

**STATEMENT OF BASIS
for Draft Permit**

EPA AREA CLASS V PERMIT NO. CO52393-00000
Area Permit for Aquifer Storage and Recovery Project

Meridian Metropolitan District
6380 South Fiddlers Green Circle Suite 400
Greenwood Village, Colorado 80111

**STATEMENT OF BASIS
FOR DRAFT UNDERGROUND INJECTION CONTROL PERMIT CO52393-00000**

**Class V Aquifer Storage and Recovery (ASR) Area Permit for Meridian Metropolitan District Wells
Located in Douglas County, Colorado**

Permit Coordinator:

Craig Boomgaard
Underground Injection Control Program
U.S. Environmental Protection Agency
Mail Code: 8WP-SUI
1595 Wynkoop Street; Denver, Colorado 80202-1129
Telephone: (800) 227-8917, extension 312-6794
Email: boomgaard.craig@epa.gov

This Statement of Basis gives the derivation of site-specific Underground Injection Control (UIC) permit conditions and the reasons for them.

The EPA UIC permits regulate the injection of fluids into underground injection wells to prevent endangerment to Underground Sources of Drinking Water (USDWs). The EPA UIC permit conditions are based upon the authorities set forth in regulatory provisions at 40 CFR parts 144 to 147 and are intended to prevent movement of contaminants into USDWs that could adversely affect human health. Issuance of this Permit does not convey property rights of any sort or any exclusive privilege, nor authorize injury to persons or property or invasion of other rights, or any infringement of other Federal, state, or local laws or regulations. Under 40 CFR 144 subpart D, certain conditions apply to all UIC permits and may be incorporated either expressly or by reference. General permit conditions for which the content is mandatory and not subject to site-specific differences (40 CFR parts 144, 146 and 147) are not discussed in this document.

The EPA administers the UIC Class V program throughout the State of Colorado. Regulations specific to injection wells located in Colorado are found at 40 CFR 147 subpart G. From the date of signature, this Permit is issued for a duration of three (3) years unless: 1) modified, revoked or reissued by the Director; or 2) upon the EPA's authorization of primary enforcement responsibility (primacy) for the UIC Class V Program to Colorado.

Part 1. General Information and Description of Project

Permittee:

Meridian Metropolitan District
6380 South Fiddlers Green Circle Suite 400
Greenwood Village, Colorado 80111

Facility:

Meridian Metropolitan District Aquifer Storage and Recovery (ASR) Area Permit

Background: On January 31, 2017, Meridian Metropolitan District (Meridian) or “the Permittee” or “the Applicant” submitted an application to the EPA Region 8’s Underground Injection Control (UIC) Program for Class V ASR wells, DE-1R and A-4, located in northern Douglas County, Colorado. An area permit, rather than individual permits was determined to be appropriate for this project. This is an Area Permit for Meridian’s utility service area, which supplies water to residents in Douglas County, Colorado. Meridian’s utility service area map included in the Permit as Exhibit A was obtained from Exhibit 2 of the application. The corresponding legal description for the utility service area was pulled from a GIS mapping system. While there are two wells currently approved under the Permit, additional wells may be added, which is discussed in Part 3 of this Statement of Basis. Adding wells does not require additional public notification and is allowed under the area permitting action.

The purpose of an ASR well is to inject water into the ground for storage until it is needed when availability from other sources is low. This practice helps prevent the depletion of groundwater aquifers during periods of low surface water availability. There are several ASR wells operating in Colorado, especially along the Front Range. There are several advantages to this method of storage over surface storage, such as reservoirs. Specifically, there is no need to buy surface land and build impoundments to contain the water, there is protection from surface contamination, and there is no loss of water to evaporation, which can be high during the summer months in Colorado. Water recovered from an ASR operation also requires less treatment than water stored on the surface. Water recovered from ASR wells must meet National Primary Drinking Water Regulation standards prior to distribution as drinking water.

While the water proposed for injection must meet all enforceable drinking water standards issued by EPA’s Public Water System Supervision (PWSS) program, the UIC regulations are designed to also ensure that any contaminants do not “endanger” underground sources of drinking water (USDW). This includes contaminants that may pose a health risk if consumed in drinking water. Accordingly, the list of sampling constituents in this draft permit includes contaminants which must meet not only Maximum Contaminant Levels (MCLs), but Lifetime Health Advisory Limits (HALs) and other health-based limits, all of which the EPA enforces under its UIC regulatory authority in 40 CFR parts 144 to 147.

One group of contaminants that the EPA’s UIC program has determined may pose a health risk if consumed in drinking water are nitrosamines, including N-Nitrosodimethylamine (NDMA). Recent sampling data provided by Meridian shows that NDMA is present in treated drinking water that would serve as a source of water to be injected for ASR purposes. NDMA is a concern due to its solubility in water, as well as its carcinogenicity and toxicity (see EPA’s Technical Fact Sheet on NDMA, November 2017 at https://www.epa.gov/sites/production/files/2017-10/documents/ndma_fact_sheet_update_9-15-17_508.pdf). While this Permit requires monitoring of NDMA, the EPA is not setting an enforceable permit limit for this contaminant because it does not have enough information at this time to determine whether a permit limit for NDMA is needed. Instead, the EPA expects the additional data obtained through the permit monitoring requirements will enable the EPA to better understand the concentrations and fate of NDMA and any associated

risks. Concurrently, the EPA's Office of Ground Water and Drinking Water is studying this contaminant to assess the risk of NDMA exposure in drinking water to assess the need to regulate NDMA.

The EPA is limiting the duration of this permit authorizing injection into the Denver and Arapahoe Aquifers to three years. Typically, Class V permits are issued for ten years. The EPA expects to have enough monitoring data within this timeframe to determine if a permit limit for NDMA is needed and whether injection can continue to be authorized in a way that protects USDWs. The EPA will also determine if a permit renewal should be issued for a newly determined duration of time following the review of data collected by the Permittee.

Part 2. Permit Considerations (40 CFR §146.24)

Hydrogeologic Setting (Table 1)

TABLE 1: LITHOLOGY LOG
DENVER DE-1R
MERIDIAN METRO DISTRICT

Page 1

DEPTH (ft)	DESCRIPTION
0-50	Alternating Sandstone: v.c.sand (qtz,feld,mica) + Shale: green brn, clay-rich
50-80	Shale: med gray, laminated, clay-rich
80-120	Sandstone: m.grained, well sorted, rnd (qtz,feld,mica) + silt; coarsens w/ depth
120-170	Shale to siltstone: dk gray to blk, silt to f.grained sand size; coarsens w/depth
170-200	Sandstone: dk gray, v.c.grained (qtz,feld,biotite), clay matrix
200-270	Alternating Shale: dk gray, laminated + Sandstone: fine-grained
270-300	Sandstone: v.c.grained consisting of qtz, feld, and biotite
300-340	Shale: gray, laminated, clay-rich
340-360	Sandstone: fine to med. grained
340-380	Shale: dk black, clay-rich
	TOP OF DENVER FORMATION
380-470	Alternating Shale: dk gray, laminated + Sandstone: andesitic, med to coarse grained
470-540	Shale: dk gray blk to dk brn, laminated, clay-rich
540-560	Sandstone: fine to med. Grained, andesitic in origin
560-620	Shale: dk gray to grn
620-690	Alternating Sandstone: m-c.grained (qtz) + shale: dk gray to blk
690-710	Sandstone: grayish color, c to v.c. grained; very clean for Denver
710-790	Shale: dk gray to grn; silty
790-800	SA 690-710 ft
800-810	50% shale and 50% sandstone: fine to med. Grained
810-860	Shale: dk gray to grn; silty
860-870	SA 800
870-940	Shale: grayish grn blk w/ some brn; clay-rich
940-950	Sandstone: grayish color, c to v.c. grained; very clean for Denver
950-980	Shale: dk grayish blk, well laminated, carbonaceous lens
980-990	Sandstone: dk gray, fine grained, clay lens
990-1050	Shale: grayish grn, clay-rich
1050-1060	Sandstone: m.-c. grained w/ some clay lens
1060-1090	Shale
1090-1160	Sandstone/ shale mix- dk gray; mostly shale
1160-1170	Sandstone: dk gray, fine to med grained
1170-1180	Sandstone/ shale mix- dk gray
1180-1200	Shale: blk, well laminated
1200-1220	Sandstone: dk gray, fine to med grained
	END OF DENVER FORMATION
1220-1285	Shale: blk, well laminated

TABLE 1
Meridian Metro District Well A-4
Lithologic Log

DEPTH (ft)	DESCRIPTION
0-8	Overburden- sandy clay loam
8-70	Sandy claystone with iron staining and plant fragments
70-90	Sandstone: fine to med grained, gray and white colored- abundant dk of a meta origin
90-100	Shale: blk, laminated and clay rich
100-290	Alternating SS and shale: c to vc grained sandstone; dk bm sticky claystone
290-300	Sandstone: fine grained, gray color
300-350	Claystone: gray gm bm, very sticky and plastic
TOP OF DENVER FORMATION	
350-360	Sandstone: fine grained, andesitic origin (gray, white and black color)
360-440	Claystone/shale: gray gm, very sticky
440-470	Sandstone: v.c.grained, arkosic (feld, qtz), pink and white in color
470-490	Sandstone: fine to vc grained, poorly sorted, andestic in origin w/ abundant dk material
490-510	Sandstone SA 440
510-580	Claystone: gray gm, very sticky and plastic
580-680	Shale: gray blk, clay rich and laminated
680-890	Alternating SS/shale: c.grained sandstone, qtz rich, well-sorted: dk gray blk shale, lam
890-920	Sandstone: f. grained
920-960	Shale: dk blk, laminated with carbonaceous frag
960-1080	Siltstone: clay rich and silty
1080-1100	Shale: dk gray blk, laminated and clay-rich
1100-1280	Alternating SS/shale: fine to med grained, well sorted, andesitic: dk gray blk shale, silty
TOP OF ARAPAHOE FORMATION	
1280-1290	Sandstone: fine grained, well sorted, arkosic
1290-1320	Silty to sandy mudstone
1320-1360	Sandstone: c to vc grained, qtz and feld rich, congl. sandstone
1360-1370	Sandstone: fine grained, well sorted, arkosic
1370-1420	Sandstone: c to vc grained, qtz and feld rich, congl. sandstone
1420-1530	Sandstone: fine grained, well sorted, arkosic
1530-1560	Sandstone: c to vc grained, qtz and feld rich, congl. sandstone
1560-1580	Sandstone: fine to med grained, arkosic
1580-1620	Shale: gray gm, clay rich
1620-1670	Sandstone: fine to med grained, arkosic- qtz rich
1670-1710	Shale: gray gm, clay rich forms sticky clay balls
1710-1720	Sandstone: fine grained with a muddy matrix
1720-1740	Shale: gray gm color, sticky clay rich matrix
1740-1760	Sandstone: c grained, qtz rich, well sorted
TOP OF LARAMIE FORMATION	
1760-1770	Shale: grayish blk, weathered gm color
1770-1790	Mudstone: grayish blk color, very dense
1790-1800	Shale and coal seam
1800-1820	Shale/mudstone: gray blk color, sections are laminated, carbonaceous material

NOTE: All measurements are from Kelly Bushing which is 8 ft above ground surface

The well hydrogeology tables provided above were included in Meridian's application to operate its ASR Project with the use of the DE-1R and A-4 injection wells.

Proposed Injection Zone

An *injection zone* is a geological formation, group of formations, or part of a formation that receives fluids through a well. There are two proposed injection zones for UIC Permit CO52393-00000: the Denver Formation (380 to 1,220 feet below ground surface [bgs]) and the Arapahoe Formation (1,285 to 1,760 feet bgs).

Confining Zones

A *Confining Zone* is a geological formation, group of formations, or part of a formation that is capable of limiting fluid movement from an injection zone. The designated upper Confining Zone for UIC Permit CO52393-00000 in the Denver Formation is a shale from an approximate depth interval of 340 feet to 380 feet. The lower Confining Zone is a shale from an approximate interval of 1,220 feet to 1,285 feet. The upper Confining Zone for the Arapahoe Formation is a shale from an approximate interval of 1,220 feet to 1,285 feet and a lower Confining Zone of the Laramie Formation of shale and mudstone from 1,760 feet to 1,820 feet.

Underground Sources of Drinking Water (USDWs)

Aquifers or the portions thereof which are being or could in the future be used as a source of drinking water are considered to be USDWs. Generally, aquifers with a Total Dissolved Solids (TDS) content below 10,000 mg/L are considered by the EPA to be USDWs. The receiving aquifers, Denver and Arapahoe are USDWs and they currently supply water for the Denver metropolitan area. Pursuant to the UIC regulations at 40 CFR § 144.12, underground injection cannot cause movement of a contaminant into a USDW, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 142 or may otherwise adversely affect the health of persons.

Other USDWs exist above and below the proposed injection zones. The proposed injection fluid is treated to drinking water standards at a drinking water supply plant. The EPA is reasonably certain that other USDWs at this location will not be impacted by injection activities due to the geologic isolation separating them from the injection zone for this project.

USDWs in the area are the Dawson, Denver, Arapahoe, Laramie and Fox Hills Aquifers. Since the ASR wells are not introducing constituents that exceed drinking water standards no aquifer exemption is required. Compliance with permit conditions will ensure that the Denver and Arapahoe Aquifers are protected as USDWs.

Part 3. UIC Permit Conditions

Well Construction Requirements

The proposed well construction plan was evaluated and determined to be in conformance with standard practices and guidelines that ensure well injection does not result in the movement of fluids outside the permitted injection zone. The approved well completion plan is incorporated into the Permit as APPENDIX A and will be binding on the Permittee. Modification of the approved plan during well construction and prior to the issuance of an authorization to inject approval is allowed under 40 CFR 144.52(a)(1) provided written approval is obtained from the Director prior to actual modification.

The construction plans for the DE-1R and A-4 wells proposed in Meridian's application meet the required standards of the Permit conditions and comply with 40 CFR 147.305(d) for injection wells in Colorado.

The EPA will review requests for any new wells to be added to this permit and determine if the injection zone and well operations are similar to those previously authorized. If the hydrogeology, water chemistry, groundwater

flow direction, etc. demonstrate that the well operations are compatible to the DE-1R and/or A-4 well, then the operator may receive approval to inject into the new well. However, if the well operations and/or formation characteristics are found to be non-comparable to the conditions of the DE-1R and A-4 wells, then the Director may choose to require that the Permittee perform additional testing such as a water chemistry test, pilot cycle test, etc., prior to receiving authorization to inject into the new well. The EPA will also maintain a list of all approved wells. This list will be available for review by the public and other stakeholders upon request. The Permittee will be required to perform quarterly groundwater sampling of the injection zone for any new well added to this permit. The Director may change this schedule following the review of the quarterly data.

Casing and Cement

As noted above, Meridian’s well construction plan was evaluated and determined to be in conformance with standard practices and guidelines that ensure well injection does not result in the movement of fluids out of the injection zone. Well construction details for DE-1R and A-4 injection wells are shown in TABLE 3.1 which are converted drinking water supply wells.

Table 3.1 – Well Construction Requirements

Table 3.1A, DE-1R Well Construction

Casing Type	Hole Size, inch (in)	Casing Size, in	Cased Interval, ft	Cemented Interval, ft	Perforations, ft
Surface	22	18	0 - 40	0 - 40	
Longstring	14 ¾	8 5/8	0 - 385	40 - 375	
Screen	14 ¾	8 5/8			385 - 1214

The DE-1R well was drilled to a total depth of 1285 ft and completed on August 20, 2001 to a depth of 1,254 ft. to operate recovery operations.

Table 3.1B, A-4 Well Construction

Casing Type	Hole Size, inch (in)	Casing Size, in	Cased Interval, ft	Cemented Interval, ft	Perforations, ft
Surface	36	24	0 - 24	0 - 24	
Longstring	20	12 3/4	0-1285	0-1285	
Screen	20	12 3/4	1285 - 1812		1285 - 1740

Well A-4 was drilled to a total depth of 1812 feet and completed on January 31, 2002 to a depth of 1780 ft.

All depths are approximate and true vertical depths.

Monitoring Devices

The Permittee will be required to install and maintain wellhead equipment that allows for monitoring pressures and providing access for sampling the injected fluid at/near the wellhead to assess compliance with permit conditions. Required equipment may include but is not limited to: 1) shut-off valves located at the wellhead on the injection tubing; 2) a flow meter that measures the cumulative volume of injected fluid; 3) fittings or pressure gauges attached to the injection tubing and the wellhead for monitoring the injection pressure; and 4) a tap on the injection line, isolated by shut-off valves, for sampling the injected fluid. All sampling and measurement taken for monitoring must be representative of the monitored activity.

Area of Review

An Area of Review (AOR) was conducted within the boundaries of the facilities utility service area including a ¼-mile radius buffer to identify the location of any other wells which penetrate the injection zone. This is to ensure that all known wells within the area of review that penetrate the injection zone formations, and may be affected by increased pressure, are evaluated to ensure these wells do not serve as conduits for fluid movement outside the injection zone. There are currently no known wells within a ¼-mile radius of the two proposed ASR wells penetrating the injection zone and therefore no potential risks to other USDWs. If new wells are proposed, the AOR will need to be evaluated at the time of proposal.

A list of wells in the AOR must be updated and reported in the Annual Report that is submitted to the EPA.

Corrective Action Plan

For wells in the AOR which are improperly sealed, completed or abandoned, the Permit requires the applicant to develop a Corrective Action Plan consisting of the steps or modifications that are necessary to prevent movement of fluid into USDWs. The Corrective Action Plan is included in Appendix F of the Permit and will be binding upon the Permittee.

The EPA has determined no wells within the AOR require corrective action. If new wells are proposed, the need for a Corrective Action Plan will be reviewed for these wells.

Approved Injection Fluid

The approved injection fluid is limited to treated drinking water from sources under Meridian's jurisdiction for purposes of ASR.

Meridian's water is supplied by Aurora, Denver, and East Cherry Creek Valley (ECCV). At the time of this permit approval, the source water for injection is provided by only Aurora and ECCV. Addition of source water from Denver Water in the future will require additional EPA approvals. The permit includes provisions to accommodate future requests from the Permittee to add a new water source for injection using this permit.

The approved injection fluid is treated drinking water from three Aurora Water Treatment Plants (i.e., Binney, Wemblinger, and Griswold), as well as treated drinking water from the East Cherry Creek Valley Quebec Street Water Treatment Plant. The EPA has been informed that backflow preventers are installed at the facilities connected to the pipeline which will prevent mixing of water resources.

Prior to adding new sources (e.g. different supply formation, well field, or new water system) of fluids, the Permittee must provide a baseline analysis of the water to the EPA for review. The analytes to be measured are found in Appendix G of the Permit. The applicant would need to submit an application which describes the source of the water. If the new source water is found to be compatible to previous sources then the fluid may be approved without further testing. However, if concerns are observed from the review of the water quality data and/or if the treatment processes are found to be different from previously approved sources then the EPA may require the Permittee to perform additional testing of the fluids such as performing Bench Scale Water Chemistry and Pilot Cycle tests. Also, the addition of the new water source may result in a change of the Maximum Allowable Injection Pressure (MAIP) based upon the specific gravity of the fluid. Whenever a new water sources is added the applicant shall be required to monitor the injectate and recovered water. If EPA determines that Bench Scale Water Chemistry and/or Pilot Cycle testing is needed, Meridian will need to conduct quarterly sampling for the constituents listed in Appendix J of the Permit. The EPA Director may change the frequency following the review of the quarterly data.

Injection Pressure Limitation

Injection pressure, measured at the wellhead, shall not exceed the MAIP calculated to assure that the pressure applied during injection does not initiate new fractures or propagate existing fractures in the confining zones adjacent to the USDWs.

Since this is an ASR well and injection pressures will be well below the calculated fracture pressure, the MAIP is set at 200 psi. This pressure is conservative based on the calculated fracture gradient methodology of multiplying the depth at the top of well screen by 0.8 psi/foot. Since DE-1R's top of screen is at 385 feet, the anticipated fracture gradient is 308 psi and would be higher for the AR-1 well. An aquifer pump test may be performed to determine more appropriate MAIPs for the A-4 and DE-1R wells, and any other wells subsequently added to the Permit. If Meridian wishes to request a different MAIP, it may submit aquifer pump test data collected from the proposed well for EPA's review.

The wellhead injection pressure will be recorded from a gauge on the wellhead to assess compliance with the MAIP.

Injection Volume Limitation

The Permit does not set a volume limitation for these injection wells because the expected amount of treated drinking water stored and recovered over time will not pose a risk to the Denver and Arapahoe Aquifers or other aquifers above or below the injection zones for the AR-1 and DE-1R wells.

Mechanical Integrity (40 CFR 146.8)

An injection well has mechanical integrity if:

- 1) there is no significant leak in the casing, tubing, or packer (Part I); and
- 2) there is no significant fluid movement out of the injection zone through vertical channels adjacent to the injection well bore (Part II).

The Permit prohibits injection into a well which lacks mechanical integrity and requires demonstration of mechanical integrity prior to injection and periodically thereafter. A demonstration of mechanical integrity includes both internal (Part I) and external (Part II). The methods and frequency for demonstrating Part I and Part II mechanical integrity are dependent upon well-specific conditions.

Initially the Permittee will test each well's casing using a pressure test, to detect any leaks in the casing or tubing to meet Part I Internal Mechanical Integrity Test Requirements. After determining there are no significant casing leaks, the Permittee will monitor and create a chart for rates and well head pressures initially observed when the wells are injecting. Thereafter, if the wells remain free of significant casing leaks, they should operate within 20% of these expected rates and pressures. Rate and pressure data will be recorded on a weekly basis. The Permittee will contact the EPA if it is determined that an unexpected 20% decrease or increase of the rate or pressure is observed with an explanation for the change. This information would be used to determine if there is a leak in the well.

A procedure like that used for the performance of a step rate test has been incorporated into the permit to establish a baseline for a range of injection and wellhead pressures that will be used to make the 20% comparison measurements. The EPA anticipates that whenever there is an increase of the curve greater than 20% then this could mean a buildup of solids in the wells. However, whenever there is a loss of 20% in the well this may indicate leakage. The Permittee must provide a written response to the EPA should an observance of a 20% deviation from the curve occur.

The Permittee has submitted cement records for the two proposed ASR wells that indicate adequate cement to meet the requirements for Part II (External) MI Requirements. If new wells are proposed and already constructed then cement records may be used to verify Part II MI Requirements. The Permittee will submit a cement bond log (CBL) to address these requirements for newly drilled wells added to the Permit. Remedial cementing may be required if the casing cement is shown to be inadequate by CBL for demonstration of Part II mechanical integrity. Part II MI for newly drilled wells will be demonstrated with a CBL that the Director determines to show a sufficient interval of 80 percent cement bond index compressive strength or greater within the designated confining zone. The operator can submit cement records for wells in the Area of Review for the injection well(s) applications.

Injection Well Monitoring Program

At least once a year the Permittee must analyze a sample of the injected fluid for parameters specified in Appendix J. This analysis shall be reported to the EPA as part of the Annual Report to the Director.

Instantaneous wellhead tubing pressure, injection flow rate, cumulative injected fluid volume must be observed on a weekly basis. A recording, at least once every thirty (30) days, must be made of the injection pressure, annulus pressure, monthly injection flow rate and cumulative fluid volume. This information is required to be reported as part of the Annual Report to the Director.

Appendix D – Ongoing Monitoring and Reporting Requirements

1. Samples will be collected for the injectate from the tap at the wellhead and from each injection zone through the approved injection wells on a quarterly basis for the analysis of NDMA for the duration of the Permit. This information will be used to evaluate whether NDMA is present in the injectate, may be present in the Denver or Arapahoe aquifers, and whether it attenuates over time.
2. Samples of recovered water will be collected from each injection zone through the approved injection wells on an annual basis for the analysis of constituents listed in Appendix J.
3. Samples will be collected and evaluated for each injection source on an annual basis.
4. Recovered water will be sampled and evaluated for constituents that exceed current levels on a quarterly basis from a new well which is added to the Permit under Part II, Section A. The Director may alter this schedule following the review of the quarterly data.
5. Injectate and recovered water will be sampled for constituents that exceed current levels and analyzed on a quarterly basis once a new water source is added in accordance with Part II, Section D.9. The Director may alter this schedule following the review of the quarterly data.
6. Obtain an injectate sample from the tap at the wellhead and analyze injectate for NDMA on an annual basis during the month where flows from surface water sources are at their maximum level. The peak month shall be determined by evaluating three years of monthly production rates at the supplying water systems.

Appendix G – ASR Baseline Constituent List

1. Contains a list of general constituents, anions, cations, metals, inorganics, radionuclides, volatile organic compound, semi volatile organic compounds, pesticides and herbicides, disinfectants and disinfection byproducts, and nitrosamines.
2. This is a larger list of constituents analyzed to establish a baseline and to evaluate water quality for a new water source and/or the injection zone for a new well. This information is needed to ensure that future injection activities will not adversely impact human health and/or cause the mobilization of contaminants in a USDW.
3. Injection activities will not be authorized if a contaminant exceeds a Permit Limit.
4. Nitrosamines are included on this list of analytes. The reporting limits for nitrosamines were obtained from the Second Unregulated Contaminants Monitoring Rule for EPA Method 521.

5. If constituents not currently listed in Appendix J are detected during baseline evaluations and/or exceed a Permit Limit, the Director may choose to add it to Appendix J.

Appendix H – Bench Scale Water Chemistry Test Procedures for Nitrosamines

The Permit requires a bench scale water chemistry test for nitrosamines following authorization to inject by EPA. There are two main goals for this test: 1) collect formation water and spike it with NDMA and NDBA to evaluate the conditions associated with any attenuation or other reactions which may occur over time; and 2) investigate changes in water chemistry that may occur over time for the injectate as a result of water storage and recovery. More specifically, Meridian will collect initial source water and formation water samples for this test prior to commencing injection in order to obtain representative samples for bench-scale testing. Part A of the water chemistry bench test is expected to provide more information about the potential for NDBA and/or NDMA to attenuate in the Denver and Arapahoe aquifers. Part B of the bench test is performed to evaluate the potential for NDMA and/or NDBA formation in these aquifers over time. The EPA is requiring that NDBA and NDMA be analyzed because these two nitrosamines were detected in Water Treatment Plant analyses provided as part of this ASR application. These additional tests may be required by the Director when the addition of a new water source or well is requested.

Appendix I – ASR Pilot Cycle Test Procedures

A pilot cycle test is required to evaluate the potential impacts of injection for ASR on the Denver and Arapahoe aquifers. There are three main goals for these procedures: 1) investigate well, aquifer hydraulics, and behavior during repetitive storage and recovery cycles; 2) evaluate the mechanics involved in well operation, flow and water level control, and instrumentation; and 3) investigate changes in water quality chemistry that may occur from water storage and recovery. This Appendix does not address all the details or all of the contingencies associated with an ASR pilot-testing plan, as many of these cannot be reliably anticipated in advance of the actual testing. Rather, it is intended to provide an overall structure for conducting the pilot studies.

The Permittee shall perform this test for both the DE-1R and A-4 wells following authorization to inject from EPA. These are currently the only wells that Meridian has requested to operate as ASR Injection wells. The test procedure under Appendix I, Section B contains the minimum timeframes associated with injection, storage and recovery of fluids that EPA Region 8 requires at all ASR facilities. Cycle 1 will be used to optimize project operations. Cycles 2 thru 4 will be performed for a longer duration of time. For Cycles 2, 3, and 4, analysis will be performed for the constituents listed in Appendix J to evaluate any potential for mobilization of contaminants in these Aquifers. Meridian has requested and is authorized to perform a longer test for Cycle 4.

Once the test is completed, the Permittee shall submit a report to the EPA in accordance with Part II, Section F.5 of the Permit. This information will inform the potential contamination risk, if any, to these aquifers resulting from injection activities. These tests may be required by the Director whenever Meridian requests that a new water source or well be added.

The following conditions must be measured and recorded in advance of, and during, the cycle testing:

1. Static water levels (between cycles)
2. Water levels while pumping
3. Water levels while injecting or specify surface, if applicable
4. Flow rate and cumulative amount pumped while recovering, by cycle and total
5. Flow rate and cumulative amount stored while injecting, by cycle and total
6. Flow rate entering and exiting the system
7. Pressure recorded from a gauge on the wellhead.
8. Inflation pressure on flow control valve.

9. Intermittent sampling for measurement of total organic carbon and dissolved oxygen in injectate and recovered water
10. Start/stop times and elapsed time for cycles
11. Sampling dates and sample testing protocol

Appendix J – Constituent List for Pilot Cycle Test Analysis and Ongoing Monitoring Requirements

The Permittee will use this shorter parameter list to evaluate water quality for the injectate and/or recovered water required in the Pilot Cycle Test procedures in Appendix I and when analytical data is required for Monitoring requirements provided in Appendix D. This list may be modified based on the initial samples collected and results of pilot cycle testing.

Plugging and Abandonment Requirements (40 CFR § 146.10)

All wells shall be plugged with cement in a manner which isolates the injection zone and will not allow the movement of fluids either into or between USDWs in accordance with 40 CFR § 146.10. Additional federal, state or local law or regulations may also apply.

Wells authorized under this permit, must be either transferred out of the program or plugged and abandoned. Meridian will notify the EPA with any plans to permanently abandon the well. The Director will review and approve any plugging and abandonment plans prior to Meridian implementing any such plans.

Part 4. Federal Law Compliance

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act (ESA), 16 U.S.C. § 1536 (a)(2), requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of federally-listed endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. The EPA has determined that a decision to issue a Class V area permit for authorization of injection well operations for Meridian's proposed ASR project would constitute an action that is subject to the Endangered Species Act and its implementing regulations (50 CFR part 402). Accordingly, the EPA will comply with these regulations by determining what, if any, effects this action will have on any federally-listed endangered or threatened species or their designated critical habitat and by following any required ESA procedures. The EPA's determination will be documented as part of the administrative record supporting the final Class V area permit decision.

National Historic Preservation Act (NHPA)

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effects of their undertakings on historic properties. The proposed injection wells are already in existence and only re-entry into the well to modify components inside the well is required. Since there will be no new disturbance of the ground, the EPA has determined that this undertaking does not have the potential to cause effects on historic properties.

Executive Order 12898

On February 11, 1994, the President issued Executive Order 12898, entitled "Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations." The EPA has concluded that there are no EJ communities proximate to the Authorized Permit Area. The primary potential human health or environmental effects to these communities associated with injection well operations would be to local aquifers that are currently being used or may be used in the future as a USDW. The EPA's UIC program authority under the Safe Drinking Water Act is designed to protect USDWs through the regulation of underground injection wells. Consequently, EPA has concluded that compliance with the specific conditions of UIC Permit CO52393-00000 is not expected to result in contamination of USDWs or mobilization of contaminants within USDWs, including USDWs which either are or will be used in the future by communities of EJ concern.