Baseline Monitoring Report Template
R18-9-A215(F)

Aquifer Protection Permit No.P-(######)
(Facility Name)

Report prepared by:
(name and address)

Report submitted to:
ADEQ – Groundwater Section
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(Date submitted)

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1.0 INTRODUCTION

- *Who prepared the report (signed and sealed by a PE or RG)*
- *Facility name and aquifer protection permit (APP) number*

1.1 PURPOSE AND SCOPE

The purpose of the Baseline Monitoring Report is to summarize the baseline monitoring data and calculate the discharge limits (DLs), alert levels (ALs), and aquifer quality limits (AQLs) at the permit-required monitoring locations, in accordance with Arizona Administrative Code (AAC) R18-9-A215(F).

The scope of the Baseline Monitoring Report is to amend the current APP to include the new or adjusted aquifer water quality standards (AWQS), in accordance with R18-9-A215(G). The parameters with new or adjusted AWQS their corresponding standards are:

Parameter	New or Adjusted AWQS
Arsenic	0.010 mg/L
Bromate	0.010 mg/L
Chlorite	1.0 mg/L
Haloacetic Acids	0.060 mg/L
Microbiological Contaminants	See note1
Total Trihalomethanes	0.080 mg/L
Uranium	0.030 mg/L

Note: Adjusted to a requirement of either Fecal Coliform or E. coli indicator parameters in the routine & repeat compliance sampling orientation.

2.0 BASELINE MONITORING SUMMARY

This section is intended to summarize the baseline monitoring locations, schedule, parameters, methods of sampling, and relinquishing the samples to the analytical laboratory.

2.1 BASELINE MONITORING LOCATIONS

- *List and describe the permit-required monitoring points included in the baseline monitoring report.*
- *Attach a figure that includes a map of discharge monitoring locations and POC monitor well(s).*
- *Attach a figure that includes a process flow diagram with discharge monitoring locations, if applicable.*
- *Provide a table summarizing the sampling events. A template is provided as Table 1.*

2.2 BASELINE MONITORING SCHEDULE

- *Describe the schedule that baseline monitoring was performed at the permit-required monitoring locations and whether the monitoring schedule meets or deviates from any of the monitoring requirements listed in R18-9-A215(E)(3, 5-6).*
- *If applicable, describe any deviations from the schedule and explain the circumstances for the deviation.*
    - *Explain why the data collected under the deviation is still acceptable to be included as part of the evaluation.*
- *If an alternative baseline monitoring schedule in accordance with R18-9-A215(D) was approved by ADEQ, summarize the alternative baseline monitoring schedule, recap the justifications for the alternative baseline schedule, and include the date when ADEQ approved the alternative schedule.*

2.3 BASELINE MONITORING PARAMETERS

- *List each of the new or adjusted AWQS that were sampled as part of the baseline monitoring requirement.*
- *Provide a table summarizing the parameters. A template is provided as Table 2.*
- *If a demonstration in accordance with R18-9-A215(H), was submitted to ADEQ and any of the new or adjusted AWQS pollutants were excluded from the baseline monitoring, summarize this demonstration, recap the justification for not including the parameter(s), and include the date the demonstration was submitted to ADEQ.*

2.4 SAMPLING PROCEDURES

- *Describe the sample procedures that were followed during the sample collection process to ensure sample integrity and data quality, pursuant to R18-9-A206(B), and R18-9-A215(E)(2-3).*
- *Provide copies of any field data sheets as an appendix.*

2.5 SAMPLE DELIVERY

- *After sample collection, describe the procedures that were followed to preserve the samples until they were relinquished to the lab, in accordance with AAC R18-11-404.*

3.0 BASELINE MONITORING ANALYTICAL RESULTS

- *List the lab(s) used to analyze the samples.*
- *Include the lab name and methods used and if it is in accordance with the requirements in R18-9-A215(E)(4).*
- *To ensure accurate and reliable monitoring, the permittee is responsible for confirming that the method detection limit for the analytical method used by the laboratory is lower than the new or adjusted AWQS limit.*

Pursuant to R18-9-A215(E)(4), approved analytical methods include Arizona Department of Health Services-approved (ADHS) methods under A.A.C. R9-14-610, including methods on the ADHS Director Approved List, if available. If an ADHS-approved method does not exist, sample analyses shall be conducted using an appropriate EPA-approved method or a method specified by the ADEQ Director. ADEQ has provided a list of accepted methods in the table below;

Analyte	Analytical Method
Arsenic	EPA 200.8, SM 3113B, SM 3114B
Bromate	EPA 300.1, EPA 317.0 Rev 2.0, EPA 321.8, EPA 326.0, EPA 557
Chlorite	EPA 300.0, EPA 300.1, EPA 317.0 Rev 2.0, EPA 326.0
Haloacetic Acids	EPA 552.1, EPA 552.2, EPA 552.3, EPA 557, SM 6251B
Fecal coliform	SM 9223B
E. coli	SM 9223B
Total Trihalomethanes	EPA 502.2, EPA 524.2, EPA 551.1, SM 6251B
Uranium	EPA 200.8

3.1 ANALYTICAL LABORATORY RESULTS

- *Tabulate the lab results from each monitoring location and parameter. A template is provided below as Table 3.*
- *Attach the lab results and chain of custodies associated with baseline sampling analyses as an appendix, in accordance with R18-9-A215(F)(4)(c).*

3.2 ANALYTICAL RESULTS DATA VERIFICATION

- *Confirm that the analytical results were reviewed for completeness and accuracy*
    - *Were the results received for all samples?*
    - *Were all the requested parameters analyzed?*
    - *Were the requested methods used?*
    - *Were the requested detection limits used?*
    - *Were the samples received by the laboratory below 6 degrees Celsius?*
    - *Is the lab narrative free from problems that require further explanation or affect sample results?*
    - *Are samples free of flags or qualifiers that require further action?*
    - *Are non-detect results reported without dilutions?*
    - *Was the matrix spike/matrix spike duplicate (MS/MSD), percent recovery, and/or relative percent difference accuracy criteria met?*
    - *Are all laboratory blank concentrations non-detect?*
    - *Are the lab QC results free of flags or qualifiers that require further action?*

4.0 METHOD FOR DETERMINING DLs

- *Describe the method that was used to determine the DLs for the parameters subject to baseline monitoring. Guidance is provided below.*
- *DLs are governed by the rule at R18-9-A205(B),*
    - *If Discharge Limitations are to be prescribed in a permit, they shall be based on the considerations described in Arizona Revised Statute (A.R.S.) § 49-243, known as Best Available Demonstrated Control Technologies (BADCT) considerations.*

Method for Determining DLs for E. coli or Fecal Coliform

- *Wastewater Treatment Plants that meet BADCT requirements in R18-9-B204(B)(4)(a) which are a design flow of less than 250,000 gallons per day and the groundwater table is greater than 20 feet below ground surface and there is no karstic or fractured bedrock at the surface, then proceed with the following discharge limits:*
    - *Fecal Coliform BADCT standard:*
        - *Single sample maximum DL = 800 Most Probable Number (MPN) per 100 mL*
        - *Four of seven daily samples in a week DL = 200 MPN per 100 mL*
    - *Or, E.coli BADCT standard:*
        - *Single sample maximum DL = 504 MPN per 100 mL*
        - *Four of seven daily samples in a week DL = 126 MPN per 100 mL*
- *Wastewater Treatment Plants that meet BADCT requirements in R18-9-B204(B)(4)(b):*
    - *Fecal Coliform BADCT standard:*
        - *Single sample maximum = 23 cfu/100 mL*
        - *Four of seven daily samples in a week DL = Non-detect*
    - *Or, E.coli BADCT standard:*
        - *Single sample maximum = 15 cfu/100 mL*
        - *Four of seven daily samples in a week DL = Non-detect*
- *Wastewater Treatment Plants or other facilities that **do not meet** BADCT requirements in R18-9-B204(B)(4)(a) or (b), then proceed with the adjusted AWQS pursuant to, R18-9-A215:*
    - *Fecal Coliform*
        - *DL = Non-detect*
    - *E.coli*
        - *DL = Non-detect*
    - *Although <2.2 MPN is considered non-detect for Total Coliform in bottled water by the FDA, the AWQS for microbiological contaminants is for Fecal Coliform and E.coli. The AWQS is established as a presence or absence standard. Any positive detection of Fecal Coliform or E. coli is considered an exceedance of the standard and confirmation sampling within five days of becoming aware of the exceedance is required.*
- *Reclaimed Water Quality Standards for Fecal Coliform listed in AAC Title 18, Chapter 11, Article 3 will not be adjusted because the reclaimed monitoring purpose is separate from the AWQS monitoring.*

Method for Determining DLs for Arsenic and Total Trihalomethanes

- *A proposed DL shall not exceed the adjusted AWQS for discharges to the aquifer or vadose zone.*
- *If there is evidence during baseline monitoring that the discharge exceeds the adjusted AWQS, then it would be necessary to provide:*
    - *Proposed BADCT upgrades to bring the exceeding parameter into compliance with DLs, or*
    - *Any other proposed implementation or upgrades of treatment technology to reduce concentrations in order to meet the adjusted AWQS*
    - *DLs may be listed as the previous AWQS (0.05 mg/L for arsenic and 0.1 mg/L for total trihalomethanes) as long as proposed treatment or BADCT upgrades are included in the baseline monitoring report to address parameters that are exceeding the adjusted*

standards. These recommended upgrades will be added as a compliance schedule item in the amended permit.

Method for Determining DLs for Bromate, Chlorite, Haloacetic Acids, and Uranium

- *A proposed DL shall not exceed the new or adjusted AWQS for discharges to the aquifer or vadose zone.*
- *If there is evidence during baseline monitoring that the discharge exceeds the new or adjusted AWQS, then it would be necessary to provide:*
    - *Proposed BADCT upgrades to bring the exceeding parameter into compliance with DLs, or*
    - *Any other proposed implementation or upgrades of treatment technology to reduce concentrations in order to meet AWQS*
    - *DLs may be listed as "reserved" as long as proposed treatment or BADCT upgrades are included in the baseline monitoring report to address parameters that are exceeding the new standards. These recommended upgrades will be added as a compliance schedule item in the amended permit.*

5.0 METHOD FOR CALCULATING ALs AND AQLs

- *This section is to describe the method that was used for calculating the ALs, and AQLs.*

5.1 METHOD FOR AL CALCULATION

- *Describe the method for how the ALs were calculated for the POC well*
- *Alert Levels are to be calculated based on a one-sided, 95 percent tolerance level, with obvious outliers excluded from the data used in the calculation.*

- *The AL calculation equation is:*
    - $AL = M + K\sigma$
        - *Where:*
        - M *= mean*
        - K *= one-sided normal tolerance interval adjustment factor with a 95 percent confidence level*
            - *Equals 2.736 for sample size of 12*
            - *Equals 2.373 for sample size of 8*
        - *σ = standard deviation (Lieberman, 1958, and Gibbons, 1994)*
            - *Gibbons, R.D., 1994. Statistical Methods for Groundwater Monitoring. John Wiley & Sons, Inc.*
            - *Lieberman, G.J., 1958. Tables for One-sided Statistical Tolerance Limits: Industrial Quality Control, Vol. XIV, No. 10.*

- *The following criteria shall be met in establishing new ALs in the permit:*
    - *1. The AL will be calculated for a parameter using the analysis from the baseline monitoring.*

- *2. Any data where the Practical Quantitation Limit (PQL, also known as the reporting limit) exceeds 80 percent of the AWQS shall not be included in the AL calculation.*
- *3. If a parameter is below the detection limit, the permittee shall report the value as "less than" the numeric value for the detection limit for the parameter, not just as "non-detect." For those parameters, the permittee shall use a value of one-half the detection limit for the AL calculation.*
- *4. If the analytical results from more than 50 percent of the samples for a specific parameter are below the detection limit, then the AL shall be set at 80 percent of the AWQS for that parameter.*
- *5. If the calculated AL for a specific parameter is less than 80 percent of the AWQS, the AL shall be set at 80 percent of the AWQS for that parameter.*

- *The following shall be applied to microbiological contaminants:*
  - *The AL for fecal coliform and/or E.coli should be set as Not Applicable.*
  - *The AQL for fecal coliform and/or E.coli should be set as Non-detect.*
- *Although <2.2 MPN is considered non-detect for Total Coliform in bottled water by the FDA, the AWQS for microbiological contaminants is for Fecal Coliform and E.coli. The AWQS is established as a presence or absence standard. Any positive detection of Fecal Coliform or E. coli is considered an exceedance of the standard and confirmation sampling within five days of becoming aware of the exceedance is required.*

5.2 METHOD FOR AQL CALCULATION

- *Describe the method for how the AQLs were calculated for the POC well.*
  - *The AQLs shall be established in the permit for each required parameter.*
  - *The AQL shall be established per A.A.C. R-18-9-A205(C)(1) and (2), as follows:*
    - *If the concentration of a pollutant in the aquifer does not exceed the AWQS, the AQL shall be set at the AWQS.*
    - *If the concentration of a pollutant in the aquifer exceeds the AWQS, the AQL shall be set equal to the calculated AL value and no AL shall be set for that parameter in that particular POC well.*

5.3 DATA EVALUATION FOR NORMALITY AND OUTLIERS

- *Describe how the data was evaluated for normal distribution.*
- *Describe how the data was evaluated for obvious outliers.*
- *Describe if any outliers were identified and subsequently removed from the calculations.*
- *Provide a table summarizing the statistics of the data. A template is provided as Table 4.*

6.0 PROPOSED LIMITS

- *Describe the proposed limits for each parameter at each permit-required monitoring location*

6.1 PROPOSED DISCHARGE LIMITS

- *List the proposed DL for each parameter at each permit-required routine discharge monitoring sampling point.*

- *Provide a table summarizing the proposed DLs for each routine discharge monitoring sampling point. A template is provided below as Table 5.*

6.2 PROPOSED ALERT LEVELS

- *List the proposed AL for each parameter at each permit-required discharge or POC monitoring location, as applicable.*
- *Provide a table summarizing the proposed ALs. A template is provided below as Table 6.*

6.3 PROPOSED AQUIFER QUALITY LIMITS

- *List the proposed AQL for each parameter at each permit-required POC monitoring location, as applicable.*
- *Provide a table summarizing the proposed ALs. A template is provided below as Table 6.*

7.0 REFERENCES

- *List the references used to prepare the Baseline Monitoring Report*

TABLE 1. BASELINE MONITORING SAMPLING EVENTS (TEMPLATE)
(EXAMPLE WHERE A PERMIT HAS 2 DISCHARGE MONITORING LOCATIONS AND 3 POC WELLS)

BASELINE MONITORING EVENT NO.	***SAMPLE DATE***	***MONITORING LOCATION SAMPLED***				
1	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*(POC WELL 1)*	*(POC WELL 2)*	*(POC WELL 3)*
2	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*(POC WELL 1)*	*(POC WELL 2)*	*(POC WELL 3)*
3	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*(POC WELL 1)*	*(POC WELL 2)*	*(POC WELL 3)*
4	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*(POC WELL 1)*	*(POC WELL 2)*	*(POC WELL 3)*
5	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*(POC WELL 1)*	*(POC WELL 2)*	*(POC WELL 3)*
6	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*(POC WELL 1)*	*(POC WELL 2)*	*(POC WELL 3)*
7	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*(POC WELL 1)*	*(POC WELL 2)*	*(POC WELL 3)*
8	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*(POC WELL 1)*	*(POC WELL 2)*	*(POC WELL 3)*
9	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*n/a*	*n/a*	*n/a*
10	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*n/a*	*n/a*	*n/a*
11	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*n/a*	*n/a*	*n/a*
12	*MM/DD/YYYY*	*(DISCHARGE LOCATION 1)*	*(DISCHARGE LOCATION 2)*	*n/a*	*n/a*	*n/a*

TABLE 2. BASELINE MONITORING PARAMETER LIST (TEMPLATE)
(This table is useful if a demonstration has been approved by ADEQ that removes parameters from Baseline Monitoring)

Monitoring Location	***Parameters Required to be Monitored***						
	Arsenic	***Bromate***	***Chlorite***	***HAAs***	***E. coli or Fecal Coliform***	***TTHs***	***Uranium***
Discharge Location 1	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Discharge Location 2	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
POC 1	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
POC 2	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
POC 3	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*

*TABLE 3. BASELINE MONITORING DATA (TEMPLATE **for Discharge Location #1**)*
(Create a table for each monitoring location. Discharge monitoring locations will have 8 rows of data and POC monitoring wells will have 12 rows of data. Remember to update the table header to indicate whether you monitored for E. coli or Fecal Coliform.)

Discharge Location No. 1							
Sample Date	***Arsenic (mg/L)***	***Bromate (mg/L)***	***Chlorite (mg/L)***	***HAAs (mg/L)***	***E. coli or Fecal Coliform (insert unit, if applicable)***	***TTHs (mg/L)***	***Uranium (mg/L)***
mm/dd/yyyy	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
mm/dd/yyyy	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
mm/dd/yyyy	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
mm/dd/yyyy	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
mm/dd/yyyy	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
mm/dd/yyyy	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
mm/dd/yyyy	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
mm/dd/yyyy	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*

(Repeat this table for each permit-required monitoring location.)

TABLE 4 SUMMARY STATISTICS FOR DATA USED TO CALCULATE PROPOSED LIMITS

(TEMPLATE summarizes data for only one location. please create a table for each monitoring location that was subject to baseline monitoring. REMEMBER TO INDICATE WHETHER YOU ARE MONITORING FOR E. COLI OR FECAL COLIFORM - CHANGE THE HEADER IN THE TABLE, ACCORDINGLY

POC Location No. 1							
Statistic	***Arsenic***	***Bromate***	***Chlorite***	***HAAs***	***E. Coli or Fecal Coliform***	***TTHs***	***Uranium***
Total Count (# of Samples)	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Non-Detect Count	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Non-Detect %	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Minimum (mg/L)	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Maximum (mg/L)	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Mean (mg/L)	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Standard Deviation	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Coefficient of Variation	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Calculated Alert Level (mg/L)	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
Alert Level Set for Parameter (mg/L)	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*

Notes:
Calculated Alert Level (mg/L): If more than 50% of results are non-detect, then AL=(0.8)(AWQS)

TABLE 5. SUMMARY OF PROPOSED DISCHARGE LIMITS

(TEMPLATE ASSUMES 3 MONITORING LOCATIONS; REMEMBER TO INDICATE WHETHER YOU ARE MONITORING FOR E. COLI OR FECAL COLIFORM - CHANGE THE HEADER IN THE TABLE, ACCORDINGLY)

Monitoring Location	Arsenic (mg/L)	Bromate (mg/L)	Chlorite (mg/L)	HAAs (mg/L)	E. coli and or Fecal Coliform (unit or N/A)	TTHs (mg/L)	Uranium (mg/L)
	DL	DL	DL	DL	DL	DL	DL
Location 1	0.010	0.010	1.0	0.060	absent	0.080	0.030
Location 2	0.010	0.010	1.0	0.060	absent	0.080	0.030
Location 3	0.010	0.010	1.0	0.060	absent	0.080	0.030

TABLE 6. SUMMARY OF PROPOSED ALs and AQLs

(TEMPLATE ASSUMES 3 POC WELLS; REMEMBER TO INDICATE WHETHER YOU ARE MONITORING FOR E. COLI OR FECAL COLIFORM - CHANGE THE HEADER IN THE TABLE ACCORDINGLY)

(Template also assumes that every parameter is required to be monitored at all of the POC monitor wells, in this example)

Monitoring Location	***Arsenic (mg/L)***		***Bromate (mg/L)***		***Chlorite (mg/L)***		***HAAs (mg/L)***	
	AL	*AQL*	*AL*	*AQL*	*AL*	*AQL*	***AL***	***AQL***
POC 1	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
POC 2	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*
POC 3	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*	*(result)*

Monitoring Location	***E. coli and/or Fecal Coliform***		***TTHs (mg/L)***		***Uranium (mg/L)***	
	AL	*AQL*	*AL*	*AQL*	*AL*	*AQL*
POC 1	Not Applicable	Non-Detect	*(result)*	*(result)*	*(result)*	*(result)*
POC 2	Not Applicable	Non-Detect	*(result)*	*(result)*	*(result)*	*(result)*
POC 3	Not Applicable	Non-Detect	*(result)*	*(result)*	*(result)*	*(result)*

FIGURE 1. SITE PLAN/MAP WITH MONITORING LOCATIONS
(INSERT MAP)

FIGURE 2. PROCESS FLOW DIAGRAM FOR DISCHARGE MONITORING
(INSERT FIGURE)

APPENDIX A. FIELD DATA SHEETS
(ATTACH FIELD DATA SHEETS USED TO DOCUMENT SAMPLE COLLECTION)

APPENDIX B. ANALYTICAL LABORATORY REPORTS
(ATTACH LAB REPORTS & CHAINS OF CUSTODY)