   - BOD_5 – numerous limits between August 2017 and September 2018,
   - TSS – numerous limits between August 2016 and September 2018,
   - *E. coli* bacteria – limits between September 2017 September 2018,
   - Ammonia – numerous limits between August 2017 and September 2018, and
   - Nitrite + nitrate (as N) – daily maximum August 2016 and December 2017.

The facility stated the exceedances occurred between the time the bio-wheels started malfunctioning in 2017 and their replacement with two aeration units in 2018. The west aeration tank was put on-line in late October 2018 and the east aeration tank was put on-line on November 6, 2018.

Table 4 summarizes the exceedances at Manhattan WRF since December 2018:

Table 4: Summary of Exceedances since December 2018

Parameter	BOD_5	BOD_5 removal	*E.coli*	N+N	Ammonia		TSS		TSS removal
Limit	45	> 85	252	10	10/17	21.5	30	100	> 85
Units	mg/L	%	cfu/100 mL	mg/L	mg/L	lb/day	mg/L	lb/day	%
12/2018	--	--	--	--	12	--	--	--	--
1/2019	--	--	--	--	11/20	--	48	--	--
3/2019	52	--	--	--	--	--	86	--	--
4/2019	--	--	--	--	--	--	36	--	--
5/2019	--	--	--	--	--	--	68	--	79
6/2019	--	--	312	--	--	--	76	--	81
7/2019	--	--	--	--	--	--	56	--	--
9/2019	--	--	--	--	--	--	31	174	82
10/2019	--	74	--	--	12	37	62	240	--
11/2019	--	--	--	--	17/19	39	48	--	--
12/2019	--	--	--	--	14/20	--	--	--	--
4/2020	--	--	--	--	--	--	59	--	--
8/2020	--	--	--	14.5	--	--	--	--	--

Manhattan continued to experience exceedances of several parameters after the upgraded facility became operational by the end of November 2018, including wintertime ammonia limits (October through January) and TSS limits year-round. However, during 2020 there were only two exceedances: one for TSS and one for N+N.

III. Technology-Based Effluent Limits

The minimum requirements for secondary treatment, or the equivalent, for publicly owned treatment works (POTWs) are set forth in 40 Code of Federal Regulations (CFR) 133. Secondary treatment for a POTW is defined in terms of effluent quality as measured by pH, BOD_5, TSS, and percent removal of BOD_5 and TSS.

A. Technology-Based Effluent Limits – National Secondary Standards

The technology-based effluent limitations (TBELs) in the 2010-issued permit were based on national secondary treatment standards (NSS) for BOD_5, and TSS (limits of 30 mg/L monthly, 45 mg/L weekly, with 85% removal) as well as pH (6.0 - 9.0 su). Because the Manhattan WRF is a mechanical plant, it does not meet the eligibility for treatment equivalent to secondary treatment (TES)(40 CFR 133.101(g)). The NSS limits applied in the 2010-issued permit are maintained in this permit renewal.

B. Technology-Based Effluent Limits - Mass

In addition to concentration, effluent limits must be expressed in terms of mass (mass/time), except for certain conditions, such as pH or temperature. For municipal treatment plants, mass-based limits are calculated using the average daily design flow for the facility, which is 0.37 mgd for Manhattan:

Load (lbs/day) = Design Flow (mgd) x Concentration (mg/L) x 8.34 (lb·L)/(mg·gal)

BOD_5 and TSS mass-based limits:

Average Weekly = 0.37 mgd x 45 mg/L x 8.34 (lb·L)/(mg·gal) = 139 lb/day

Average Monthly = 0.37 mgd x 30 mg/L x 8.34 (lb·L)/(mg·gal) = 92.6 lb/day

The most stringent of the above average monthly load limits and the nondegradation allocated load will be the monthly load limits for BOD_5 and TSS for this permit renewal.

C. Nondegradation

In order to prevent significant changes to water quality, DEQ caps a POTW at the most stringent load allocation since 1993 for both BOD_5 and TSS. Any increases above these amounts would be subject to the provisions of Montana's Nondegradation Policy.

For the Manhattan POTW, the average monthly BOD_5 and TSS load allocations permitted since 1993 were based on an average daily design flow of 0.25 mgd (1984 lagoon upgrade through 2008 mechanical plant installation) and the most stringent permitted treatment standards for the facility during that time:

- BOD_5: 62.6 lb/day (NSS: 0.25 mgd x 30 mg/L x 8.34).
- TSS: 93.8 lb/day (TES: 0.25 mgd x 45 mg/L x 8.34).

These allocated loads are compared to the actual discharge loads from Manhattan's self-monitoring data in **Table 5**.

Table 5: Nondegradation Allocated and Actual Annual Loads						
Parameter	**Allocated Load (lb/day)**	Actual 30-Day Average Loads (lb/day)				
		2016	2017	2018	2019	2020
5-Day Biochemical Oxygen Demand	**63**	9	34	53	26	12
Total Suspended Solids	**94**	28	85	111 (1)	60	30
Footnotes: (1) Manhattan exceeded numerous TSS limits in 2018 due to bio-wheel failures.						

This permit renewal will include the most stringent of the nondegradation monthly average load allocations and the mass-based average monthly load limit calculated above:

- 63 lb/day BOD_5 (nondegradation) and
- 93 lb/day TSS (current mass-based limit).

D. Proposed Final TBEL limits

The proposed TBEL concentration limits continue to be based on NSS. This renewal proposes the following changes from the 2010-issued permit load limits:

- BOD_5 average weekly load limit: relaxed from 95 lb/day to 139 lb/day, since nondegradation does not apply to weekly average loads.
- TSS load limits: slightly more stringent, based on correcting the average daily design flow from 0.40 mgd to the current design flow of 0.37 mgd, as follows:
  - The TSS average monthly load limit was reduced from 100 to 93 lb/day.
  - The TSS average weekly load limit was reduced from 150 to 139 lb/day.

Table 6 presents the proposed TBELs with consideration of nondegradation:

Table 6: Manhattan WRF Outfall 001 TBELs			
Parameter	Units	Average Monthly Limit	Average Weekly Limit
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	30	45
	lb/day	63 (1)	139
	% removal	85 (2)	NA
Total Suspended Solids (TSS)	mg/L	30	45
	lb/day	93	139
	% removal	85 (2)	NA
pH	s.u.	6.0-9.0 (instantaneous)	
Footnotes: (1) The load-based average monthly limit for BOD_5 is based on the nondegradation allocated load. (2) The arithmetic mean of the BOD_5 and TSS values for effluent samples collected in a period of 30 consecutive days shall not exceed 15% of the arithmetic mean of the values for influent samples collected at approximately the same time during the same period (85% removal).			

IV. Water Quality-based Effluent Limits

A. Scope and Authority

Permits are required to include water quality-based effluent limits (WQBELs) when TBELs are not adequate to protect state water quality standards. Montana water quality standards require that no wastes may be discharged that can reasonably be expected to violate any state water quality standards. Montana water quality standards also define both water use classifications for all state waters, and numeric and narrative standards that protect those designated uses.

B. Receiving Water

The Manhattan WRF discharge travels 200 feet through a dedicated effluent ditch before it reaches Dita Ditch (aka Backlin Ditch), which is the initial receiving waterbody. After receiving the WRF discharge, Dita Ditch flows more than two miles before reaching the Gallatin River.

This segment of the Gallatin River, as well as Dita Ditch, are classified B-1. Waters classified B-1 are to be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

The following information is used to describe the watershed for Dita Ditch, based on the downstream receiving waterbody, the Gallatin River.

Water Use Classification:	B-1
HUC Name:	Upper Missouri
Watershed:	Gallatin River
Montana Stream Segment:	MT41H001_010
Stream Segment Name:	GALLATIN RIVER, Spanish Creek to mouth (Missouri River)
Ecoregion (for Nutrients):	17w Middle Rockies
Identified as Impaired:	Yes, flow regime modifications
Total Maximum Daily Load (TMDL):	Not required (no pollutant-related impairment in this segment of the Gallatin River)

Although there is no TMDL for this segment of the Gallatin River, there is an ammonia point source wasteload allocation (WLA) in a facility-specific TMDL for the Manhattan WRF discharge that was approved by the EPA in 2005. The total ammonia WLA is 21.5 lb/day as a 30-day average (see additional discussion in this Fact Sheet Part IV.E.2).

The WRF discharges into an intermittent stretch of Dita Ditch. Upstream of the facility the flow is mainly seasonal irrigation return water; Manhattan personnel have observed that Dita Ditch flows typically from May through October. The types of water contribution vary in different proportions throughout the year, with effluent being the sole contribution for most of the winter months (WRF personnel, 2017).

In January 2003, DEQ drafted *the Use Attainability Analysis: Manhattan, Montana Lagoon Ditch and Stream Channel*. The draft Use Attainability Analysis (UAA) reviewed Dita Ditch in two reaches: Reach #1 from the old sewage lagoons to Nixon Bridge Road (the reach that includes the current WRF discharge) and Reach #2 from Nixon Bridge Road to the Gallatin River.

The Dita Ditch UAA included the recommendation that the first section of Reach #1, from the old lagoons to Perks Canal, be re-classified as Category E-1. [Review of geographical information during this renewal indicates that Dita Ditch is a lateral of the Perks Canal system.] Furthermore, the UAA included the recommendation that the second section of this Reach, between Perks Canal to Nixon Bridge Road, be re-classified as D-1. Downstream of Nixon Bridge Road was determined to be perennial. The UAA concluded by requiring that the City of Manhattan request the reclassification in writing. The 2003 draft UAA was never finalized.

As part of the draft UAA, DEQ described the flow characteristics for the stretch of Dita Ditch between the old sewage lagoons and Nixon Bridge Road. The following are relevant facts provided in the draft UAA:

> The channel from the lagoons to the mouth of Perks Canal is about ½ mile long (*sic*; Manhattan constructed the mechanical plant 2,000 feet downstream from the abandoned lagoons in 2008). Water flows in this area in response to return irrigation water conveyed to it from sources upstream of the lagoons, from occasional lagoon effluent discharge, from Perks canal water and water provided by another irrigation ditch west of the old town dump, and, in some areas, in response to precipitation and runoff. During the non-irrigation season the ditch channel remains dry until it reaches a point near a culvert at Nixon Bridge Road.

During the 2004-issued permit development, DEQ established the annual 7-day, ten-year critical low flow (7Q10) upstream of the old sewage treatment lagoons' discharge as zero. However, an alternate mixing zone was provided for ammonia, providing a dilution allowance of 25% of the 7Q10 of one cubic foot per second (cfs) that was developed by DEQ for the downstream perennial reach of Dita Ditch beginning shortly downstream of the Nixon Bridge Road. The alternative mixing zone and resulting ammonia limits were based on the intermittent nature of the receiving water and the first order decay rate of ammonia over the distance from the facility discharge to perennial surface water (November 2003 Town of Manhattan SOB). This dilution allowance was established at a time when the draft UAA to downgrade the uses of the intermittent stretch was under consideration and the discharge from the old sewage treatment lagoon system was periodic.

The current WRF was constructed in 2008. The current facility's discharge location is approximately 0.4 miles downstream from the old sewage lagoons' discharge location. Dita Ditch, at the current discharge location, remains an intermittent segment. The waterbody becomes perennial ~0.44 miles (2,300 feet) downstream from the WRF discharge, shortly after the Nixon Gulch Bridge. During the 2010-issued permit development, DEQ acknowledged the 7Q10 remained zero at the new discharge location but maintained the alternate mixing zone and limits for ammonia.

As part of this permit renewal, DEQ considered the fact that the UAA was never completed and the intermittent stretch of Dita Ditch remains classified as a high-quality water. Furthermore, the WRF is a continuous discharger; in fact, the only flow in the wintertime is typically effluent. Therefore, the 7Q10 for all parameters is zero.

Ambient Water Quality Data

Manhattan provided one sample for ambient water quality analysis, collected upstream of the WRF in September 2014. **Table 7** presents the ambient water quality data.

Table 7: Dita Ditch Ambient Water Quality Data (September 2014)

Parameter	Units	Concentration
Ammonia, total as N	mg/L	< 0.05
Nitrate + Nitrite as N	mg/L	1.31
Total Kjeldahl Nitrogen, as N	mg/L	1.4
Total Nitrogen	mg/L	2.7
Total Phosphorus	mg/L	0.03

There were no recent ambient data for pH or temperature. Therefore, DEQ is using the data collected in 2001 used in the ammonia standard development for the 2004-issued permit:

- pH: 7.415 su (75th percentile of 41 datapoints, back-calculated from the ammonia standard developed in the November 2003 Statement of Basis)
- Temperature: 14 °C (75th percentile of 40 datapoints, back-calculated)

C. Applicable Water Quality Standards

Discharges to surface waters classified B-1 are subject to the specific water quality standards of ARM 17.30.629 and ARM 17.30.635 through 637, and the numeric standards found in Circular DEQ-7. In addition to these standards, dischargers are also subject to ARM 17.30 Subchapter 5 (Mixing Zones), Subchapter 7 (Nondegradation), and Circular DEQ-12A (Base Numeric Nutrient Standards, 2014) and Circular DEQ-12B (Nutrient Standard Variances, 2017).

D. Mixing Zone

A mixing zone is an area where effluent mixes with the receiving water and certain water quality standards may be exceeded. Mixing zones must have the smallest practicable size, a minimum practicable effect on water uses, and definable boundaries. DEQ will determine the appropriateness of a mixing zone and will grant a mixing zone, deny the mixing zone, or grant an alternative or modified mixing zone.

Mixing zones allowed under a permit issued prior to April 29, 1993, will remain in effect unless there is evidence that previously allowed mixing zones will impair existing or anticipated uses. Manhattan was not granted a mixing zone prior to 1993. Mixing zones are granted on a parameter-by-parameter basis. No mixing zone will be granted that will impair beneficial uses. Chronic aquatic life, acute aquatic life, and human health standards may not be exceeded outside of a mixing zone.

The 1998-issued permit included a mixing zone extending two miles downstream of the old sewage lagoons. The 2004- and 2010-issued permits included only an alternative mixing zone for ammonia, extending 0.8- and 0.4-miles respectively, to the west side of Nixon Bridge Road (Nixon Gulch Road) but neither permit provided a mixing zone for any other parameter. As discussed in **Part IV.B**., Dita Ditch upstream of the WRF discharge is an intermittent segment. The annual 7Q10 is zero, since the WRF effluent is the sole contribution for most of the winter months (WRF personnel, 2017). Because the annual 7Q10 is zero there is no available dilution for any parameter and no mixing zone is granted.

Nutrient standards are seasonal (July through September) and if there is assimilative capacity DEQ provides dilution based on the 14-day 5-year critical low flow for July - October (seasonal 14Q5). These seasonal standards occur during the same time period that the irrigation return water typically flows through Dita Ditch (May through October, WRF personnel). Lacking better data, the seasonal 14Q5 for Dita Ditch upstream of the WRF discharge will be assumed as equal to the 7Q10 (1.0 cfs or 0.64 mgd) for the downstream perennial stretch after Nixon Gulch Road developed in the Statement of Basis for the 2004-issued permit.

E. Basis for Water Quality-Based Effluent Limits

MPDES permit limits must control all pollutants which will, or have RP to, cause or contribute to an excursion above any state water quality standard, including narrative criteria. Parameters typically present in municipal wastewater that may cause or contribute to a violation of water quality standards include: conventional pollutants such as biological material (as measured by BOD_5), TSS, pH, oil & grease, and pathogenic bacteria; and non-conventional pollutants such as nitrate + nitrite, nutrients, total ammonia, and metals.

Pollutants and parameters are identified as a pollutant of concern (POC) if the pollutant: is a TBEL; has limits in the previous permit; is known present in the effluent through monitoring or otherwise expected present in the discharge; or is a pollutant associated with an impairment which may or may not have a wasteload allocation in a TMDL.

DEQ evaluated pollutants of concern for Manhattan WRF in **Table 8**.

Table 8: Identification of POC and Need for RP Analysis

Parameter	Basis for POC Identification
5-day Biochemical Oxygen Demand	TBEL
Total Suspended Solids	TBEL
pH	TBEL
Oil & Grease	Previous permit, known present
E.coli bacteria	Previous permit, known present
Ammonia, as N	Previous permit, known present
Nitrate + Nitrite, as N	Previous permit, known present
Total Nitrogen, Total Phosphorus	Known present

DEQ uses a mass balance equation to determine RP and develop WQBELs based on *EPA's Technical Support Document for Water Quality-based Toxics Control, March 1991* (TSD), EPA/505/2-90-001 (see *Equation 1* and *Equation 2*):

$$C_r = \frac{C_d Q_d + C_s Q_s}{Q_d + Q_s} \qquad \textit{(Equation 1)}$$

Given:

C_r = the resulting receiving water concentration
Q_d = critical discharge rate (POTW average daily design flow)
Q_s = instream flow available for dilution (critical low flow x available % for dilution)
C_d = critical effluent pollutant concentration (maximum discharge concentration x TSD multiplier)
C_s = critical upstream ambient pollutant concentration (75th percentile concentration)

RP for the WRF discharge to cause exceedances of water quality standards is evaluated using *Equation 1* (see **Attachment A-1)**. The critical effluent concentration (C_d) is obtained following the method recommended by the EPA's TSD: a multiplier determined using TSD methods, based on the dataset statistics, is applied to the maximum observed concentration during the Period of Record. Since the 7Q10 for this stretch of the Dita Ditch is zero, the equation reduces to $C_r = C_d$, and the facility has RP for a parameter if $C_d >$ water quality standard.

WQBELs must be developed for any parameter for which there is RP to cause or contribute to exceedances of instream numeric or narrative water quality standards. To establish WQBELs for an existing discharger, DEQ first calculates each parameters' Wasteload Allocation (WLA). As shown in *Equation 2*, the mass-balance equation can be arranged to calculate the WLA (C_{WLA}) so that the discharge does not cause or contribute to an exceedance of the applicable water quality standard under critical conditions.

$$C_{WLA} = \frac{Q_r C_r - Q_s C_s}{Q_d} \qquad \textit{(Equation 2)}$$

Given:

C_{WLA} = calculated wasteload allocation necessary to maintain water quality standard downstream
Q_d = critical discharge rate (POTW average daily design flow)
Q_s = instream flow available for dilution (critical low flow x % available for dilution)
$Q_r = Q_d + Q_s$
C_r = water quality standard
C_s = critical upstream ambient pollutant concentration (75th percentile concentration)

The WLAs are then translated into average monthly limitations (AMLs) and maximum daily limitations (MDLs) using TSD multipliers. See **Attachments A-3 and A-4**.

The following subsections discuss the basis for the RP and WQBELs in this permit.

1. Conventional Pollutants

BOD_5, TSS, and pH: These parameters are typical effluent quality indicators for POTWs and are regulated as TBELs (see Section III of this Fact Sheet). The permit renewal will maintain limits for BOD_5 TSS, and pH based on NSS and nondegradation load allocations. The WRF provides significant amount of control for biological material, solids, and pH through secondary treatment. No additional limits are required for these parameters.

Oil and Grease (O&G): Montana regulations require state waters be free from substances attributable to municipal discharges that will result in concentrations of oil and grease at or in excess of 10 mg/L.

The standard of 10 mg/L was applied in the 2010-issued permit as a maximum daily limit with monthly effluent monitoring. As part of this renewal, DEQ reviewed the reasonable potential for the WRF discharge to cause exceedances of the oil and grease water quality standard based on results for the period of December 2018 through November 2020. RP was evaluated based on *Equation 1* (see **Attachment A-1**).

The resulting critical discharge concentration for the new facility was found to be less than the water quality standard for oil & grease (1.4 mg/L < 10 mg/L). However, O&G is a known pollutant, and the previous limit of 10 mg/L will be maintained. Weekly visual and semi-annual sampling for oil & grease will be required (see **Part VI** of this fact sheet). An additional oil and grease sample must be collected and analyzed if an oil sheen is observed in the discharge.

***Escherichia coli* Bacteria:** Pathogens are known municipal wastewater contaminants. Pathogen limits are defined in terms of *Escherichia coli* (*E. coli*) bacteria, which are a surrogate for all human pathogens including bacteria and viruses. The water quality standards for *E.coli* bacteria varies according to seasons as follows:

(i) April 1 through October 31 of each year - the geometric mean number of *E. coli* must not exceed 126 colony forming units (cfu) per 100 milliliters (mL) and 10% of the total samples may not exceed 252 cfu per 100 mL during any monthly period; and

(ii) November 1 through March 31 of each year - the geometric mean number of *E. coli* must not exceed 630 cfu per 100 mL and 10% of the total samples may not exceed 1,260 cfu per 100 mL during any monthly period.

Montana regulations were updated in May 2017 to read "Water quality criteria for *Escherichia coli* are expressed in colony forming units per 100 milliliters of water or as most probable number, which is a statistical representation of the number of organisms in a sample, as incorporated by reference in 40 CFR 136.3(b)." With this renewal DEQ is proposing to retain the existing *E. coli* bacteria limits but will change the associated units to read "number of organisms/100 mL," which will incorporate either cfu or most probable number (MPN).

2. Non-conventional Pollutants

Total Ammonia as N: The 2004-issued permit established ammonia limits based on meeting the calculated ammonia water quality standards in the downstream perennial reach of Dita Ditch and a first-order decay analysis for the intermittent portion of the ditch (November 2003 Town of Manhattan SOB). The ammonia limits were 10 mg/L average

monthly and 17 mg/L maximum daily. After the 2004 permit issuance, EPA approved a point source TMDL for ammonia for the Manhattan WRF discharge to the Dita Ditch. The TMDL WLA was 21.5 lb/day ammonia as an average monthly load limit. The 2010-issued permit continued the 2004-issued concentration and TMDL ammonia load limits.

As part of this renewal, DEQ reviewed the ammonia effluent data since the recent WRF upgrade was completed (December 2018 through December 2020). The WRF has consistently met the ammonia limits for the warmer weather months (February through September); however, Manhattan has exceeded winter-time ammonia compliance five of the eight wintertime months. The last ammonia exceedance was December 2019. For this two-year POR, the reported maximum ammonia effluent concentration was 20 mg/L, and the maximum load was 39 lb/day (November and December 2019).

DEQ reviewed RP for the WRF discharge to cause exceedances of ammonia standards based on the maximum effluent concentration and CV for the period of December 2018 through December 2020. RP was evaluated based on *Equation 1* (see **Attachment A-1**). Since there has been no recent ambient pH or temperature data, the ammonia standards of 4.7 mg/L chronic and 15 mg/L acute were continued from the 2004-issued permit (see **Attachment A-2**). The calculated critical ammonia concentration (C_r = 19 mg/L) was found to be greater than the acute and chronic water quality standards. Therefore, DEQ finds that the WRF has RP to exceed the ammonia standards and a limit is required.

As discussed in the mixing zone section, the stretch of Dita Ditch that receives discharge from the WRF is intermittent and the 7Q10 is zero. Therefore, the WLA for the discharge is calculated at the end of pipe with no dilution. Based on *Equation 2* and the calculated TSD Table 5-1 LTA multiplier (based on the 99th percentile for 30-day rather than 4-day chronic effects), the proposed ammonia limits are 5.4 mg/L average monthly and 15 mg/L maximum daily. See **Attachment A-3**.

Because these limits are more stringent than the existing ammonia limits of 10 mg/L average monthly and 17 mg/L maximum daily, and the facility has submitted design plans to upgrade the facility with unknown ammonia removal capabilities, a compliance schedule until July 1, 2025 will be provided. The existing concentration limits will remain as interim limits. The ammonia load limit of 21.5 lb/day average monthly will be continued.

Nitrate plus Nitrite (N+N): Nitrate and nitrite are toxic components of total nitrogen, which is a common constituent of municipal wastewater. The N+N limit in the 2010-issued permit was established at 10 mg/L, based on the human health standard (HHS) and no available dilution.

DEQ evaluated RP for the WRF discharge to exceed the N+N standard using *Equation 1* (see **Attachment A-1)**. The critical discharge concentration was calculated as 14 mg/L, which is greater than the HHS of 10 mg/L; therefore, DEQ finds RP to exceed the N+N standard and an effluent limit is required.

A wasteload allocation (C_{WLA}) was calculated based on *Equation 2,* so that the discharge does not cause or contribute to an exceedance of the N+N standard under critical conditions. Because the standard is an HHS, C_{WLA} is equivalent to the AML (TSD Section 5.4.4). Based on Footnote 16 in Department Circular DEQ-7, no sample shall exceed the HHS; therefore MDL = AML. The proposed N+N limit is 10 mg/L AML and MDL (see **Attachment A-3**).

Total Nitrogen (TN) and Total Phosphorus (TP): The 2010-issued permit did not contain nutrient limits, but quarterly nutrient effluent monitoring was required. **Table 9** compares the quarterly concentration and loads reported by the Manhattan WRF between January 2019 and December 2020.

Table 9: Comparison of Nutrient Concentrations and Loads

Parameter		mg/L	lb/day	# Samples
Total Nitrogen as N (TN)	Annual Avg	13	21	12
	Summer Avg	10	17	3
Total Phosphorus as P (TP)	Annual Avg	1.3	2.5	53 (1)
	Summer Avg	1.1	2.0	14 (1)

Footnote:
(1) Due to engineering work, the Town of Manhattan took weekly TP samples during 2020.

Department Circulars DEQ-12A and -12B: Montana's Circular DEQ-12A (Base Numeric Nutrient Standards) and Circular DEQ-12B (Nutrient Standard Variances) were first adopted in July 2014 and approved by EPA on February 26, 2015. DEQ submitted a revised Circular DEQ-12B (June 2017) that was approved by EPA on October 31, 2017.

Upper Missouri Waterkeeper challenged EPA's 2015 approval in May 2016 and subsequently amended their 2016 complaint to challenge the EPA's 2017 approval. On July 16, 2019, the U.S. District Court for the District of Montana directed DEQ to adopt a timeline in accordance with the court's order, including a revised nutrients general variance, and required EPA to review the submission. After EPA disapproved DEQ's resulting submission on February 24, 2020, DEQ considered the Circular DEQ-12A standards to be voided as well.

However, on October 30, 2020, the U.S. District Court issued an order in *Upper Missouri Waterkeeper v. Environmental Protection Agency*, clarifying its previous orders regarding Montana's nutrient water quality standards. Under the October 2020 Court Order, Montana's numeric nutrient criteria (Circular DEQ-12A, 2014) and general variance approved by EPA on October 31, 2017 (Circular DEQ-12B, 2017) remain in effect.

On August 21, 2017, the Town of Manhattan applied for a general variance from the nutrient criteria for the Discharger Category "< 1 mgd," they were approved by the EPA on October 31, 2017. Therefore, as part of this renewal, DEQ has conducted an RP analysis and WQBEL development to determine Manhattan's capability of meeting the criteria, reviewed the general variance requirements, and developed necessary limits for TN and TP, as follows:

Total Nitrogen

Numeric Nutrient Criteria

Seasonal numeric nutrient criteria of 300 µg/L (0.30 mg/L) TN for Ecoregion 17 apply to the Dita Ditch between July 1st through September 30th (Circular DEQ-12A). DEQ evaluated whether the facility's current discharge can meet the TN criteria outside of a nutrient mixing zone, based on discharge monitoring results after the recent plant upgrade

(since January 2019). The RP evaluation was based on *Equation 1* (**Attachment A-1**). Manhattan provided one ambient TN data point for Dita Ditch (2.7 mg/L); since this ambient concentration was greater than the TN criteria (0.3 mg/L) there is no assimilative capacity. The critical resulting water quality (C_r) was calculated to be 12 mg/L TN, which is above the TN criteria. Therefore, DEQ finds that Manhattan has RP to exceed the TN standard and a WQBEL is required.

DEQ calculated the seasonal monthly average concentration limit that would be needed to allow Manhattan to remain below the TN standard based on *Equation 2* (see **Attachment #A-4**). Since there is no assimilative capacity, the C_{WLA} is equivalent to the TN criteria of 0.3 mg/L. Consistent with Circular DEQ-12A Section 2.2, DEQ calculated the average monthly limit from the C_{WLA} based on TSD methods appropriate for chronic concentrations, using values corresponding to the 95th percentile probability distribution of the effluent. DEQ found that the seasonal average TN monthly concentration would be 0.30 mg/L. Manhattan cannot meet this concentration limit. Therefore, the WRF is eligible for the general variance under the 2017 Circular DEQ- 12B approved by EPA on October 31, 2017.

General Variance

The Highest Attainable Condition (HAC) treatment requirement in Circular DEQ-12B, *Nutrient Standards Variances* **Table 12B-1** for a minor (< 1 mgd) mechanical facility is 10 mg/L. This treatment requirement is treated as the long-term average (LTA) concentration (DEQ, *First Triennial Review of Base Numeric Nutrient Standards and Variances,* April 2017). Using the TSD to develop a concentration-based effluent limit using the value in Table 12B-1 as the LTA concentration, based on a default coefficient of variation (CV) of 0.6 and the appropriate LTA multiplier from TSD Table 5-2 for the 95th percentile, yields a concentration of 15.5 mg/L (see **Attachment A-4**).

Manhattan can meet this concentration as demonstrated by the facility's 95th percentile TN discharge concentration (11 mg/L) for the three seasonal data points taken between July 1st – September 30th for 2019 and 2020 samples.

Circular DEQ-12B Section 2.0 specifies that variance-based nutrient limits are to be expressed as seasonal monthly average loads. The calculated seasonal load limit for Manhattan, based on the **Table 12B-1** treatment requirement for minor mechanical plants of 10 mg/L TN, is:

TN load limit = 10 mg/L x TSD multiplier (1.55) x 0.37 MGD x 8.34 **= 48 lb/day**

Actual TN loads calculated based on the 95th percentile for the three seasonal samples (23 lb/day), indicate that Manhattan can achieve this load limit.

Circular DEQ-12B provides that mechanical plants that can produce effluent TN levels of higher quality than the general variances shall be required to meet effluent load limits that reflect the treatment capability of the facility. However, due to the small seasonal sampling set, and the fact that numerous changes to the plant have been made and are planned for the next few years, DEQ believes that the seasonal load limit of 48 lb/day between July 1st and September 30th is an appropriate limit.

Mechanical facilities, such as Manhattan, that are achieving **Table 12B-1** treatment requirement-based effluent load limits, but not achieving WQBELs, are required to develop a Pollutant Minimization Program (PMP). Manhattan's PMP requirements are discussed in **Part VII** of this Fact Sheet. The load limit based on **Table 12 B-1** treatment requirements, together with the PMP requirement achieve the Highest Attainable Condition.

Total Phosphorus

Numeric Nutrient Criteria

Seasonal numeric nutrient standards of 30 µg/L (0.03 mg/L) TP for Ecoregion 17 apply to the Dita Ditch between July 1st through September 30th (Circular DEQ-12A).

DEQ evaluated whether the facility's current discharge can meet the TP criteria outside of a nutrient mixing zone, based on effluent monitoring results after the most recent upgrade (since January 2019). The RP evaluation was based on *Equation 1* (see **Attachment A-1**). Manhattan provided one ambient TP data point for Dita Ditch (0.03 mg/L); since this ambient concentration was the same as the TP standard (0.03 mg/L) there is no assimilative capacity. The critical resulting water quality (C_r) was calculated to be 6.2 mg/L TP, which is above the TP criteria. Therefore, DEQ finds that Manhattan has RP to exceed the TP standard and a WQBEL is required.

DEQ calculated the seasonal monthly average concentration limit that would be needed to allow Manhattan to remain below the TP standard based on *Equation 2* (see **Attachment #A-4**). Since there is no assimilative capacity, the C_{WLA} is equivalent to the TP criteria of 0.03 mg/L. DEQ calculated the average monthly limit from the C_{WLA} based on TSD methods as described for TN, above. DEQ found that the seasonal average TP monthly concentration would be 0.030 mg/L. Manhattan cannot meet this concentration limit. Therefore, the WRF is eligible for the general variance under the 2017 Circular DEQ- 12B approved by EPA on October 31, 2017.

General Variance

The Highest Attainable Condition (HAC) treatment requirement in Circular DEQ-12B, **Table 12B-1** for a minor mechanical facility is 1 mg/L for TP. This value is treated as the long-term average (LTA) concentration and a concentration-based limit is developed in the same method as TN. Since there were over 10 data points for TP, the actual coefficient of variation (CV) of 0.72 was used, which yields an average monthly concentration of 1.7 mg/L (see **Attachment A-4**).

Manhattan cannot meet this concentration as demonstrated by the facility's 95th percentile TP discharge concentration (2.2 mg/L) for the 14 seasonal data points taken between July 1st – September 30th for 2019 and 2020 samples. However, Circular DEQ-12B Section 2.0 specifies that variance-based nutrient limits are to be expressed as seasonal monthly average loads. The calculated seasonal load limit for Manhattan, based on the **Table 12B-1** treatment requirement for minor mechanical plants of 1 mg/L TP, is:

TP load limit = 1 mg/L x TSD multiplier (1.67) x 0.37 MGD x 8.34 **= 5.2 lb/day**

Actual TP loads calculated based on the 95th percentile for the 14 seasonal samples (4.2 lb/day), indicate that Manhattan can achieve this treatment requirement load limit.

Circular DEQ-12B provides that mechanical plants that can produce effluent TP levels of higher quality than the general variances shall be required to meet effluent load limits that reflect the treatment capability of the facility. However, due to the small seasonal sampling set, and the fact that numerous changes to the plant have been made and are planned for the next few years, DEQ believes that the seasonal load limit of 5.2 lb/day between July 1st and September 30th is an appropriate limit.

Mechanical facilities, such as Manhattan, that are achieving **Table 12B-1** treatment requirement-based effluent load limits, but not achieving WQBELs, are required to develop a PMP. Manhattan's PMP requirements are discussed in **Part VII** of this Fact Sheet. The load limit based on **Table 12 B-1** treatment requirements,, together with the PMP requirement, provides a path toward adaptive management strategies for implementing a final limit based on the numeric nutrient criteria in Circular DEQ-12A.

Whole Effluent Toxicity (WET): The proposed facility is a small POTW discharging less than 1.0 mgd. There are no identified industrial contributions as listed in 40 CFR 122 Appendix A, and the facility will not receive discharge from significant industrial users subject to pretreatment requirements. WET testing is not required.

V. Final Effluent Limits

Effluent limits or conditions in reissued permits must be at least as stringent as those in the existing permit, with certain exceptions. Federal regulations require permits to contain the more stringent TBEL or WQBEL limitation applicable to an individual pollutant. DEQ considered the proposed permit limits to ensure that they were as stringent as previous limits or met the anti-backsliding requirements.

A. Interim Limits

Beginning on the effective date of this permit and lasting through midnight **June 30, 2025**, the discharge from Outfall 001 shall, at a minimum, meet the effluent limits presented in **Table 10**:

Table 10: Proposed Interim Effluent Limits for Outfall 001 through June 30, 2025

Parameter	Units	Effluent Limits [1]		
		Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit
5-Day Biochemical Oxygen Demand	mg/L	30	45	--
	lbs/day	63	139	--
	% removal	85	--	--
Total Suspended Solids	mg/L	30	45	--
	lbs/day	93	139	--
	% removal	85	--	--
pH [2]	s.u.	6.0 – 9.0 instantaneous		
Escherichia coli Bacteria –summer [3][5]	No organisms/ 100 mL	126	252	--
Escherichia coli Bacteria –winter [4][5]		630	1,260	--
Oil & Grease	mg/L	--	--	10
Ammonia, total as N	mg/L	10	--	17 [6]
	lb/day	21.5	--	--
Nitrate + Nitrite	mg/L	10	--	10
Total Nitrogen, as N [7]	lb/day	48 [8]	--	--
Total Phosphorus, as P	lb/day	5.2 [8]	--	--

Footnotes:
(1) See definitions in the permit.
(2) Effluent pH shall remain between 6.0 and 9.0 (instantaneous minima and maxima).
(3) The summer *E. coli* limits apply from April 1 through October 31.
(4) The winter *E. coli* limits apply from November 1 through March 31.
(5) The geometric mean of the samples taken for the sample period may not exceed these values.
(6) The ammonia short-term limit of 17 mg/L was corrected from average weekly to a maximum daily limit.
(7) Total Nitrogen calculated as the sum of total Kjeldahl nitrogen plus nitrate + nitrite.
(8) Limits effective during the summer season of July 1st through September 30th.

There shall be no discharge that may create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter), or globules of grease or other floating materials.

B. Final Limits

Beginning on midnight, **July 1, 2025**, the discharge from Outfall 001 shall, at a minimum, meet the effluent limits presented in **Table 11**:

Table 11: Proposed Outfall 001 Final Effluent Limits

Parameter	Units	Effluent Limits (1)		
		Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit
5-Day Biochemical Oxygen Demand	mg/L	30	45	--
	lbs/day	63	139	--
	% removal	85	--	--
Total Suspended Solids	mg/L	30	45	--
	lbs/day	93	139	--
	% removal	85	--	--
pH (2)	s.u.	6.0 – 9.0 instantaneous		
Escherichia coli Bacteria –summer (3)(5)	Number of organisms/ 100 mL	126	252	--
Escherichia coli Bacteria –winter (4)(5)		630	1,260	--
Oil & Grease	mg/L	--	--	10
Ammonia, total as N	mg/L	5.4	--	15
	lb/day	21.5	--	--
Nitrate + Nitrite	mg/L	10	--	10
Total Nitrogen as N (6)	lb/day	48 (7)	--	--
Total Phosphorus as P	lb/day	5.2 (7)	--	--

Footnotes:
(1) See definitions in the permit.
(2) Effluent pH shall remain between 6.0 and 9.0 (instantaneous minima and maxima).
(3) The summer *E. coli* limits apply from April 1 through October 31.
(4) The winter *E. coli* limits apply from November 1 through March 31.
(5) The geometric mean of the samples taken for the sample period may not exceed these values.
(6) Total Nitrogen calculated as the sum of total Kjeldahl nitrogen plus nitrate + nitrite.
(7) Limits effective during the summer season of July 1st through September 30th.

There shall be no discharge that may create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter), or globules of grease or other floating materials.

VI. Monitoring Requirements

Samples shall be collected, preserved, and analyzed in accordance with approved procedures listed in 40 CFR 136. The analysis must have a detection or meet any Required Reporting Values (RRVs) listed in Circular DEQ-7 for any non-detect, unless otherwise specified. Monitoring results must be submitted electronically (NetDMR) no later than the 28th day of the month following the end of the monitoring period. If no discharge is observed during the reporting period, "no discharge" shall be reported on the NetDMRs.

A. Influent/Effluent Monitoring

Monitoring for all parameters shall occur, at a minimum, at the frequencies listed in **Table 12.** Samples shall be representative of the volume and nature of the discharge. Influent samples are collected at the wastewater influent Parshall flume and effluent samples are collected following treatment in the UV disinfection system, prior to discharge to the constructed discharge ditch, unless another location is requested and DEQ agrees, in writing. **Table 12** summarizes Outfall 001 monitoring and reporting requirements.

Table 12: Outfall 001 Monitoring and Reporting Requirements

Parameter	Units	Sample Location	Min. Frequency	Sample Type (1)	Reporting Requirements	Required Reporting Value
Flow	mgd	Effluent	Continuous	Instantaneous	Daily Max Monthly Avg	NA
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	Influent	Weekly	Composite	Monthly Avg	NA
	mg/L	Effluent	Weekly	Composite	Max Weekly Avg Monthly Avg	
	lb/day	NA	Weekly	Calculated		
BOD_5 Percent Removal	%	NA	Monthly	Calculated	Monthly Min	
Total Suspended Solids (TSS)	mg/L	Influent	Weekly	Composite	Monthly Avg	NA
	mg/L	Effluent	Weekly	Composite	Max Weekly Avg Monthly Avg	
	lb/day	Effluent	Weekly	Calculated		
TSS Percent Removal	%	NA	Monthly	Calculated	Monthly Min	
pH	s.u.	Effluent	Daily	Instantaneous	Daily Max Daily Min	NA
Escherichia coli Bacteria (2)	#organisms /100 mL	Effluent	Weekly	Grab	Weekly Geo Mean Monthly Geo Mean	NA
Oil and Grease	mg/L	Effluent	Semi-Annual (3)	Grab	Daily Max	NA
	Y/N		Weekly	Visual	Yes/No	NA
Ammonia, total as N	mg/L	Effluent	Weekly	Composite	Daily Max Monthly Avg	0.070
	lb/day	Effluent	Monthly	Calculation	Monthly Avg	--
Nitrate + Nitrite, as N	mg/L	Effluent	Weekly	Composite	Monthly Avg	0.05
Total Kjeldahl Nitrogen	mg/L	Effluent	Weekly (5)	Composite	Monthly Avg	0.225
Total Nitrogen, as N (4)	mg/L	Effluent	Weekly (5)	Calculated		NA
	lb/day	Effluent	Monthly (5)	Calculated		
Total Phosphorus, as P	mg/L	Effluent	Weekly (5)	Composite		0.01
	lb/day	Effluent	Monthly (5)	Calculated		NA

Footnotes:
(1) See Definition section at end of permit for explanation of terms.
(2) Report Geometric Mean if more than one sample is collected in the reporting period.
(3) Oil and grease analysis must be conducted twice a year (January through June and July through December), with the samples taken at least four months apart. In addition, Manhattan must take a sample for analysis immediately if an oil sheen is observed.
(4) The total nitrogen concentration calculated as the sum of total Kjeldahl nitrogen plus nitrate + nitrite.
(5) Nutrient monitoring only required from July 1 through September 30.

B. Upstream Monitoring

Upstream monitoring requirements are listed in **Table 13**. Monitoring must take place at a consistent location upstream and outside the influence of Outfall 001 with the sample type, frequency, and RRV as identified below.

The value shall be reported on the facility's NetDMRs for the three calendar years 2023, 2024, and 2025.

Table 13: Dita Ditch - Upstream Monitoring Requirements

Parameter	Units	Sample Type (1)	Minimum Sample Frequency	Required Reporting Value (2)
Flow	mgd	Visual Estimate	Monthly	NA
Total Nitrogen (4)	mg/L	Grab or Calculated	Monthly (3)	0.07
Total Phosphorus	mg/L	Grab	Monthly (3)	0.003
Total Ammonia, as N	mg/L	Grab	Quarterly	0.070
pH	su	Instantaneous	Monthly	NA
Temperature	°C	Instantaneous	Monthly	NA

Footnotes:
(1) See Definition section at end of permit for explanation of terms.
(2) See Circulars DEQ-7 and DEQ-12A for more information on RRVs. If reporting non-detects analysis must achieve these, or lower, reporting limits.
(3) Nutrient sample collection required monthly during the summer months of July, August, and September
(4) The ambient total nitrogen concentration may be analyzed by either persulfate digestion or by the sum of total Kjeldahl nitrogen plus nitrate + nitrite; the RRV for the selected method must be sufficient for detecting the TN concentration or meet the lowest RRV.

VII. Compliance Schedule/Special Conditions

A. Compliance Schedule

1. Ammonia

Manhattan cannot currently meet the proposed final ammonia concentration limits during the winter. The facility's existing ammonia limits will be applied as interim limits until the final limits become effective **July 1, 2025**.

The Manhattan WRF submitted a preliminary engineering report (PER) to DEQ for three phases of a facility upgrade. DEQ expects the construction and optimization of this project should be complete by Spring 2025.

Manhattan must submit an annual progress report by January 28th of each year starting **January 28, 2022** to summarize progress made during the previous year and planned for the upcoming year for complying with the final ammonia limit.

B. Special Conditions

1. Total Nitrogen and Total Phosphorus - Pollutant Minimization Program

A pollutant minimization program (PMP) is a structured set of activities designed to improve processes and pollutant controls that will prevent and reduce TN and TP wastewater loads. The PMP is required for two reasons: (1) Manhattan needs and is eligible for a General Variance from the Montana Base Numeric Nutrient Standards in DEQ-12A, and (2) Manhattan has met highest attainable conditions in Table 12B-1 of DEQ-12B for TN and TP, as seasonal monthly average loads.

Manhattan submitted a Preliminary Engineering Report (PER) to the State Revolving Program (SRF) in DEQ on June 1, 2020, which included proposed improvements to the WRF that, in part, was developed to address nutrient requirements. Part of the upgrade includes converting the old lagoons into groundwater infiltration basins, to allow the WRF to avoid surface water discharges during the summer season. The facility upgrades are anticipated to be constructed and optimized by Late Spring 2025. The upgrades will influence which operational strategies are appropriate.

A PMP reflecting the greatest pollutant reduction achievable must be adopted and implemented in accordance with Circular DEQ-12B Section 2.2. Specifically, Manhattan is required to develop, implement, and maintain their PMP in accordance with Section 2.2.1.1, including:

- evaluating current facility operations and developing discharger-specific pollutant minimization activities to implement the PMP considering all reasonable options including, but not limited to, facility advanced operational strategies, reuse, recharge, and land application.
- maintaining in progress documentation (i.e. operation and maintenance manual) the specific advanced operational strategies found to be effective toward reducing nutrients, as applicable:
  - identification of aerators and mixers used or taken offline
  - aeration cycle times
  - oxygen reduction potential (ORP) target points
  - variable frequency drive set points
  - target mixed liquor suspended solids (MLSS) concentration
  - return and wasting strategies
  - seasonal adjustments

Manhattan must develop the PMP and submit an Executive Summary report to DEQ no later than {**12 months from the permit effective date**} describing the activities examined and a scheduled list of the activities the permittee proposes to implement. The PMP must be updated and maintained during the term of this permit.

Manhattan must submit a brief (~ one-page) annual report addressing the following:

- Nutrient reduction measures implemented that year.

- Effectiveness of each implemented nutrient reduction measure, including quantifying discharge concentrations.
- Proposed nutrient reduction measures for the upcoming year.

The annual reports will be due January 28th of each year, beginning **January 28, 2022**.

VIII. Public Participation

A. Public Notice

In accordance with ARM 17.30.1372, DEQ issued Public Notice No. **MT-21-05** dated **April 5, 2021**. The public notice states that a tentative decision has been made to issue an MPDES permit to the Permittee and that a draft permit, fact sheet and environmental assessment (EA) have been prepared. Public comments are invited any time prior to the close of the business on **May 5, 2021**. Comments may be directed to:

Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620

or

DEQWPBPublicComments@mt.gov

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments and issue a final decision within sixty days of the close of the public comment period or as soon as possible thereafter.

All persons, including the applicant, who believe any condition of a draft permit is inappropriate or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing) under ARM 17.30.1372.

B. Notification of Interested Parties

Copies of the public notice were mailed to the discharger, state and federal agencies and interested persons who have expressed an interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this permit. In addition to mailing the public notice, a copy of the notice and applicable draft permit, fact sheet and EA were posted on DEQ's website for 30 days.

Any person interested in being placed on the mailing list for information regarding this MPDES permit should contact DEQ, reference this facility, and provide a name, address, and email address.

C. Public Hearing

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing (ARM 17.30.1373).

D. Permit Appeal

After the close of the public comment period DEQ will issue a final permit decision. A final permit decision means a final decision to issue, deny, modify, revoke and reissue, or terminate a permit. A permit decision is effective 30 days after the date of issuance unless a later date is specified in the decision, a stay is granted pursuant to ARM 17.30.1379, or the applicant files an appeal pursuant to 75-5-403, MCA.

The Applicant may file an appeal within 30 days of DEQ's action to the following address:

Secretary, Board of Environmental Review
Department of Environmental Quality
1520 East Sixth Avenue
PO Box 200901
Helena, Montana 59620-0901

E. Additional Information

Requests for additional information or questions regarding this permit should be directed to the Water Protection Bureau at (406) 444-5546.

IX. Information Sources

Administrative Rules of Montana Title 17 Chapter 30 - Water Quality

Subchapter 2 - *Water Quality Permit and Application Fees*

Subchapter 5 - *Mixing Zones in Surface and Ground Water*

Subchapter 6 - *Montana Surface Water Quality Standards and Procedures*

Subchapter 7- *Nondegradation of Water Quality*

Subchapter 12 - *Montana Pollutant Discharge Elimination System (MPDES) Standards*

Subchapter 13 - *Montana Pollutant Discharge Elimination System (MPDES) Permits*

CWAIC: Clean Water Act Information Center, Department of Environmental Quality, (http://deq.mt.gov/Water/WQPB/cwaic (accessed 2021)

DNRC, Application to Montana Renewable Resource Grant & Loan For: Wastewater Reclamation Facility Phase I Improvements, June 1, 2020

Montana Code Annotated (MCA), Title 75-5-101 et seq., "Montana Water Quality Act"

Montana DEQ. 2014. Department of Environmental Quality, Circular DEQ-12A, Montana Base Numeric Nutrient Standards (July 2014)

Montana DEQ. 2017. Department of Environmental Quality, Circular DEQ-12B, Nutrient Standards Variances (June 2017)

Montana DEQ. 2019. Circular DEQ-7, Montana Numeric Water Quality Standards.

Montana Pollutant Discharge Elimination System (MPDES) Permit Number MT0021857

a. Administrative Record
b. Renewal Application Forms DEQ-1 and EPA Form 2A, 2015

Stahly Engineering. 2008. *Town of Manhattan, MT Operation & Maintenance Manual for the Wastewater Treatment Plant*

TD&H, Final – *Manhattan Water Reclamation Facility Preliminary Engineering Report,* May 2020

US Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, & 136.

US EPA. 1991. *Technical Support Document for Water Quality-Based Toxics Control*, EPA/505/2-30-001

Fact Sheet prepared: Christine Weaver March 2021

Figure 1: Manhattan Area Map

GALLATIN RIVER
EAST GALLATIN RIVER
GALLATIN RIVER
DITA DITCH
WATER RECLAMATION FACILITY
BETTINGILL ROAD
PREVIOUS WASTEWATER TREATMENT LAGOONS
GREENSPUR ROAD
NIXON GULCH ROAD
2019 COLLECTION SYSTEM IMPROVEMENT PROJECT
YADON ROAD
FRONTAGE ROAD
DRY CREEK ROAD
FABRICK STREET
S 3RD STREET
N 5TH STREET
RAILROAD AVENUE N
S BROADWAY STREET
MAIN STREET
S 6TH STREET
INTERSTATE-90
AMSTERDAM-CHURCHILL SEWER DISTRICT CONNECTION POINT

LEGEND
- 6-INCH GRAVITY SEWER MAIN
- 8-INCH GRAVITY SEWER MAIN
- 10-INCH GRAVITY SEWER MAIN
- 12-INCH GRAVITY SEWER MAIN
- 15-INCH GRAVITY SEWER MAIN
- 18-INCH GRAVITY SEWER MAIN
- 21-INCH GRAVITY SEWER MAIN
- AMSTERDAM-CHURCHILL FORCEMAIN

SCALE 0 600' 1200' 1800'

N

FIGURE 2-1 SANITARY MAP.DWG

FIGURE 2-1

MANHATTAN WATER RECLAMATION FACILITY PER
MANHATTAN, MONTANA

WASTEWATER SYSTEM MAP

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DESIGNED BY: NMR
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DATE: 11-1-2019
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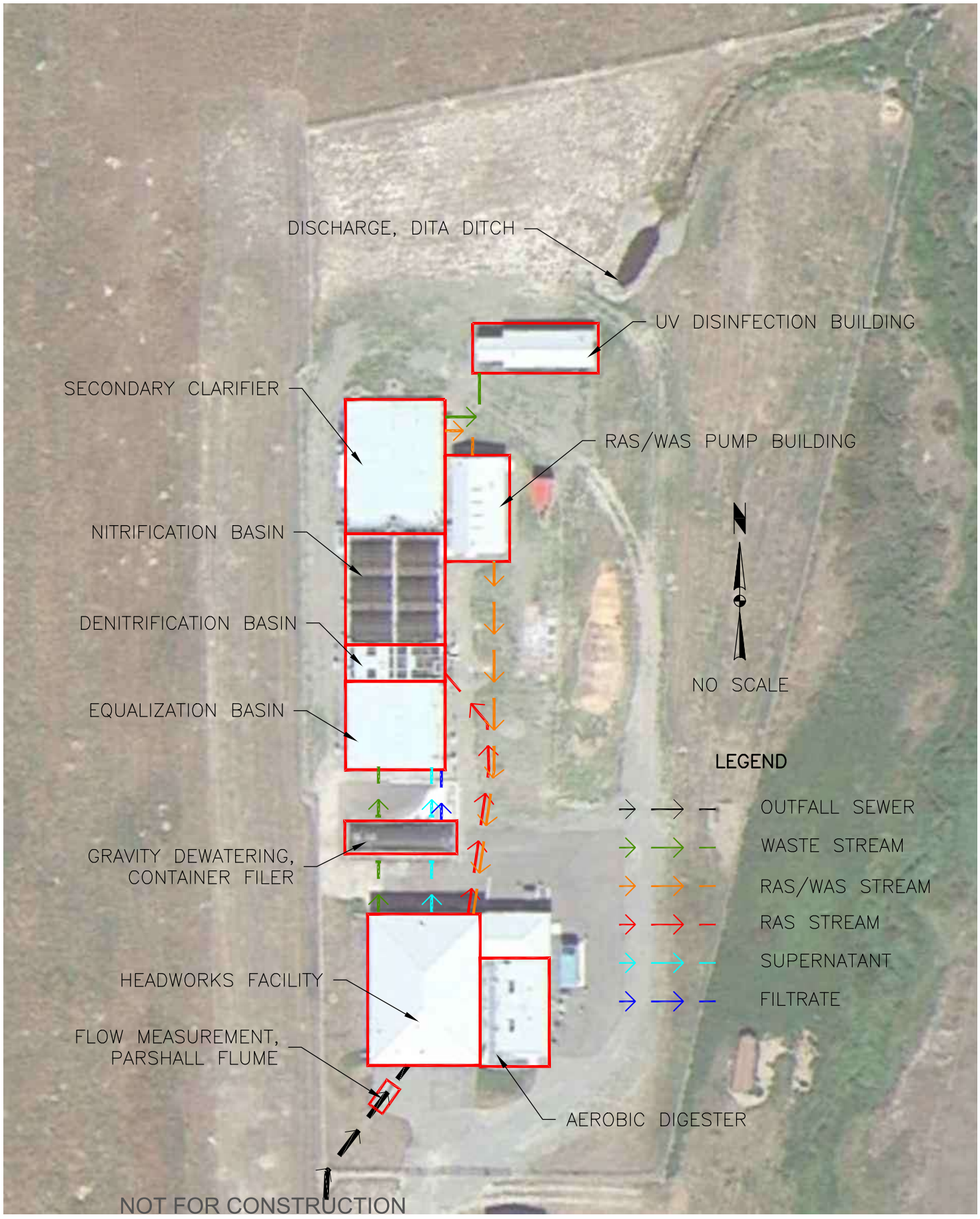
Figure 2: Manhattan WRF Site Plan



J:\2017\B17-034 Manhattan WRF PER\CADD\CIVIL\Figure 2-2 SITE PLAN.dwg, 3/17/2020 2:27:18 PM, NMR

MANHATTAN WRF PER
MANHATTAN, MONTANA

SITE PLAN

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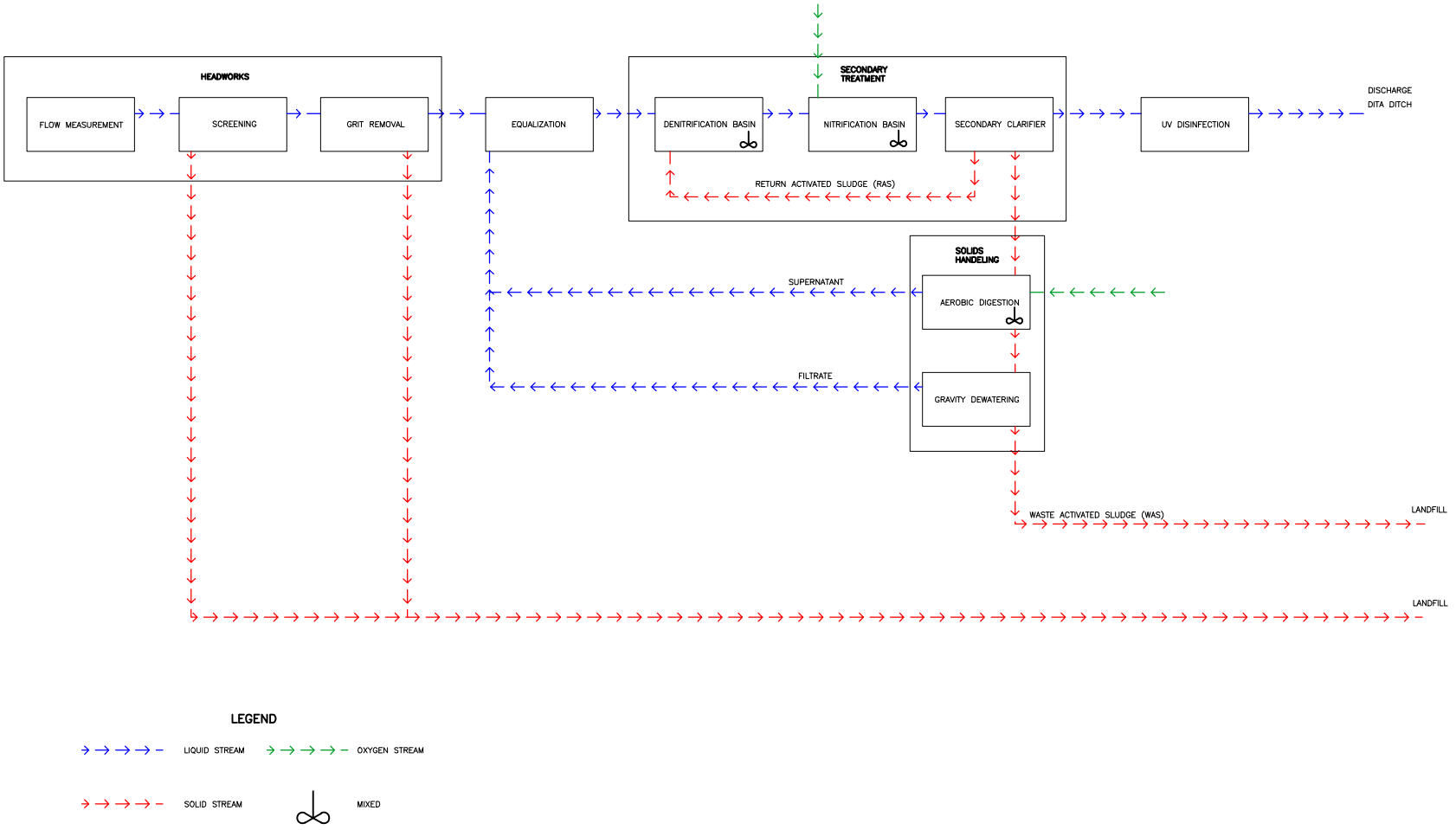
QUALITY CHECK:	
DATE:	11-04-2019
JOB NO.	B17-034
CAD NO.	FIGURE 2-2 SITE PLAN

FIGURE

2-2

Figure 3: Manhattan WRF current Process Flow Diagram



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MANHATTAN WATER RECLAMATION FACILILITY PER MANHATTAN, MONTANA

PROCESS FLOW DIAGRAM

FIGURE 2-3 PFD.DWG

FIGURE 2-3

Attachment A: Reasonable Potential and Water Quality-Based Effluent Limit Calculations

Attachment A-1: Manhattan WRF - RP Analysis March 2021

term	description		Oil & Grease	Ammonia		N+N	TN	TP
			HH	Acute	Chronic	HH	Nutrients	
Qs^1	critical stream flow (7Q10)	mgd	0	0	0	0	0.64	0.64
% Qs	% of Qs being provided		100%	100%	100%	100%	100%	100%
Qs^2	resulting critical stream flow (Qs^1 * %Qs)	mgd	0	0	0	0	0.64	0.64
Cs	critical instream concentration (75%tile if n<=30, 95% UCL if n>30)	mg/L	0.0	0.05	0.05	1.31	2.7	0.03
Qd	critical effluent flow (design flow, units must match Qs)	mgd	0.37	0.37	0.37	0.37	0.37	0.37
Cmax	**maximum effluent concentration for POR**	**mg/L**	**1.0**	**20.3**	**20.3**	**14.5**	**11.2**	**5.8**
n	number of samples in effluent data set		24	66	66	65	3	14
CV	coefficient of variation for effluent data (if n<10, use 0.6)		1.0	1.3	1.3	0.7	0.6	0.7
TSD	calculated TSD multiplier (should be close to Table 3-2 value)		1.5	0.9	0.9	1.0	2.5	2.9
C_d	**critical effluent concentration - 95%tile (C_{max} * TSD multiplier)**	**mg/L**	**1.5**	**19**	**19**	**14.1**	**27.9**	**16.8**
Qr	downstream flow (Qs + Qd)	mgd	0.37	0.37	0.37	0.37	1.01	1.01
Cr or C	**resulting pollutant concentration**	**mg/L**	**1.5**	**19.2**	**19.2**	**14**	**12**	**6.2**
WQS	water quality standard (from DEQ-7 or rule)	mg/L	**10**	**15.0**	**4.7**	**10**	**0.3**	**0.03**
		RP?	**no**	**yes**	**yes**	**yes**	**yes**	**yes**

Attachment A-2: Aquatic Life Standards for total ammonia nitrogen (mg/L) - footnote 7, Circular DEQ-7 (June 2019)

2021- Ammonia Standard Development for Dita Ditch

	Temperature˚C (75^{th} percentile)	pH (75^{th} percentile)	Ambient Water Quality Standard (mg/L ammonia-N)			
			Salmonids present	**Salmonids absent**	**Fish early lifestages present***	**Fish early lifestages absent***
CMC (acute)	N/A	7.415	**15.0**	22.5	N/A	N/A
CCC (chronic)	14	7.415	N/A	N/A	**4.7**	4.8

Footnotes:
(1) No recent ambient temperature or pH data; used 2003 Fact Sheet 75^{th} percentile.
(2) At 15°C and above, the criterion for fish early life stages absent is the same as the criterion for fish early life stages present

Attachment A-3: Manhattan WRF WQBEL Development - March 2021

Variable		Units*	N+N	Ammonia		
				Aquatic Life Standards		
			human health	acute	chronic	
7Q10		mgd	0	0	0	
% of 7Q10 to use		%	0	0	0	
instream flow (% of 7Q10)	Q_s	mgd	0	0	0	
instream concentration	C_s	mg/L	0.05	0.05		
design flow (POTW)	Q_d	mgd	0.37	0.37		
downstream flow (Qs + Qd)	Q_r	mgd	0.37	0.37	0.37	
water quality standard (WQS)	C_r (WQS)	mg/L	10	15.0	4.7	
waste load allocation ((Qr*Cr) - (Qs*Cs))/Qd)	**WLA**	**mg/L**	**10**	**15.0**	**4.7**	
number of samples per month ***(if = 1, enter 4)***	N	#		4		
coefficient of variation	CV	#		1.3		
acute and chronic long term average (99 %tile)	LTA_a LTA_c	mg/L		2.4	2.8	***<-- POC ammonia?*** yes
most conservative LTA	MIN (LTA_a, LTA_c)	mg/L		2.4		
maximum daily limit (99 %tile)	**MDL**	**mg/L**	**10**	**15.0**		
average monthly limit (95 %tile)	**AML**	**mg/L**	**10**	**5.4**		

Attachment A-4: Manhattan WRF Nutrient Limit Development (March 2021)

Variable		Units	SEASONAL NCC TN	SEASONAL NCC TP		SEASONAL HAC TN	SEASONAL HAC TP	
14Q5 ESTIMATE		mgd	0.64	0.64				
% of14Q5 to use			100%	100%				
instream flow (available dilution)	Q_s	mgd	0.64	0.64				
instream concentration	C_s	mg/L	2.7	0.03				
design flow (POTW)	Q_d	mgd	0.37	0.37				
downstream flow (Qs + Qd)	Q_r	mgd	1.01	1.01				
water quality standard (WQS)	C_r (WQS)	mg/L	0.3	0.03				
Assimilative Capacity?	*C_s < WQS?*		***No***	***No***	If no assimilative capacity,			
waste load allocation = ((Qr*Cr) - (Qs*Cs))/Qd	**WLA**		**0.3**	**0.03**	**WLA = WQS**			
# samples per month ***(if = 1, enter 4)***	N		4	4		4	4	
coefficient of variation	CV		0.60	0.72		0.60	0.72	
chronic long term average (95%tile for nutrients)	LTA_a LTA_c		0.19	0.018	*LTA using Table 5-1 chronic*	10	1	**<-- LTA = HAC**
average monthly limit (95 %tile)	**AML**	**mg/L**	**0.30**	**0.030**	*AML using Table 5-2 chronic*	**15.5**	**1.7**	