Kirtland Air Force Base

Bernalillo County, New Mexico

Appendix C-3

BACTERIA REDUCTION PLAN

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1.1 INTRODUCTION

Section 303(d) of the Clean Water Act requires states to develop Total Maximum Daily Load (TMDL) management plans for water bodies determined to be water quality limited or impaired. A TMDL documents the amount of a pollutant a water body can assimilate without violating a state's or a Tribe's water quality standard. A TMDL is established for the MRG Watershed, and addresses Escherichia Coli (E. Coli) for Kirtland AFB (KAFB) receiving waters (the Rio Grande Isleta Pueblo Bend to Alameda Bridge).

Controls required by the TMDL include the development of a bacteria reduction plan, the development of or participation in a bacteria monitoring program, and annual reporting requirements. Specific requirements of the bacteria reduction plan are included in the Water Quality Control Commission approved TMDL (WQCC 2010) for the MRG Watershed.

1.2 BACKGROUND

KAFB calculated a Waste Load Allocation (WLA) based on the E. Coli TMDL established for the MRG Watershed as directed by the New Mexico Environmental Department (NMED). The entire installation area of 43,000 acres or 67.25 square miles is used to calculate the WLA. Multiplying this area by the NMED pre-calculated E. Coli loading numbers results in WLAs for the following regimes:

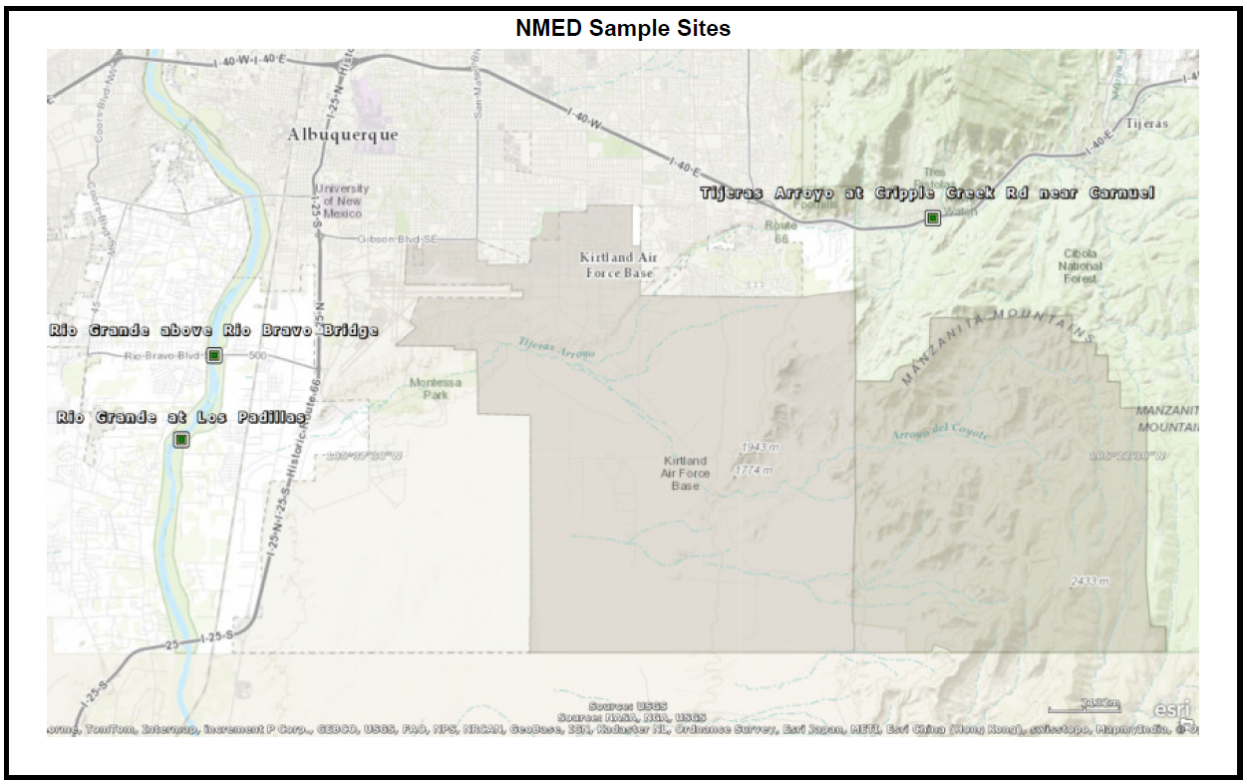
Table 1: Kirtland AFB E. Coli Waste Load Allocation (cfu/day)

Flow Regime				
High (>3360 cfs)	**Moist (929-3360 cfs)**	**Mid (664-929 cfs)**	**Dry (319-664 cfs)**	**Low (0-319 cfs)**
1.20E+11	3.01E+10	2.03E+10	7.46E+09	1.74E+09

KAFB will compare sample results to the WLA values for E. Coli based on the flow regime at the time of sampling. The results of this comparison will be used to determine the levels of bacteria in storm water releases and provide a basis for the implementation or modification of best management practices (BMPs).

Existing Sampling Data

In 2014, water quality samples were collected by the NMED in the Middle Rio Grande area as part of a rotational census of the state's surface waters (Personal communication with NMED Monitoring Team Supervisor, Scott Murray). A large sample suite was collected that included various chemical, bacterial, and physical parameters including E. Coli. The Surface Water Census Report is not complete so the data is provisional. Various locations were sampled by the NMED, including a site on the Tijeras Arroyo above KAFB (Tijeras Arroyo at Cripple Creek Road near Carnuel), the Rio Grande above the Tijeras Arroyo (Rio Grande above Rio Bravo Bridge), and the Rio Grande below the Tijeras Arroyo (Rio Grande at Los Padillas). The Tijeras Arroyo site is approximately 6 miles up gradient of KAFB. Land uses between the sample site and the installation boundary include an interstate highway, a housing development, and open land of natural conditions. These land uses are representative of the installation land uses for bacterial contribution. The sampling points used are illustrated in the following figure.



Samples were collected between March and October 2014. The data are provisional at the time of this report and did not include flow data. The data are summarized in the tables below:

Table 2: Tijeras Arroyo E.Coli at Cripple Creek Rd

Date	E. Coli (cfu/100ml)
3/27/14	3.1
4/23/14	2.0
5/29/14	4.1
6/26/14	13.2
7/24/14	29.5
8/21/14	83.9
9/26/14	98.4

Table 3: Rio Grande E. Coli above Tijeras Arroyo

Date	E. Coli (cfu/100ml)
3/19/14	14.5
4/29/14	33.6
5/12/14	68.4
6/11/14	54.6
7/14/14	686.7
8/12/14	148.3
9/2/14	154.1
10/7/14	110.6

Table 4: Rio Grande E. Coli below Tijeras Arroyo

Date	E. Coli (cfu/100ml)
3/19/14	29.2
4/29/14	38.4
5/12/14	48.7
6/11/14	93.3
7/14/14	285.1
8/12/14	180.7
9/2/14	298.7
10/7/14	198.9
10/20/14	488.4

Results from the Tijeras site above KAFB were fairly low throughout the sampling period. The E. Coli levels in the two Rio Grande sites are much higher, trending higher in the late summer months. This may indicate the increase in wildlife and outdoor human activities as the weather warms up. Examining the difference between the samples collected at sites below and above the Tijeras Arroyo may give an indication of its influence on the Rio Grande as the Tijeras is the only major tributary to enter the Rio Grande between those two points.

Table 5: Difference Above and Below Tijeras Arroyo

Date	E. Coli (cfu/100ml)
3/19/14	14.7
4/29/14	4.8
5/12/14	-19.7
6/11/14	38.7
7/14/14	-401.6
8/12/14	32.4
9/2/14	144.6
10/7/14	88.3

The difference in the measured results shows an increase in E. Coli for most months however no discernible pattern or correlation in the data exists. Additional data on the flow volume and flow regime associated with the sample is needed to develop further conclusions.

KAFB also reviewed historical sampling results taken from MS4 outfalls. The following table includes sampling data taken in 2010 from Outfall F.

Table 6: 2010 E. Coli Sampling Data

Outfall Location	Date	Analysis Type	Sample Results (cfu/100ml)	Discharge Volume (gal)	Average Flow Rate (cfs)
Outfall F	7/26/2010	E. Coli	>2,419.6	506	0.001
Outfall F	8/16/2010	E. Coli	>2,419.6	1,987	0.01

This data was used to calculate the waste load and compare it to the WLA. The waste load for these sampling events was calculated by multiplying the sample results by the discharge volume for the sampling event. The flow rate is within the low flow regime, therefore the waste load was compared against the WLA for low flow. The calculated Waste Load Equation is:

sample results (cfu/ml) x conversion factor (ml/gal) x discharge volume (gal) = Waste Load (cfu)

2419.6 (cfu/ml) x 3785.9 (ml/gal) x 506 (gal) = 4.63E+09 cfu

Table 7: 2010 E. Coli Waste Load

Outfall Location	Date	Calculated Waste Load (cfu)	WLA (Low Flow Regime)
Outfall F	7/26/2010	4.63E+09	1.74E+09
Outfall F	8/16/2010	1.82E+10	1.74E+09

The waste load calculations listed in Table 7 indicate that at the time the samples were taken, KAFB would exceed the WLA. However, other factors should be considered before concluding the WLA may be exceeded. Primarily, this sample was for Total Fecal Coliform not specifically E. Coli. Operations have also changed by implementing BMPs and the method, rates, and qualifying storm events used for calculations in the 2010 data may vary from the current methodology. The results of the first sampling event will be compared to the WLA and any exceedance detected will trigger implementation of corrective actions.

1.3 IMPLEMENTATION

The KAFB Water Quality Program Manager will:

- Identify and investigate point sources and potential sources to determine bacterial loads;
- Oversee current programs and staffing in place to monitor current conditions and identify any potential new conditions that may occur;
- Plan and conduct sampling;

- Prepare and submit reports; and
- Conduct evaluation and modification of the strategy.

1.4 Identify Potential Sources of Bacteria

The KAFB Water Quality Program Manager will monitor activities that potentially contribute fecal coliform to storm water including domestic animals, operation of septic tanks, sanitary sewer system breaks and impervious areas. Section 5.3 and 5.4 of the SWMP identify programs in place that will be used to monitor and identify any new sources or evidence of fecal coliform.

Kirtland Family Housing (KFH) and the Base Maintenance Contractor (BMC) maintain dog feces collection stations that are situated throughout the public areas and parks. These stations are checked regularly, emptied, and new bags added. KFH maintenance personnel also periodically perform clean-up activities for tenants that do not clean up their own pet waste.

KAFB has established and maintains a Septic Tank Management Plan which documents all septic tanks on KAFB. All septic tanks are registered and managed IAW the NMED Liquid Waste Disposal Regulations. Active tanks are routinely pumped and inspected to ensure continued operation. The BMC inspects and maintains the sanitary sewer system and completes minor repairs. Illicit discharges or breaks are investigated within 48 hours of notification.

KAFB maintains BMPs to minimize fecal coliform in discharges; however, the majority of the installation consists of undeveloped land. KAFB has no mechanism to neither control nor manage background fecal coliform loads attributed to wildlife or natural background sources. Fecal coliform detections in storm water discharges are largely attributable to non-operational sources or wildlife.

Current MS4 operations and existing control measures mitigate E. Coli within the acceptable limits as required by the Permit. Additionally sampling for E. Coli will be completed per the Permit. BMPs will be modified following the first annual report if exceedances are discovered.

1.5 Monitoring

Sampling for E. Coli will be coordinated with other sampling events required by the Permit. Sampling criteria, constituents and requirements are explained in Section 6 of the SWMP. The results of each sampling event at each outfall location will be compared to the WLA in Table 1 as indicators for E. Coli.

1.6 Reporting

Annual reporting required by the Permit includes an analysis of BMP effectiveness addressing the TMDL and pollutant reductions (in graphic representation), documentation of the monitoring methods to evaluate the measurable goals, and any BMP alterations.

1.7 Evaluation and Modification

The annual reporting requirements include an analysis of the BMP effectiveness and evaluation of the Bacteria Reduction Plan. The following control measures along with sampling results will

be evaluated to determine if modifications are required for E. Coli reductions. BMPs for Impaired Waters are identified in Table 7-3.

Structural Control Measures

Structural control measures are generally considered physical devices or structures that modify water flows to provide some sort of water quality or quantity treatment. Measures discussed in this section are intended to prevent bacterial pollution to the receiving waters of KAFB. Structural controls such as bio-retention cells or rain gardens which are depressed areas of porous backfill under a native vegetated surface may be used to improve water quality.

Non-structural Control Measures

Non-structural control measures are typically management practices or strategies that may improve water quality. They may involve physical actions or implementation of structural devices. The implementation of these measures may result in reduced bacterial pollution to the receiving waters of KAFB. Non-structural control measures are described in Section 5. Specific non-structural control measures identified may include, increasing the number of pet waste stations, increasing compliance through additional public education, monitoring and fines for offenders.