Arizona Department of Environmental Quality

Water Quality Division

DRYWELL INVESTIGATION GUIDELINES



March 2014 Revision

1. INTRODUCTION

Drywells in Arizona are to be used for the sole purpose of intercepting storm water, with the exception of several activities and sources of discharge that are exempted from requiring an Aquifer Protection Permit (APP) under Arizona Revised Statutes (A.R.S.) § $49-250(B)(23)^1$.

If a drywell receives a non-exempt discharge, an investigation is required. An investigation and APP are required for drywells draining areas where any hazardous substances (including wastes, products, fuels, etc.) are used, stored, loaded, or treated. Further detail on when an investigation is required and when it may be conducted for other purposes is provided in Section 2.

OBJECTIVE

This document provides guidance for the investigation of a drywell that may have received fluids other than storm water. The Aquifer Protection Program requirements, where applicable, are discussed in the document. This guidance is intended to help drywell owners and/or operators through the investigation process. This document also provides guidance for collecting samples from the drywell sediment chamber and from a soil boring, including the appropriate analytical methods.

REVISIONS (March 2014)

Modifications to this document include revising Table I to reflect the revised minimum groundwater protection levels (GPLs) for volatile organic compounds (VOCs), re-organizing the sections regarding sediment screening and borings, revising the criteria for performing a soil boring, clarifying that GPLs and residential Soil Remediation Levels (rSRLs) are used for sediment screening for the purpose of General Permit investigations only, removing Best Management Practice Plan (BMPP) and Best Available Demonstrated Control Technology (BADCT) references, and removing the remediation section. The ADEQ contact information was also updated. Additional information about the Drywell Program can also be obtained by accessing: *http://www.azdeq.gov/environ/water/permits/drywell.html*.

(f) Air conditioning, compressor and steam equipment condensate that has not contacted a hazardous or toxic material.

⁽h) Occupational safety and health administration or mining safety and health administration safety equipment.



¹ A.R.S. §49-250.B.23 The following are exempt from the aquifer protection permit requirement of this article: Surface impoundments and dry wells that are used to contain storm water in combination with discharges from one or more of the following activities or sources:

⁽a) Fire fighting system testing and maintenance.

⁽b) Potable water sources, including waterline flushings.

⁽c) Irrigation drainage and lawn watering.

⁽d) Routine external building wash down without detergents.

⁽e) Pavement wash water where no spills or leaks of toxic or hazardous material have occurred unless all spilled material has first been removed and no detergents have been used.

⁽g) Foundation or footing drains in which flows are not contaminated with process materials.

DEFINITIONS

Per Arizona Administrative Code (A.A.C.) R18-9-101(16), **"Drywell"** means a well which is a bored, drilled, or driven shaft or hole whose depth is greater than its width and is designed and constructed specifically for the disposal of storm water. Drywells do not include class 1, class 2, class 3 or class 4 injection wells as defined by the Federal Underground Injection Control Program (P.L. 93-523, Part C), as amended. A.R.S. 49-331(3)

Per Arizona Revised Statutes (A.R.S.) §49-201(5), "Clean Closure" means implementation of all actions specified in a permit, if any, as closure requirements, as well as elimination, to the greatest degree practicable, of any reasonable probability of further discharge from the facility and of exceeding aquifer water quality standards at the applicable point of compliance. Clean closure also means post-closure monitoring and maintenance are unnecessary to meet the requirements of A.R.S. Title 49, Chapter 2.

Per A.R.S. §49-201(12), **"Discharge"** means the direct or indirect addition of any pollutant to the waters of the state from a facility. For purposes of the aquifer protection permit program, discharge means the addition of a pollutant from a facility either directly to an aquifer or to the land surface or the vadose zone in such a manner that there is a reasonable probability that the pollutant will reach an aquifer.

"Constituents of Concern" are the chemicals and components of chemicals known to be used, stored, loaded, or treated at the site; chemicals or classes of chemicals that are commonly used, or historically associated with, the type of operation or business conducted at the site; and degradation products or byproducts of chemicals and processes associated with the activities at the site.

"Groundwater Protection Levels" are described as soil cleanup levels protective of groundwater quality on the document *A Screening Method to Determine Soil Concentrations Protective of Groundwater Quality, September 1996. (ADEQ)*



2. SCENARIOS WHERE DRYWELL INVESTIGATIONS ARE TYPICALLY CONDUCTED

The six most common scenarios applicable to a drywell are described in the subsections below. If a drywell at your property does not meet any of the following descriptions, please contact the ADEQ Mining & Industrial/Drywell Unit Manager, Luke Peterson, for guidance at 602-771-2322 or lp4@azdeq.gov.

For each scenario below, ADEQ recommends collecting and analyzing a sample of the sediment or sludge within the settling chamber for VOCs (including BTEX), polycyclic aromatic hydrocarbons (PAHs), and the 13 total priority pollutant metals plus barium, at a minimum. Any constituents of concern known to have been associated with the past operations of the facility should be added to the analyses. **Laboratory detection limits should be at or below applicable soil standards.** Note that samples must be analyzed by an Arizona Department of Health Services (ADHS) approved laboratory and by an approved method. Please refer to Sampling Procedures in Section 3.E for additional information. All site investigations conducted as part of a General Permit application must be submitted to ADEQ in the form of a certification signed, dated, and sealed by an Arizona-registered professional engineer or geologist (A.A.C. R18-9-C301.B.2 and -C304.B.2).

If Clean Closure of the drywell is requested (e.g. in the event of an unauthorized discharge to the drywell that needs to be investigated), ADEQ approval of the investigation is needed and the complete assessment report and data should be submitted to ADEQ under a Clean Closure Application. Clean Closure applies not only to drywells that will be closed but can also apply to those that will remain in operation. Details on what the Clean Closure report should contain can be found within A.A.C. R18-9-A209.B.3. A site investigation conducted in support of a Clean Closure Application should be prepared by a qualified individual such as a registered professional engineer or geologist.

If the contaminant concentrations detected in the settling chamber sediments reflect background levels (as established by ambient soil sampling) or are derived from typical storm water discharges, no further investigation will be necessary. Otherwise, further investigation may be required to determine the nature and extent of contamination, as described in Section 3.

Common Scenarios for Drywell Investigations

A. Drywells used for storm water at sites undergoing property transactions

Investigation is optional. Many property transactions, especially those of a commercial or industrial nature, include a Phase I Environmental Assessment (EA) of the property so that both the seller and the buyer are protected against future environmental claims.



B. Drywells used for storm water at non-industrial/non-commercial property

Investigation is optional. The Aquifer Protection Program requirements do not typically apply to drywells located at these sites. An example of this type of drywell would be located within a residential drainage basin that is designed to receive only storm water.

C. Drywells used for storm water at industrial or commercial property where hazardous substances are used, stored, loaded, or treated on the facility property but <u>NOT</u> within the surface drainage capture area of the drywell(s)

Investigation is optional. An example of this type of facility is a business that stores hazardous chemicals outside, but the drywell is separated by engineering barriers from receiving any potential discharge from the chemical storage area. Engineering barriers may include, but not be limited to, permanent berms, sloping of grades away from the drywell, and approved forms of secondary containment that may be regulated under another agency or program.

The Aquifer Protection Program requirements do not apply to drywells located at these sites, unless there is evidence that the on-site operations have added a pollutant to a drywell. If there is a concern that a drywell is now, or has been, impacted by pollutants, a drywell investigation should be conducted and a Clean Closure Application submitted to ADEQ's Mining & Industrial/Drywell Unit.

D. Continuing operation of drywells used for storm water at industrial or commercial property or motor fuel dispensing facilities where hazardous chemicals or motor fuels are used, stored, loaded, or treated within the surface capture area of the drywell(s)

A drywell investigation is required for this type of facility and must be submitted as part of an APP application for continued use. There is a Type 2.01 General Permit available for drywells that drain areas where hazardous substances are used, stored, loaded or treated (A.A.C. R18-9-C301), and a Type 2.04 General Permit for drywells that drain areas at motor fuel dispensing facilities where motor fuels are used, stored or loaded (A.A.C. R18-9-C301).

Upon submittal of the General Permit application documents (Notice of Intent (NOI), Supplemental NOI and drywell investigation), a General Permit is issued for continuing operation of the drywell.



E. Closure of drywells used for storm water at industrial/commercial properties or motor fuel dispensing facilities where hazardous substances or motor fuels have been used, stored, loaded, or treated within the surface capture area of the drywell(s) in the case were the drywell has not received an APP (Individual or General Permit)

A drywell investigation must be conducted and a Clean Closure Application must be submitted to ADEQ for approval (A.R.S. § 49-252). To demonstrate a clean closure, drywells are typically decommissioned as part of closure activities, but in some cases the drywell may remain to receive only uncontaminated storm water in the future, if all hazardous substance handling activities are removed from the drainage area. If ADEQ determines that the closure plan meets the definition of clean closure (A.R.S. 49-201), a Clean Closure Approval will be issued to the owner or operator. If the review of a closure plan indicates that post-closure monitoring or maintenance at the site is necessary, an Individual APP is required.

F. Pollutants accidentally or intentionally released to a drywell

A drywell investigation must be conducted and a Clean Closure Application must be submitted to ADEQ for approval (A.R.S. § 49-252). A drywell is considered a categorical APP discharging facility, if it is constructed or was used for the purpose of injecting pollutants (other than storm water or exempt fluids pursuant to A.R.S. § 49-250(B)(23)) into the subsurface. Sampling requirements for a drywell that has accepted pollutants may be more comprehensive than for typical drywell investigations. These types of drywell investigations should be pre-approved by ADEQ. To demonstrate a clean closure, drywells are typically decommissioned as part of closure activities, but in some cases the drywell may remain to receive only uncontaminated storm water in the future, if all hazardous substance handling activities are removed from the drainage area. If ADEQ determines that the closure plan meets the definition of clean closure (A.R.S. 49-201), a Clean Closure Approval will be issued to the owner or operator. If the review of a closure plan indicates that post-closure monitoring or maintenance at the site is necessary, an Individual APP is required.



3. DRYWELL INVESTIGATION

A. Investigation Screening

Settling Chamber Sediment Sample

Analyte selection for the drywell settling chamber sediment sample should be based on the substances used, stored, loaded, or treated at the site and should include all applicable constituents of concern. The facility's Material Safety Data Sheets (MSDSs), if available, should be reviewed to determine an applicable list of constituents. If information about chemicals used or waste generated at the site is not available, at a minimum, the analyses should include VOCs (including BTEX), PAHs, and total metals for the 13 total priority pollutant metals plus barium. **Samples are considered valid only if collected prior to cleanup of the chamber.** A complete description of the sampling activities including sampling methods, equipment, and sample handling and preservation should be included in the investigation report (see Section 3.E for guidance on these items).

Site-Specific Groundwater and Floodplain Information

An inventory of all wells within one-half mile of the facility should be conducted. General depth-to-groundwater and groundwater flow direction information from the Arizona Department of Water Resources (ADWR) or United States Geological Survey (USGS) maps is acceptable only if appropriately constructed groundwater wells do not exist within one-half mile of the facility. A site map identifying the location of the facility with respect to a 100-year floodplain should be submitted.

Drywell Information

A copy of the drywell drilling log that documents the surface and subsurface lithology should be submitted, if available. The ADEQ registration number should be provided. Any available information on the design, construction, maintenance and history of the drywell should be provided. At a minimum, information on the diameter, total depth, and construction date of the drywell will be necessary. The planned future use or decommissioning should be discussed.

Evaluation

In general, if the contaminant concentrations in the settling chamber sediments reflect background soil levels as determined by ambient soil sampling, or derive from typical storm water discharges, further drywell investigation will not be necessary.

If analytical results from a sample of the drywell settling chamber sediments obtained for the purpose of demonstrating Clean Closure indicate there has been a discharge of pollutants to the drywell, a soil boring is needed. A discharge is assumed to have occurred if concentrations of pollutants are discovered in the drywell sediments that are attributable to a discharge.



If the drywell investigation is specifically for the purpose of applying for a Type 2.01 or 2.04 General Permit, the settling chamber sample results should be compared to applicable GPLs and rSRLs and a soil boring is required if there are exceedences of these standards, pursuant to the General Permit rule. Laboratory detection limits should be at or below applicable standards.

The decision to drill a soil boring will also be influenced by the type of contaminants present, contaminant concentrations, disposal history, depth-to-groundwater, and known site-specific lithologic conditions.

B. Soil Boring

If required, a soil boring should be drilled as close as possible to the drywell (e.g. 5 feet or less from the edge of the drywell). If the drywell is undergoing closure, the soil boring may be advanced through the center of the drywell shaft, provided all settling chamber sediments are removed prior to drilling and a sample of the native soil beneath the drainage rock can be obtained.

Soil samples for analysis should be collected at 5-foot intervals and at any distinct changes in lithology, starting at the depth of the bottom of the settling chamber and continuing to a total depth of at least 10 feet below the bottom of the drywell injection pipe. The boring should be advanced to deeper levels and sampled, if warranted, based on professional judgment or if visual examination or field screening equipment indicate the presence of contamination.

All collected soil samples should be analyzed for all constituents of concern that were detected in the drywell chamber sediment. If the constituents of concern include VOCs, the soil samples should be analyzed for VOCs even if no VOCs were detected in the drywell chamber sediment. **Laboratory detection limits should be at or below applicable standards.** Decisions should be based on site-specific conditions, and a rationale should be provided. Please contact the ADEQ Mining & Industrial/Drywell Unit Manager for assistance in determining the appropriate analyses.

Upon completion of soil sampling, the boring should be properly closed to ensure that contaminant migration will not occur.

Evaluation

If the drywell investigation is being conducted to demonstrate Clean Closure, the results of soil boring samples should be compared to the GPLs. If the results are below GPLs they should be submitted to the APP Program as part of a Clean Closure Application. If the results are above GPLs additional soil and/or groundwater characterization may be required and an Individual APP may be required for closure. Please contact the ADEQ Mining & Industrial/Drywell Unit Manager, Luke Peterson, for guidance at 602-771-2322 or lp4@azdeq.gov.



If the drywell investigation is specifically for the purpose of applying for a Type 2.01 or 2.04 General Permit, the soil boring sample results should be compared to applicable GPLs and rSRLs pursuant to the General Permit rule. If the results are below both the GPLs and rSRLs, the drywell meets the characterization requirements for the General Permit. If the limits are not met, the drywell does not qualify for the General Permit and will need to either apply for an Individual APP to operate or an Individual APP to close.

C. Site-specific Conditions

During drilling, certain lithologic conditions (such as extremely coarse-grained materials) may result in auger refusal or otherwise prohibit adequate sample recovery for laboratory analysis. Contaminants detectable in settling chamber sludge may be absent in coarsegrained sediments but detectable in fine-grained layers or the underlying groundwater. Professional judgment should be exercised when determining sample locations and defining the extent of contamination

Soil gas sampling is recommended when VOC analysis is required and the cobble and gravel content of the soils results in low, or no, sample recovery.

If groundwater is encountered during drilling, groundwater samples should be collected according to current EPA, ADEQ, and ADHS requirements and analyzed for all constituents of concern.

D. Groundwater Investigation

ADEQ may request groundwater sampling if soil sampling is inadequate to determine the extent of impact, the drywell shaft is completed in or close to the water table, or impact to groundwater is suspected. In this case, groundwater sample results should be compared against applicable aquifer water quality standards (AWQS). Note that specific instructions with respect to the detection limits should be provided to the laboratory on the Chain-of-Custody. Laboratory detection limits should be at or below applicable standards.

E. Sampling Procedures

A description of the sampling procedures, including sampling equipment and sample handling and preservation, should be submitted. Sampling procedures should be consistent with current EPA, ADEQ, and ADHS requirements. Sludge, sediment, and soil sampling methods for VOCs should be consistent with ADHS approved methods such as methanol field extraction or use of an Encore[®] device and under applicable holding times. Drywell sediment samples for VOC analysis should be collected as discreet samples from as deep within the settling chamber sediments as possible so that losses due to volatilization will be minimized. All other sediments, whenever possible.



Analytical results must include the method of sample analysis, and relevant quality assurance/ quality control (QA/QC) data. In general, at least one duplicate sample and one type of blank must be obtained for every ten field samples. If there are less than ten field sampling points, one duplicate sample and one blank must be obtained. Chain-of-Custody documentation and proof of laboratory certification should be provided. The laboratory must be certified by ADHS for each specific method used.

F. Analytical Methods

The most common analyses performed on drywell sediments and soils include VOCs (including BTEX), semi-VOCs, PAHs, and 13 total priority pollutant metals plus barium using one or more of the following method(s)²:

- 8015AZ (C₁₀-C₃₂ hydrocarbons) BTEX by EPA 8021B, and PAHs analyses by EPA 8270 or 8310 may be required, depending on the type of petroleum products used and the concentrations detected.
- EPA 8260B or EPA 8021B (VOCs) EPA 8260B should be used when all the potential contaminants at a site have not been identified. EPA 8021B should be used for specific contaminants only, such as BTEX.
- EPA 8270 (semi-VOCs) This method should be used where semi-VOCs are suspected. For PAH only, EPA 8310 should be used.
- EPA 6000 and 7000 series for <u>total metals</u>- Arsenic, barium, cadmium, chromium, lead, and mercury are common contaminants. Other metals with aquifer water quality standards include antimony, beryllium, nickel, selenium, and thallium. Metals such as copper, silver, and zinc should be requested, if they are possible indicators of an unauthorized discharge. (Basically, the 13 total priority pollutant metals plus barium is the best way to cover the metals analysis, unless you already know what the contaminant stream contains.)

G. Demonstration of Technical Capability

All documents submitted to ADEQ that fall within the statutory definition of engineering practice or geologic practice are to be prepared by a qualified preparer and sealed by an appropriate registrant of the Arizona State Board of Technical Registration according to the applicable laws and rules. The site investigation required for Type 2.01 and 2.04 General Permits requires a certification signed dated and sealed by an Arizona registered professional engineer or geologist (A.A.C. R18-9-C301.B.2 and –C304.B.2)

² The analytical method used must be a method approved by ADHS. Any approved analytical method for each parameter may be used as long as the substituted method provides detection limits which are adequate to meet applicable regulatory limits. Methods other than those mentioned above may be required.



DRYWELL DECOMISSIONING

If the drywell is to be decommissioned, the abandonment should follow the ADEQ Drywell Decommissioning Guidelines, available on ADEQ's web site. If a permit for closure or a clean closure approval is required, the drywell should not be abandoned until ADEQ has reviewed and approved the results of the drywell investigation.

Drywell owners or facility operators should contact the ADEQ Mining & Industrial /Drywell Unit Manager, Luke Peterson, at (602) 771-2322, to obtain technical guidance, if necessary, to ensure that all regulatory concerns are addressed.

Additional information about the Drywell Program can also be obtained by accessing <u>http://www.azdeq.gov/environ/water/permits/drywell.html</u>.



Analyte	CAS No.	Minimum GPL (mg/kg)	SRL(s)* (mg/kg)
Benzene	71-43-2	0.70	0.65 (ca)
Carbon Tetrachloride	56-23-5	0.95	0.25 (ca) / 2.2
1,2-Dichlorobenzene	95-50-1	116**	600
1,4-Dichlorobenzene	541-73-1	27	35
1,2-Dichloroethane (1,2-DCA)	107-06-2	0.23	0.28 (ca)
1,1-Dichlorethylene (1,1-DCE)	75-35-4	0.85	120
cis-1,2-Dichloroethylene (cis-1,2-DCE)	156-59-2	5.30	43
trans-1,2-Dichloroethylene (trans-1,2-DCE)	156-60-5	9.20	69
1,2-Dichloropropane	78-87-5	0.36	0.34 (ca)
Ethylbenzene	100-41-4	82**	400
Chlorobenzene (Monochlorobenzene)	108-90-7	16.50	150
Styrene	100-42-5	45	1500
Tetrachloroethylene (PCE)	127-18-4	0.80	0.51 (ca)
Toluene	108-88-3	159**	650
Chloroform	67-66-3	6.8	0.94 (ca)
1,1,1-Trichloroethane (TCA)	71-55-6	0.94	1200
Trichloroethylene (TCE)	79-01-6	0.76	3.0 (ca) / 17
Xylenes (Total)	1330-20-7	31**	270
Alachlor	15972-60-8	0.11	6.8 (ca)
Atrazine	1912-24-9	0.11	2.5 (ca)
Carbofuran	1563-66-2	2.1	310
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.015	0.53 (ca) / 1.5
1,2-Dibromoethane (Ethylene dibromide [EDB])	106-93-4	0.0033	0.029 (ca)
Endrin	72-20-8	45	18
HCH (gamma) or Lindane	58-89-9	0.088	0.5 (ca)
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94-75-7	6.7	690
Trichlorophenoxypropionic Acid (2,4,5-TP) or Silvex	93-72-1	42	490

Table I. Minimum GPLs and SRLs for Organic Contaminants

* Note that SRLs are from Appendix A of the Arizona Administrative Code, Title 18, Chapter 7. For carcinogens the Residential SRL listed is the 10⁻⁶ value.

** Minimum GPL value based upon the saturation limit of that constituent (see Reference 6 at end of this document).

"ca" indicates carcinogenic effects



Analyte	CAS No.	Minimum GPL (mg/kg)	SRL(s) ¹ (mg/kg)
Antimony	7440-36-0	35	31
Arsenic	7440-38-2	290	10
Barium	7440-39-3	12,000	15,000
Beryllium	7440-41-7	23	150
Cadmium	7440-43-9	29	39
Chromium (III)	16065-83-1	590²	120,000
Chromium (VI)	18540-29-9	Present ³	30 (ca) / 65
Total Chromium	7440-47-3	590	NA
Lead	7439-92-1	290	400
Mercury	7487-94-7	12	23
Selenium	7782-49-2	290	390
Nickel	7440-02-0	590	1,600
Thallium	7440-28-0	12	5.2

Table II. Minimum GPLs and SRLs for Metals

¹ Note that SRLs are from Appendix A of the Arizona Administrative Code, Title 18, Chapter 7. For carcinogens the Residential SRL listed is the 10⁻⁶ value.
 ² Based upon the total chromium GPL.

³ If hexavalent chromium is present, ADEQ will evaluate the investigation and closure requirements on a case by case basis.

"ca" indicates carcinogenic effects



References

- 1. EPA-Region IX, Guidelines for Closure of Shallow Disposal Wells, 1992.
- 2. ADEQ, Policy 0170.000: Implementation of EPA Method 5035 Soil Preparation for EPA Methods 8015B, 8021B, and 8260B, 2000.
- 3. ADEQ, Instructions for a Clean Closure Application, revised July 2011.
- 5. ADEQ, Drywell Decommissioning Guidelines, revised June 2005.
- 6. ADEQ, A Screening Method to Determine Soil Concentrations Protective of Groundwater *Quality, September 1996.*
- 7. ADEQ, Implementation Guidelines for Drywells That Use Flow Control and / or Pretreatment Technologies under the Aquifer Protection Program General Permit Types 2.01 and 2.04, March 2009.
- 8. ADEQ Website GPL Spreadsheet <u>www.azdeq.gov/environ/waste/sps/download/gplm.xls</u>
- 9. ADEQ Website GPL Spreadsheet Guidance www.azdeq.gov/environ/waste/sps/download/gpli.pdf

