OWRC
Ohio Water Resources Council

State of Ohio
Ohio Water Resources Council
State Coordinating Committee on Ground Water

Recommendations for Salt Storage

Guidance for Protecting Ohio's Water Resources

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John R. Kasich, Governor
Mary Taylor, Lt. Governor

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LIST OF ACRONYMS

BMP	Best Management Practices
CFR	Code of Federal Regulations
DRASTIC	[An acronym for the seven parameters used to develop Pollution Potential maps: **<u>D</u>**epth to water, net **<u>R</u>**echarge, **<u>A</u>**quifer media, **<u>S</u>**oil media, **<u>T</u>**opography, **<u>I</u>**mpact of the vadose zone media, **<u>C</u>**onductivity of the aquifer]
DSW	Division of Surface Water (Ohio EPA)
ERIN	Earth Resources Information Network
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
Ohio EPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
PTI	Permit-to-Install
RCRA	Resource Conservation and Recovery Act
SWAP	Source Water Assessment and Protection
SWP3	Storm Water Pollution Prevention Plan
SWPA	Source Water Protection Area
U.S. EPA	United States Environmental Protection Agency

INTRODUCTION

Purpose

The purpose of this document is to provide guidance on salt storage practices that will help prevent the contamination of ground water and surface water. “Salt”, as used here, includes solids such as the popular sodium chloride (NaCl), as well as potassium chloride (KCl), calcium chloride (CaCl2), and magnesium chloride (MgCl2). It also includes mixtures of the same substances with abrasives such as sand, cinder, slag, etc.

Background

A variety of Ohio organizations, including highway agencies, counties, cities, townships, distributors, and snow removal companies, stockpile salt to be spread on roads, walkways, and parking lots during the winter months to melt snow and ice. This storage is beneficial and necessary to ensure the safety and mobility of Ohio citizens, as well as the unimpeded mobility of goods and services. The downside is that, if not stored properly, the salt can contaminate water resources, and the owner or operator can be held liable for the damages. The environmental threat from salt storage is potentially much greater than the environmental threat from application to roads. When stored, a large amount of salt is concentrated at a single location, which can result in very salty storm water runoff. However, when applied, the environmental damage is generally minimized because the salt is widely dispersed and the runoff is diluted by ice and snow.

Recently, several salt storage piles in Ohio have been identified as the source of high chlorides in public or private ground water supplies. Chloride can cause water to taste bad when levels are above the secondary drinking water standard of 250 mg/L. High chloride can also corrode appliances such as washing machines. Treatment can be difficult and expensive and, in one particular instance, a village in southwestern Ohio lost its wellfield due to salt contamination. Additionally, elevated sodium in water above a U.S. EPA guideline of 20 mg/L presents health concerns for people on a low salt diet.

While Ohio has no rules specifically governing the storage of salt, ORC 6111 prohibits unauthorized discharge of pollutants to waters of the state, including runoff from salt storage. Ohio EPA considers brine created from rainfall passing through salt piles to be an industrial wastewater that is subject to permitting requirements. For a new salt storage site, Ohio EPA’s Division of Surface Water (DSW) can require a permit-to-install (PTI) to ensure adequate protection of water quality resources. When complaint investigations or routine audits for existing facilities indicate impacts to water resources due to poor management practices, DSW can take action to address any problems identified. Storm water permitting requirements pursuant to 40 CFR 122.26 and OAC 3745-39 must be met, as well as any local zoning requirements. For salt piles in designated urban areas, best management practices can be required under a Municipal Separate Storm Sewer System Permit (MS4), although there are no specific siting or design criteria. For salt stored at an industrial site, the Industrial Multi-Sector General Storm Water Permit would apply and would require the salt to be properly covered/enclosed. Ohio EPA-DSW can require a National Pollutant Discharge Elimination System (NPDES) permit for any site, regardless of location, if it is aware of pollution. Additionally, characterization and abatement of a release from a salt facility can be required under ORC 6111.04.

Elements of salt storage that are relevant to preventing contamination generally include siting, design, and operation. Siting recognizes that some locations are more likely to result in contamination than others due to the proximity of wells or surface water or the underlying geology's inability to impede the infiltration of salty runoff. Design refers to how a storage facility is constructed. Proper cover will prevent rain, and snow from contacting the salt and causing salty runoff. A proper pad will block any salty runoff from soaking into the ground vertically, and storm water controls can help manage the runoff. Operation refers to housekeeping and structural maintenance practices that serve to minimize salty runoff through, for example, avoiding/cleaning up spills or repairing facilities as necessary.

SITING

When siting a salt storage facility, accessibility to and from transportation routes such as major roadways, rail lines, and/or waterways is a major consideration, along with finding a location that is central to the roads that will be treated. Other factors could include availability of fuel and maintenance supplies for trucks; availability of water for truck washing, restrooms, and break rooms for the staff, etc. Proximity to water wells and various environmentally sensitive settings must also be a primary consideration[1]. Appropriate siting will minimize the likelihood of salt impacts on ground water and surface water, with all the disruption, expense, and liability this can entail.

These guidelines should be followed when siting a salt storage facility:

- **Water Wells.** Avoid locating within 300 feet of any well, whether used for drinking, irrigation, or industrial water supply.
- **Direct Conveyances.** Avoid locating within 100 feet of features that have the capability to serve as a rapid pathway for salty water to migrate, such as storm drains and ditches (including roadside ditches). Avoid locating within 300 feet of dry wells (drains directly into subsurface).
- **Surface water bodies.** Avoid locating within the 100-year floodplain of a stream or within 300 feet of a stream, river, lake, pond, or wetland.

For facilities where salt piles will be housed within a structure, but operations (mixing, unloading, and loading) will be conducted outside, the inner management zones of public drinking water source water protection areas[2] should be avoided.

Additionally, if a fixed structure is not practical and salt is stored outdoors, owners/operators should make every effort to avoid source water protection areas. Moreover, if the outdoor salt pile is large (greater than 3,000 tons), the following should be avoided:

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[1]Where storage and operations all occur within a structure, setbacks can be measured from the structure's walls. Otherwise, listed setbacks should be measured from the boundaries of the facility (or at least that portion of it where salt storage or operations can feasibly take place).

[2] A drinking water source protection area is the area that supplies ground water to a public water supply well within five years. Ohio EPA also delineates an inner management zone (based on a one year time of travel) to help identify the most critical portion of the protection area. Appendix A of this document (page A-2) provides guidance on how to locate these areas.

- Areas with a DRASTIC rating of 160 or higher, due to high sensitivity to ground water contamination. For counties where DRASTIC maps are not available, unconsolidated aquifers capable of producing 100 gallons per minute or more as indicated on ground water resources maps should be avoided. Both types of maps are produced by the Ohio Department of Natural Resources (ODNR) Division of Soil and Water Resources, and most are available electronically, as described in detail in Appendix A.

- Areas with shallow, fractured bedrock due to high sensitivity to ground water contamination.

At all times, salt pile owners/operators should employ the highest design and operation standards feasible to minimize the possibility of salty runoff into surface waters or infiltration into ground water. This is even more critical when facilities are located on or near sensitive water resources.

The above-listed siting recommendations are summarized in Table 1. Appendix A provides detailed guidance on how to use online information and computerized map applications at Ohio EPA and ODNR to locate the floodplains, water bodies, wells, source water protection areas, and hydrogeologically sensitive areas throughout Ohio. The user may also request technical assistance from Ohio EPA's Source Water Protection Program staff by calling 614-644-2752 or e-mailing a request to whp@epa.ohio.gov.

Table 1. Siting Recommendations for Salt Storage Facilities

	Indoor storage and operations	Storage indoors, but operations outdoors	Storage outdoors – small piles	Storage outdoors- large piles
Avoid 100-year floodplain	X	X	X	X
Maintain 300-foot setback from rivers, lakes, ponds, and wetlands	X	X	X	X
Maintain 300-foot setback from any well, whether used for drinking, irrigation or industrial water supply	X	X	X	X
Maintain 100-foot setback from conveyances such as storm drains and roadside ditches	X	X	X	X
Maintain 300-foot setback from dry wells	X	X	X	X
Avoid inner management zone of source water protection areas		X	X	X
Avoid entire source water protection areas (inner *and* outer zones)			X	X
Avoid areas that are hydrogeologically sensitive				X

If possible, owners/operators are encouraged to relocate their existing facilities that do not meet these siting recommendations. If relocation is not practical, owners/operators should at least be aware of proximity to floodplains, water bodies, wells and ditches, source water protection areas, and hydrogeologically sensitive areas. Such awareness may lead to improvements in containment measures, which will help protect the facility from damage (such as by flooding) or future liability issues related to surface water or ground water contamination.

STORAGE/LOADING PADS

All salt should be stored, mixed, and loaded on an impervious pad to prevent salt from infiltrating into the subsurface. Pads should be large enough to contain the salt and provide maneuvering room for trucks, loaders, and other equipment. Pad thickness and material should be capable of supporting the pile and the associated heavy equipment, thereby preventing cracking. Asphalt or concrete are preferred. If concrete is used, it should be of the high quality, air-entrained variety and treated with sealants, asphalt-type coatings or other treatments to repel salt and prevent chipping and crumbling.

The pad/loading pad should be sloped (1-2%) to let water drain away in accordance with any measures in place for storm water management (see Storm Water Control section). There should be no floor drains. Around the exterior of the structure, the pad should be curbed or sloped away to keep out run-on.

COVER

Salt should always be covered when it is stored. The benefits of preventing exposure to rain, snow, and wind are that it:

- minimizes salty run-off, thereby minimizing potential contamination and the need for storm water collection and disposal,
- minimizes air transportation and deposition,
- prevents lumpy salt, which is difficult to load and apply, and
- minimizes salt loss, which saves money and helps eliminate the need for emergency shipments.

Structures with walls and a roof are highly preferred for salt storage. It is difficult to fully cover a pile with a tarp, especially during storms and considering that the tarp needs to be removed to add or remove salt. However, for larger piles, storage in a structure is not always economically feasible, and the salt would need to be covered by a well-secured tarp.

Structures

Salt storage structures come in many shapes, sizes and materials. In some cases, a vacant structure that was designed for another purpose may provide suitable cover. The Salt Institute's *Salt Storage Handbook* contains tables showing how much space different piles will cover. It is environmentally beneficial for delivery, mixing, and loading to be under cover; therefore, structures should be large enough to permit easy movement of spreaders and delivery vehicles.

For the sake of comparing features relevant to containment of runoff, salt storage structures are grouped here into two basic types, structures with pervious walls and structures with impervious walls.

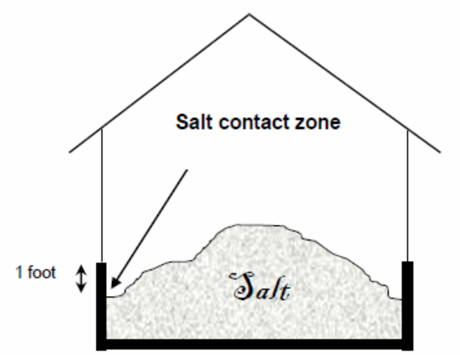


Figure 1. Recommended height of poured concrete walls

Structures with impervious walls offer the most environmental protection and consist of an integral sidewall and footing of poured and formed concrete to a height at least three feet or at least one foot higher than the salt contact zone (see Figure 1), whichever is greater. These walls should be designed to be free of gaps and cracking.

For the purposes of this document, all structures not meeting this description would be considered pervious regardless of the level of permeability. Pervious walls would include stacked block construction regardless of the waterproofing materials used. (Concrete block structures should be treated inside with a suitable sealant or coated with asphaltic material.) Structures with pervious walls offer a lesser degree of environmental protection.

Common examples of structure types found in Ohio built with both pervious and impervious walls are:

- **"Sheds" (wood framed structures with pervious sidewalls).** Any all-wood structure may be the least costly to build in the short term, but there are disadvantages. The weight of the salt against the walls tends to undermine the structure within years, resulting in cracks that allow precipitation in. Wooden structures are also susceptible to strong winds, snow loads, bumping from equipment, rot, and destruction by rodents and insects. For these reasons, they are the most likely to leak. Frequent maintenance (painting) will be needed to slow deterioration. In the long-term, a structure with concrete impervious walls may prove more cost-effective.

- **Open end (structures with impervious sidewalls but completely open on one end).** A three-sided structure with impervious walls and a roof is becoming more common in Ohio. Though more expensive, they can be easily adapted to size constraints and can be very accessible and durable. Choices of support and roofing type can greatly influence cost and service life. These issues need to be explored with a design professional. One advantage is that it is much easier to include covered unloading, mixing and loading areas with open-ended structures. However, salt may be blown out by wind, and precipitation may enter unless the facility is aligned to face away from prevailing winds. (In Ohio, prevailing winds are typically from the west, so ideally the structure should open to the east).

- **Closed end (structures with impervious sidewalls and confined entrance doors).** Four-sided structures and domes with poured-concrete walls are the most environmentally protective type of structure. They enclose the salt on all sides, allowing minimal intrusion of precipitation or spreading of salt by wind. For domes, the aerodynamic silhouette minimizes damage from snow loading or wind. However, dome structures are more complicated to build and, consequently, more expensive. Issues with domes and other confined entrance four-sided structures are that they are less versatile, less accessible by equipment, may provide little or no room for mixing, and may require ventilation and artificial lighting.

Table 2 summarizes the advantages and disadvantages of different structures. Detailed guidance on designing salt storage facilities is provided in the Salt Institute's *Salt Storage Handbook*.

Table 2. Salt Facility Structure Types: Some Pros and Cons

	Affordable	Accessible	Strong	Durable	**Effective in preventing runoff**
Any structure without an impervious base and/or sidewall. 	+++	++	+	+	++
Any roof type on 3-sided impervious concrete base. 	++	+++	++	++	+++
Any 4-sided or dome structure on an impervious concrete base. 	+	+	+++	++	++++

Tarps

If it is not feasible to store the salt in a structure, it is very important that the salt is covered properly with a durable and waterproof tarp. Acceptable materials include polyethylene, polyurethane foam, polypropylene, hypalon, canvas, and synthetic fiber.

The Salt Institute's *Salt Storage Handbook* contains tables showing how much space different height piles will cover and also provides exposure surface areas to use in calculating how many tarps would be needed. The Salt Institute's *Salt Storage Handbook* recommends sewing sections together with a two-inch standing seam. Taping the seams can improve waterproofing.

Tarps should also match the pile configuration. Configuration is determined by several factors, including site characteristics, equipment, and unloading methods. Prevailing winds should be considered when building the pile to ensure that the working end, once open, will be downwind. Outdoor salt should be placed into a windrow-, radial/kidney-, or sugarloaf-shaped pile (see Figure 2). Conical piles cannot be covered effectively with a flexible material and therefore are not recommended. See the Salt Institute's *Voluntary Guidelines for Distribution Stockpiles* for additional information on how various pile shapes are formed.

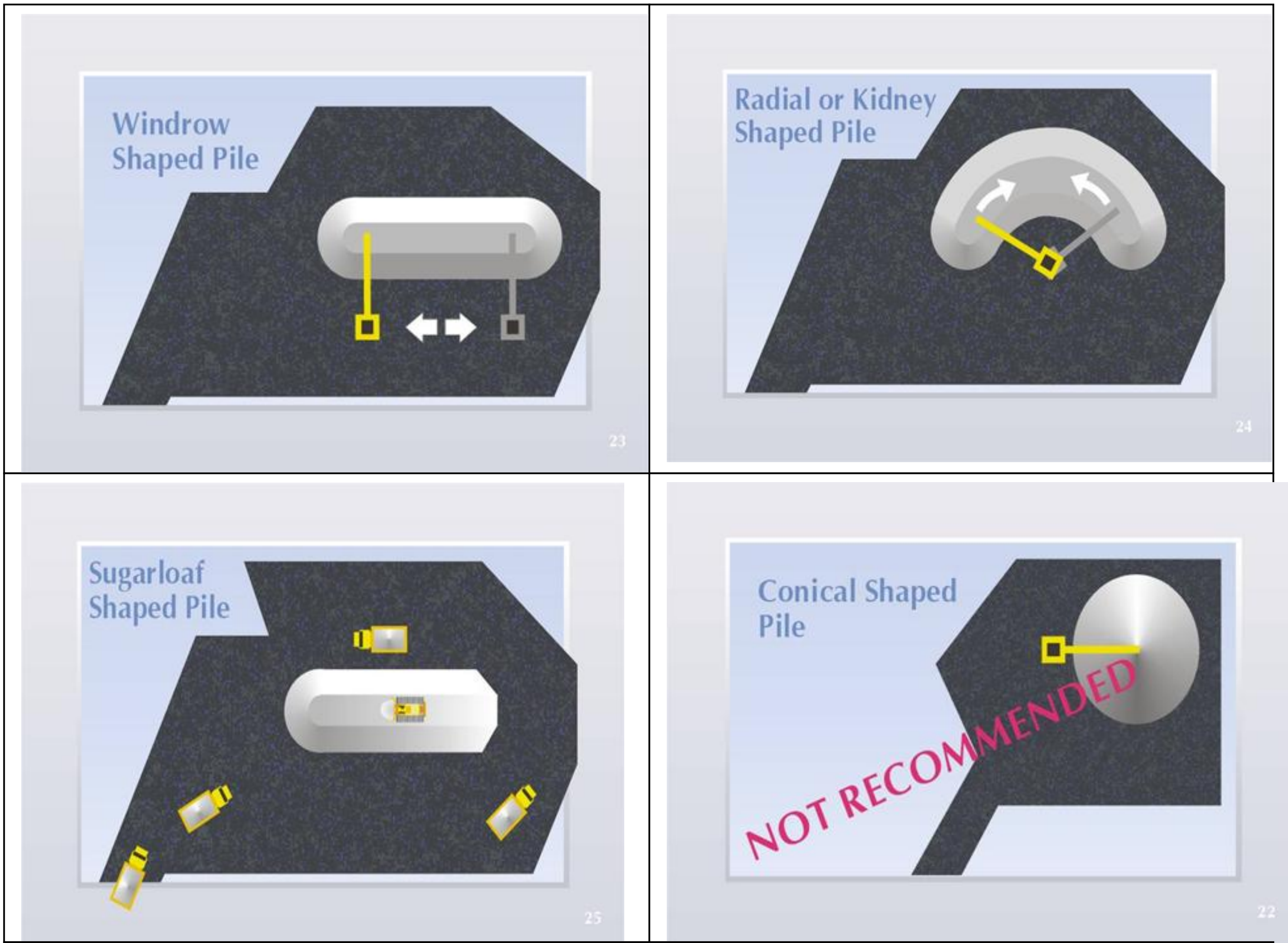


Figure 2. Outdoor salt storage pile shapes
Source: "Proper Bulk Salt Storage", Salt Institute , May 2012 (embedded Power Point presentation) at:
http://www.saltinstitute.org/Issues-in-focus/Education-Center/Salt-industry-guidelines/Stockpile-management-guidelines

The perimeter of the cover should be weighted down around the edges. Additionally, weight should be placed high enough on the pile to minimize slackness as salt shifts and flows down to the perimeter (Salt Institute's *Voluntary Guidelines for Distribution Stockpiles*). Sand bags lashed together with rope or cable and placed uniformly over the flexible cover provide a suitable method. Poly-cord nets are also available (Salt Institute's *Salt Storage Handbook)*. Items that hold water (e.g., old tires) should not be used.

OPERATIONS/SALT HANDLING

Good housekeeping during stockpiling, mixing, loading onto spreaders, and off-loading of unused salt from spreaders can prevent contact of salt with storm water, thereby minimizing salty runoff and preventing ground and surface water contamination. Consequently, it is very important that all employees involved with salt handling receive training in the proper practices.

When salt is handled outdoors, care should be taken to minimize spillage. Salt and sand/salt mixtures that are spilled should be collected and returned to storage as soon as possible.

Deliveries should be arranged such that salt is placed under cover as soon as possible upon arrival. Additionally, excess salt and sand remaining in spreaders following a storm should be returned to storage.

When Salt is Stored in a Structure

If the storage is in a structure, placing the salt directly inside is preferred to unloading it outside and then moving it inside. If the structure is three-sided, the salt should be kept pushed back from the open side to prevent exposure.

Sand and salt mixing and loading of spreaders should be indoors. If it is necessary to mix outdoors, it should be done during dry weather and the mixture should be immediately loaded to a spreader or to storage. Small, temporary piles should be covered with a water-proof tarp. The mixing should be on a properly constructed pad as close to the storage area as possible and, following mixing, the area should be swept and the sweepings returned to storage.

When Salt is Stored Outdoors

If storage is outdoors, the salt should be covered with a tarp in sections or stages as it is added. While it may be difficult to maintain daily cover for an extremely large pile, every effort should be made to minimize the time that it is uncovered. The time period can be minimized by storing salt in windrow-shaped piles, where there may be more than one pile, and only the pile being built at any one time needs to be uncovered. Due to the difficulty in maintaining cover, Ohio EPA will require a permit-to-install with storm water containment and disposal for outdoor piles that are in place for more than seven days.

The Salt Institute provides specific procedures for removing salt from a large outdoor, tarped pile in its *Voluntary Guidelines for Distribution Stockpiles*:

- Remove covering at the working face just high enough to load out the day's shipment. This will minimize moisture absorption and secure the cover if wind direction shifts toward the working face.

- Maintain the working face perpendicular to the long axis of the pile by loading alternately left/right and right/left.

- Avoid creating a horseshoe-shaped working face that results from removing the center of the pile and leaving extended edges or aprons.

- Chunks of salt that form as the crust of the pile breaks up must be crushed and blended into the pile and not allowed to accumulate.

- Maintain adequate cover at the lower edge or toe of the working face to permit maximum possible resealing of the edge of the cover when operations are completed for the day. Take care to avoid cover damage caused by cascading salt from the upper section of the working face.

- Establish and maintain the working face at the downwind end of the stockpile whenever operationally feasible.

Mixing should be on a properly constructed pad as close to the storage area as possible and, following mixing, the area should be swept and the sweepings returned to the storage pile.

Operations should be designed to minimize generation of dust and other air emissions. Specific recommendations for doing so can be found in the Salt Institute's *Voluntary Guidelines for Distribution Stockpiles*.

Spreader Washing

Spreader wash water is likely contaminated with dirt, oil, grease, and salt. Spreaders should be washed where the water can be properly contained, diluted, disposed, or treated. Prior to washing, spreaders should be swept to remove as much of the residual solids as possible to minimize the amount of dissolved salt and solids in the wash water.

Where possible, vehicles should be washed indoors rather than outdoors to contain the wash water. Where only outdoor washing is possible, it should be done where all water can be contained and directed through positive drainage to a containment system. Additional information can be found in the Ohio EPA fact sheet, *Mobile Power Washing and Environmental Regulations,* available at: http://www.epa.ohio.gov/portals/41/sb/publications/powerwash.pdf

If Brine is Stored

Liquid deicing materials, such as salt brine or magnesium chloride, should be stored in well-maintained and labeled storage tanks. Scheduled maintenance should be performed on the storage tank fittings, valves and pumps. Any leaking or dripping should be addressed in a timely manner.

Where practical, secondary containment should be provided (double-walled tanks or containment dikes). Typically, containment is 110-125% of the capacity of the largest tank.

STRUCTURAL MAINTENANCE

Salt storage facilities should be maintained in a manner that will assure physical integrity consistent with original design criteria. Keeping structures in good repair will prevent releases.

A good maintenance program starts with regular inspections of storage structures and work areas. Here are some tips:

- Any roof leaks, tears, or damage should be temporarily repaired during winter to reduce the entrance of precipitation, with permanent repairs being completed prior to the next winter season. At no time should leaks be allowed to persist when materials are being stored inside. Leaks in walls need to be similarly repaired.

- For the pad/loading pads, practice preventative maintenance such as periodic resealing to maintain the low permeability. Seal expansion joints when necessary.

- Repair and reseal cracks in the floor.

A deteriorating tarp needs to be either repaired or replaced.

STORM WATER MANAGEMENT

Ohio EPA-DSW Requirements

ORC 6111 prohibits unauthorized discharge of pollutants to waters of the state, including runoff from salt storage. Ohio EPA-DSW exercises this authority through the following:

- **New Facilities:** Anyone considering a new salt storage facility should consult with Ohio EPA-DSW to determine the potential need for permitting pursuant to ORC 6111.45. The Division will not require a PTI when a permanent building/structure is proposed and the owner/operator follows the recommendations in this document. However, if salt will be stored outdoors for more than seven days, a PTI with storm water containment and disposal will be required to ensure protection of water quality resources. The performance standard expected to be achieved with a new facility is no discharge to surface or ground water.

- **Existing Facilities:** When complaint investigations or routine storm water audits for existing facilities indicate impacts to water resources due to poor management practices, DSW can take action to address any problems identified. Salt storage and handling, in addition to BMP implementation, are evaluated during inspections. To minimize the potential for compliance issues and to reduce liability, it is highly recommended that the recommendations in this document be followed. Compliance issues include contamination of surface water or ground water in violation of ORC 6111.04.

- **Permitting Requirements for New and Existing Facilities:** For salt piles located in designated urban areas, best management practices can be required under a Municipal Separate Storm Sewer System Permit (MS4), although there is no specific siting or design criteria. For salt stored at an industrial site, the Industrial Multi-Sector General Storm Water Permit would apply and would require the salt to be properly covered/enclosed. For additional information, see 40 CFR 122.26 and OAC 3745-39.

Written Plan

A storm water pollution prevention plan (SWP3) is integral to ensuring appropriate implementation of the siting, storage and handling issues addressed in this guidance document. Such a plan is recommended for each facility that incorporates salt. The SWP3 should identify potential sources of pollution that may be reasonably expected to affect the quality of storm and ground water discharges associated with salt/brine storage and handling. In addition, the SWP3 should describe and ensure the implementation of practices used to reduce the pollutants in storm water and prevent discharges to ground water associated with salt storage and handling.

SWP3s are specifically required for facilities covered under Ohio EPA's Industrial Multi-Sector General Storm Water Permit. In addition, most municipal operations covered under Ohio EPA's MS4 permit are required to develop and implement a SWP3. These permits are NPDES Permits with specific conditions to develop and implement a SWP3. The SWP3 guidance in this document (see Appendix B) addresses salt storage and handling and may not incorporate all requirements subject to NPDES permit conditions. If your facility is subject to NPDES requirements, please refer-the following web address to ensure all permit conditions are addressed: http://www.epa.gov/npdes/pubs/industrial_swppp_guide.pdf

Run-on

Stockpiles need to be kept as dry as possible. Storm water and snowmelt should be diverted from running onto storage and loading areas, thereby preventing contact with salt. Diversion can be accomplished using berms, swales, and drains.

Uncontaminated Storm Water Management

The best storm water management option is to eliminate the potential for salt-contaminated runoff and thus remove the need for collection and disposal. This can be accomplished by following this document's recommendations as closely as possible.

For salt storage sites, storm water can be considered uncontaminated if there is no storm water exposure associated with salt storage and handling. In the event the owner/operator wishes to conduct storm water sampling for further analysis, please refer to the guidance on "how and where to sample storm water," provided in U.S. EPA's *Industrial Storm Water Monitoring and Sampling Guide*, at: http://www.epa.gov/npdes/pubs/msgp_monitoring_guide.pdf

If uncontaminated storm water is collected in a containment area, it can be applied to the soil surface outside the containment area, as long as the application does not cause ponding, flooding, erosion, or nuisance on adjacent property, and does not discharge chloride to ground water at levels above 250 mg/L). It can also be directly discharged to surface water or discharged directly to a municipal sanitary sewer with prior approval.

Contaminated Storm Water Management

If there is storm water exposure associated with salt storage and handling, collection of storm water run-off is necessary to minimize discharge of pollutants to surface water and to prevent discharges to ground water. Storm water control is necessary for outdoor salt piles. The following best management practices should be implemented:

- A collection system should be established to channel all storm water run-off to a centralized location. A collection-system is comprised of a series of berms, ditches and/or pipes capable of containing the runoff resulting from a 100 year/24 hour storm event. The collection system should divert runoff to a pond or large tank. Again, the pond/tank should be sized to contain a 100 year/24 hour storm event. Standards for developing ponds, diversions, and storm water controls can be found at: http://www.dnr.state.oh.us/tabid/9186/default.aspx

Precipitation data can be found at:
http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=oh

- An impermeable synthetic liner should be incorporated to prevent discharges to ground water if a centralized collection pond is used.

- No contaminated discharge from the impoundment is permissible, including discharge to a storm sewer. Discharging brine to storm sewer systems is considered illegal under current Ohio EPA storm water management regulations. Hauling frequency should be defined in the SWP3 to ensure that there is no discharge to surface waters of the state. All collected storm water must be handled in accordance with the following:

  --Re-use in approved de-icing operations such as brine production.

  -- Authorized disposal at a publicly owned wastewater treatment facility with an Ohio EPA approved pretreatment program. Please note this will require prior approval from the municipality.

  --Disposal at an approved Class I injection well.

Alternate disposal practices will be considered with the approval of Ohio EPA-DSW.

Water Quality Monitoring

Owners/operators should consider monitoring storm water quality every six months to verify that discharges continue to be at levels consistent with best management practices and/or discharge permits. Analytical parameters could include total suspended solids, total dissolved solids, chloride, cyanide (free or total), and total iron, with field analysis for specific conductance, pH, and temperature. Guidance on how, when, and where to sample storm water is provided in U.S. EPA's *Industrial Storm Water Monitoring and Sampling Guide*, at:
http://www.epa.gov/npdes/pubs/msgp_monitoring_guide.pdf

Owners/operators should also consider monitoring shallow ground water quality using up-gradient and down-gradient monitoring wells to aid in the determination of the extent of the impacts and effectiveness of the mitigation measures taken. Such monitoring should be conducted for large outdoor piles (>3,000 tons) and, for any salt storage facility, when there are drinking water wells nearby, and when the storage facility is within the inner management zone of a source water protection area. For new facilities, ground water monitoring should be completed prior to the site being commissioned to provide a baseline for comparison to future results. Discharges to ground water are prohibited and considered a violation of ORC 6111.04.

At minimum, parameters should include field analyses of pH, specific conductance, and temperature, and lab analyses of total dissolved solids, chloride, and sodium. Including bromide may be valuable because the results could assist in distinguishing a source when the contamination may be coming from something other than the operator's salt storage[3]. For more recommendations on ground water monitoring techniques, see Ohio EPA's *Technical Guidance Manual for Ground Water Investigations* at: http://www.epa.ohio.gov/ddagw/tgmweb.aspx

[3] Panno et al., 2006. "Characterization and Identification of Na-Cl Sources in Ground Water". *Ground Water* 44, 176-187.

APPENDIX A

Instructions on Using State Databases and Computer Applications to Locate Siting Issues

The user may request technical assistance from Ohio EPA's Source Water Protection Program staff by calling 614-644-2752 or e-mailing a request to whp@epa.ohio.gov. Provide the staff with the address for your proposed or existing salt facility; they can then e-mail you a site map showing the locations of siting issues to be avoided.

Alternately, users may conduct their own research using the following information.

How to locate private water wells, 100-year floodplains, and source water protection areas:

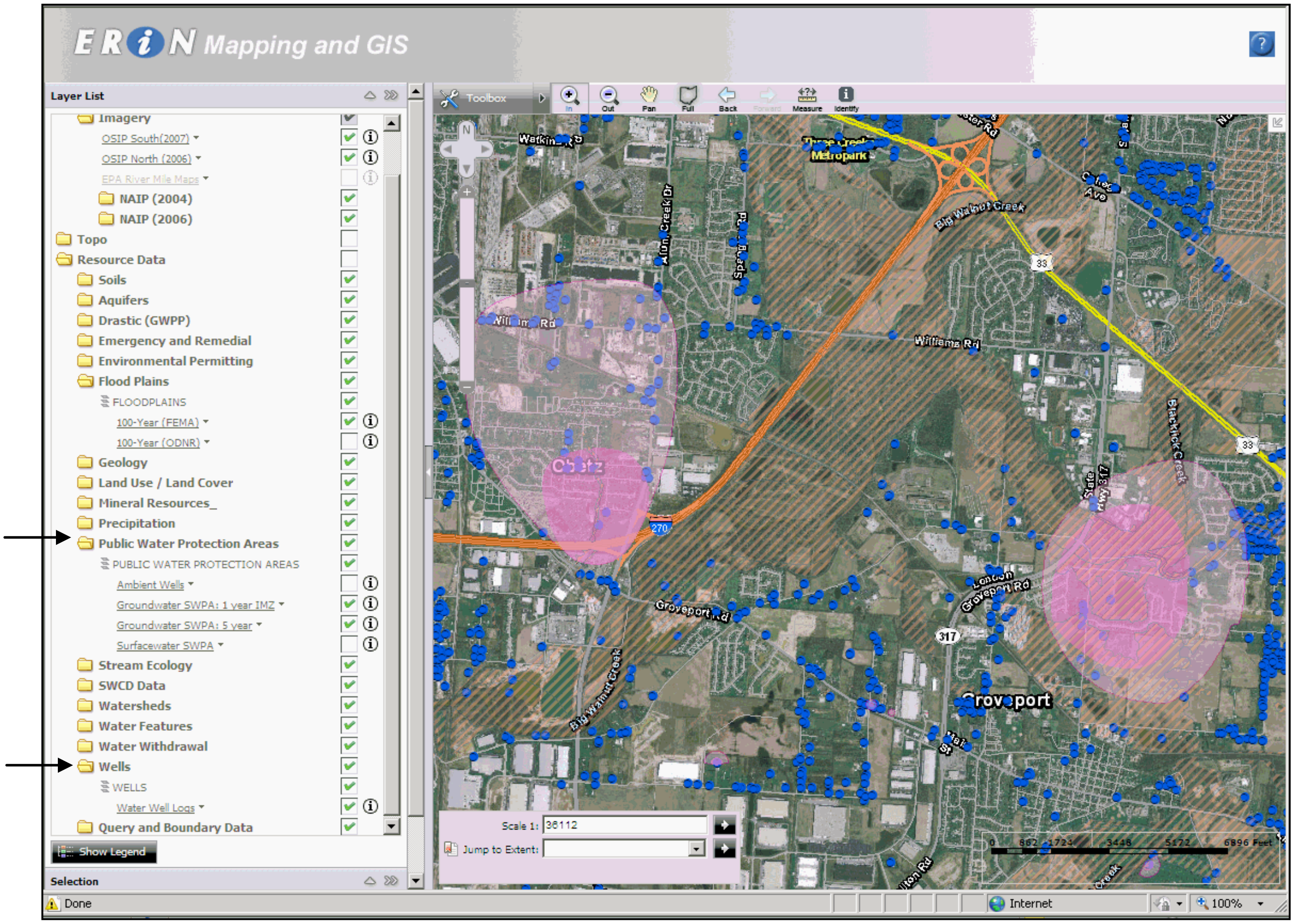
The Ohio Department of Natural Resources (ODNR) has developed a computer application called the Earth Resources Information Network (ERIN) that enables a user to view various types of geographic features on electronic maps. These include water bodies, source water protection areas, private wells and hydrogeologically sensitive areas.

To use ERIN, type www.ohioerin.com. This will open a page at ODNR's website. At the left you will see a box titled "Mapping and GIS".

Click on ERIN GIS. This will open the application; you will see a map of Ohio. You can use the tools at the top of the map to zoom in to your area of interest. Note that some features (such as aerial photography) will not be displayed until you have zoomed in sufficiently.

To the left of the map you will see a list of the features that can be displayed on the map. To activate a feature, you will need to click on the box to the right of the text. If the box is already checked, clicking on the text itself will open up a drop-down list of sub-features.

The tutorials are highly recommended, especially for anyone not familiar with GIS. They are brief and clearly explained, and will help you use ERIN effectively.



Water wells – locations of wells with verified geolocations are shown as blue dots (some wells may exist that are not geolocated). *Click on **Wells**, then check the box for <u>Water Well Logs</u>*

100-year floodplain –areas shaded as pink stipple. *Click on **Flood Plains**, then check the box for <u>100-Year (FEMA)</u>*

Source water protection areas – shown as pink shapes, one inside the other. The darker pink inner shape is the inner management zone (1-year time-of-travel area) and the larger, enclosing shape is the outer zone (5-year time-of-travel area). Together they form the source water protection area.
*Click on **Public Water Protection Areas**, then check the boxes for <u>Groundwater SWPA: 1 year IMZ</u> and <u>Groundwater SWPA: 5 year.</u>*

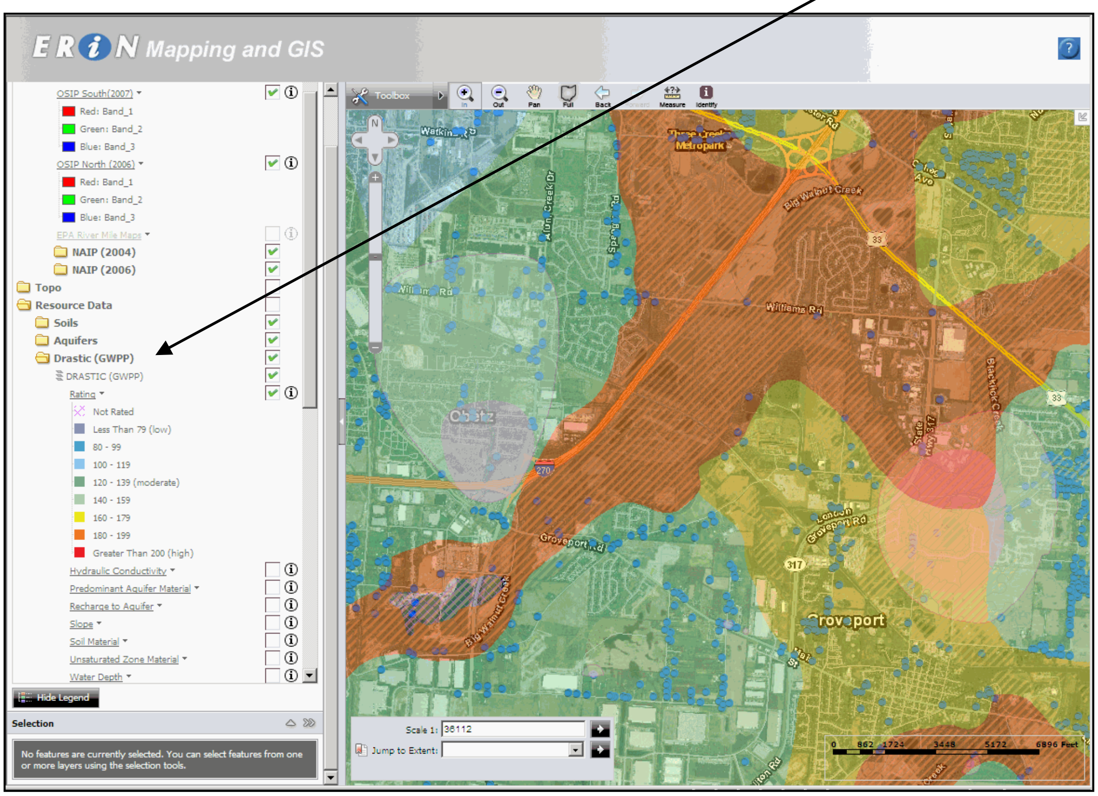
How to find hydrogeologically sensitive areas:

The Ohio Department of Natural Resources (ODNR) has developed "Pollution Potential Maps" for most of Ohio, also known as "DRASTIC maps". These county-based maps provide a numerical rating of ground water sensitivity to contamination based on seven parameters. **Areas rated 160 or above are less suitable sites for salt storage.**

Pollution Potential maps (DRASTIC maps) are available for 75 of Ohio's 88 counties. On the map at left, the counties shaded blue—mostly in southern Ohio-- still do not have a DRASTIC map.

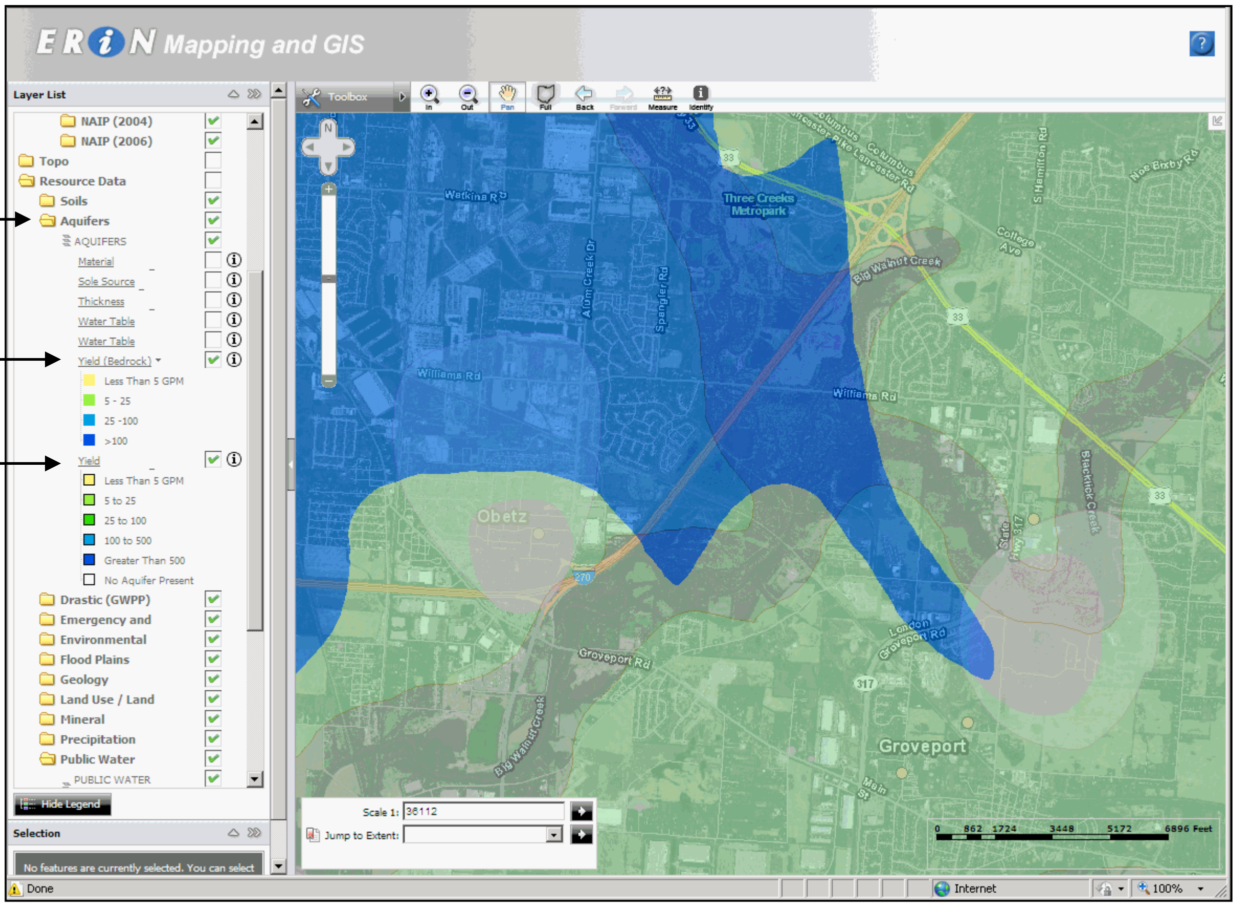
DRASTIC is an acronym for the seven parameters used to develop the maps:
Depth to water
Net **R**echarge
Aquifer media
Soil media
Topography
Impact of the vadose zone media
Conductivity of the aquifer

To locate the areas that have a DRASTIC score over 160, *click **Drastic (GWPP)** on the left panel, and check the <u>Rating</u> box*.



This will pull up the pollution potential GIS layer. To interpret the colors, click on the “Show Legend” button at the bottom of the list. This will show a list of colors, with the corresponding DRASTIC score. Generally, **areas rated 160 and above are the “warm” colors: yellow, orange and red**.

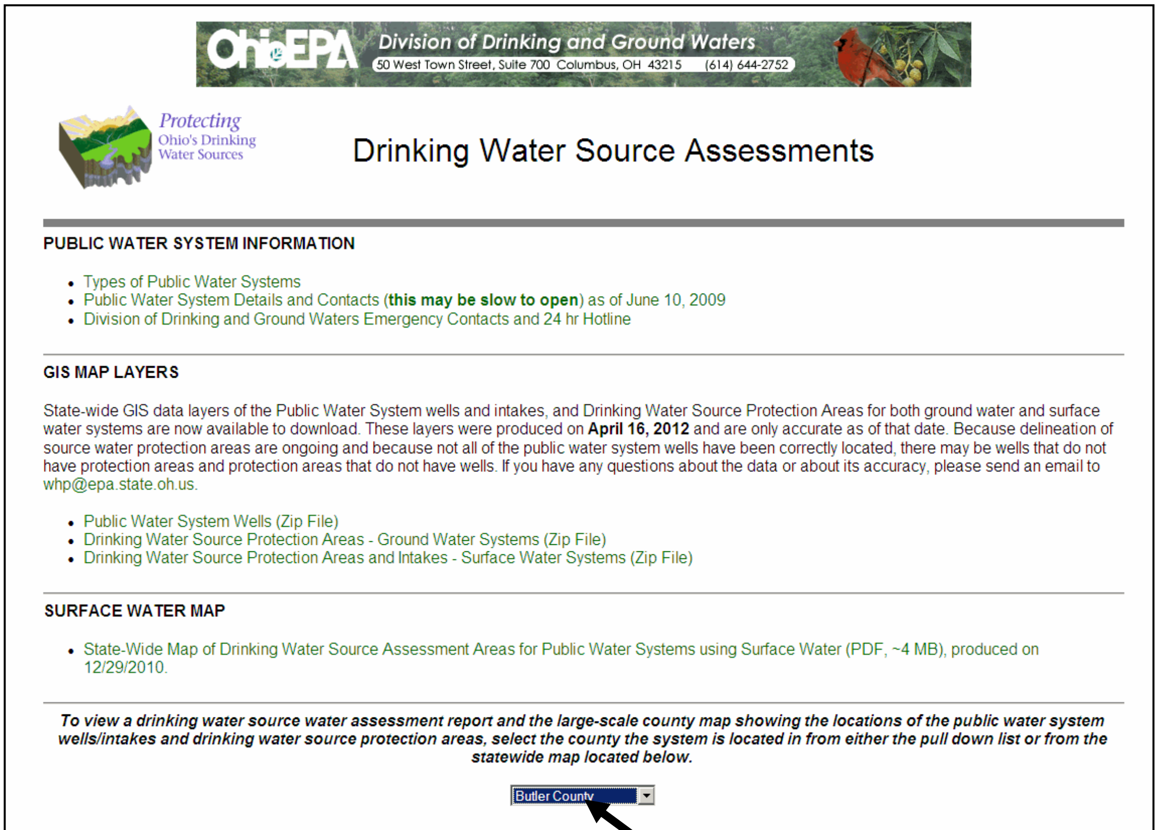
If a Pollution Potential map is not yet available for the county of interest, ODNR’s Ground Water Resources maps may be used instead; in this case, areas to avoid are where ground water resources are **greater than 100 gallons per minute (gpm)**. For most counties, this information can be accessed through ERIN: *click on **Aquifers** and then check the boxes for both Yield (Bedrock) and Yield (Sand/Gravel). Click on the “Show Legend” button at the bottom of the list to bring up the color scheme.* Areas shaded blue have yields of greater than 100 gpm and should be avoided if possible.



Most of the ground water resources maps are available on ERIN, but not all. Ground Water Resources maps for all 88 Ohio counties can be accessed by going to http://www.dnr.state.oh.us/tabid/3629/Default.aspx and clicking on the county of interest (listed in a table at the bottom of the web page).

How to locate public water system wells:

The locations of public drinking water wells are not easily identified on ERIN. Instead, the user should go to Ohio EPA's Source Water Protection (SWAP) web page at http://www.epa.ohio.gov/ddagw/swap.aspx and register to use the password-protected website. Once you have received a password, re-enter the SWAP web page and click on Accessing Reports, Maps and GIS Data. This will open the following screen:



Ohio EPA Division of Drinking and Ground Waters
50 West Town Street, Suite 700 Columbus, OH 43215 (614) 644-2752

Protecting Ohio's Drinking Water Sources

Drinking Water Source Assessments

PUBLIC WATER SYSTEM INFORMATION

- Types of Public Water Systems
- Public Water System Details and Contacts (**this may be slow to open**) as of June 10, 2009
- Division of Drinking and Ground Waters Emergency Contacts and 24 hr Hotline

GIS MAP LAYERS

State-wide GIS data layers of the Public Water System wells and intakes, and Drinking Water Source Protection Areas for both ground water and surface water systems are now available to download. These layers were produced on **April 16, 2012** and are only accurate as of that date. Because delineation of source water protection areas are ongoing and because not all of the public water system wells have been correctly located, there may be wells that do not have protection areas and protection areas that do not have wells. If you have any questions about the data or about its accuracy, please send an email to whp@epa.state.oh.us.

- Public Water System Wells (Zip File)
- Drinking Water Source Protection Areas - Ground Water Systems (Zip File)
- Drinking Water Source Protection Areas and Intakes - Surface Water Systems (Zip File)

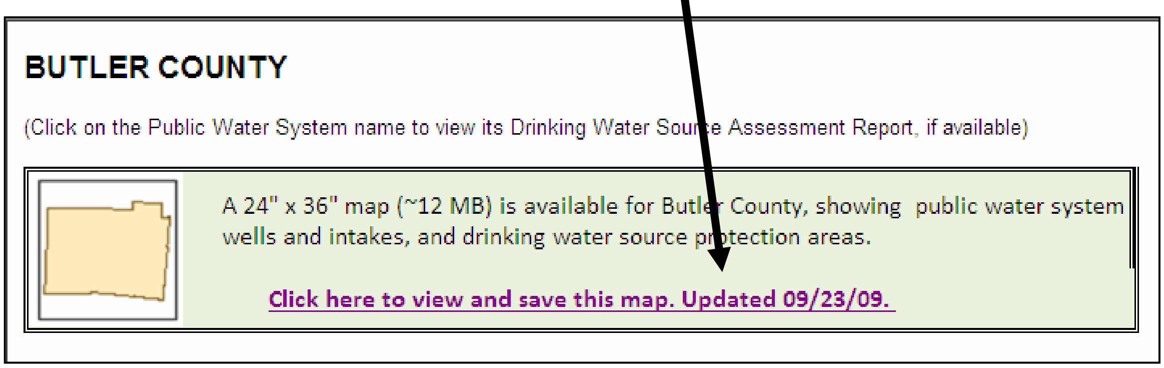
SURFACE WATER MAP

- State-Wide Map of Drinking Water Source Assessment Areas for Public Water Systems using Surface Water (PDF, ~4 MB), produced on 12/29/2010.

To view a drinking water source water assessment report and the large-scale county map showing the locations of the public water system wells/intakes and drinking water source protection areas, select the county the system is located in from either the pull down list or from the statewide map located below.

Butler County

Select the county of interest by clicking on the dropdown list at the bottom. This will bring up a page with a link to the county map at the top. Click here:

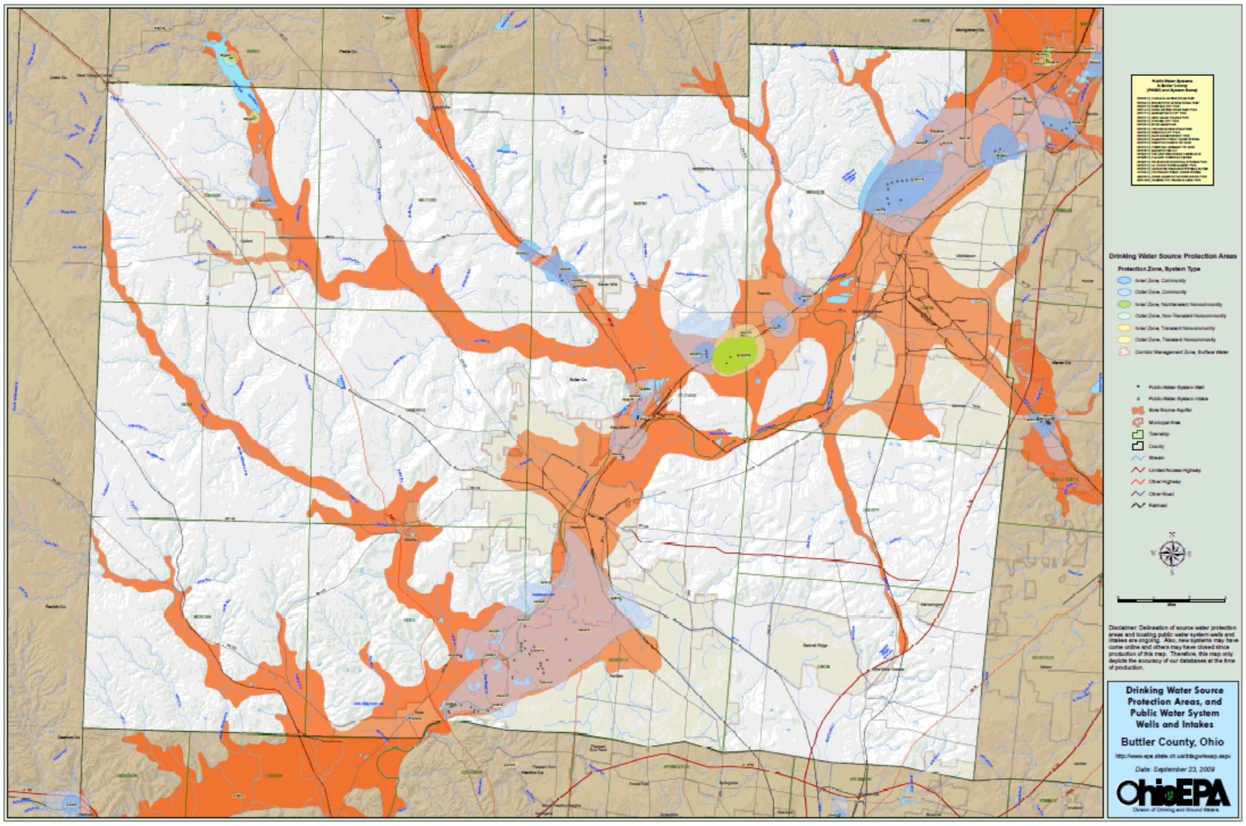


BUTLER COUNTY

(Click on the Public Water System name to view its Drinking Water Source Assessment Report, if available)

A 24" x 36" map (~12 MB) is available for Butler County, showing public water system wells and intakes, and drinking water source protection areas.

Click here to view and save this map. Updated 09/23/09.



This will pull up the county map (such as the one shown above). By clicking repeatedly on the + button at the top of the screen, you can zoom in to the area of interest. Once you are zoomed in close enough, the locations of the wells will appear.

APPENDIX B

STORM WATER POLLUTION PREVENTION PLAN (SWP3)

***Contents*:** The SWP3 should include, at minimum, the following:

Pollution Prevention Team: Each SWP3 should identify a specific individual or individuals within the facility organization as members of a Storm Water Pollution Prevention Team that is responsible for developing the plan and assisting the facility or plant manager in its implementation, maintenance, and revision. The plan should clearly identify the responsibilities of each team member. The responsibilities should address all aspects of the facility's SWP3.

Description of Potential Pollutant Sources: Each SWP3 should describe potential sources that may reasonably be expected to add pollutants to storm and ground water discharges or that may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. Each SWP3 should identify all activities and significant materials associated with salt storage and handling that may be pollutant sources. It is expected that the plan would address location, storage, and handling of salt. In addition, all equipment and associated maintenance utilized for salt storage and handling should be included. If storm water run-off is collected, the location and description of operations should be addressed in this section.

Site Map: A site map indicating an outline of the drainage area of each storm water outfall should be developed. All structural control measures to reduce pollutants in storm and ground water discharges, surface water bodies, and all sensitive areas depicted in the siting criteria above should be included. The map should include the locations of materials or activities associated with salt storage and handling, and the locations of all associated maintenance activities. The map must clearly identify drainage, including run-off and run-on management control measures such as diversions, retention/detention ponds, and all treatment/collection measures.

Inventory Storage and Handling Areas Materials: An inventory of the types of materials handled and stored associated with salt storage and handling must be included in the SWP3. Such inventory should include a narrative description of materials that have been handled, treated, stored or disposed in a manner to allow exposure to storm water; method and location of storage or disposal; practices employed to minimize contact of materials with storm water runoff; the location and a description of existing structural and non-structural control measures to reduce pollutants in storm water runoff; and a description of any treatment the storm water receives.

Measures and Controls: Appropriate storm water management controls should be described and implemented. The appropriateness and priorities of controls in a SWP3 should reflect identified potential sources of pollutants at the facility. The description should address the following minimum components, including a schedule for implementation:

1. Good Housekeeping - Refer to Salt Handling section of this document.

2. Preventive Maintenance - Refer to Structural Maintenance and other sections of this document addressing maintenance.

3. Spill Prevention and Response Procedures - Describe your procedures for preventing and responding to spills and leaks. Be sure to include all appropriate contact information. (Ohio EPA's Spill line at 1-800-282-9378 should be included) Response procedures should include notification of appropriate facility personnel, emergency agencies, and regulatory agencies, and procedures for stopping, containing and cleaning up spills. Measures for cleaning up hazardous material spills or leaks must be consistent with applicable Resource Conservation and Recovery Act (RCRA) regulations at 40 CFR part 264 and 40 CFR Part 265. Employees who may cause, detect or respond to a spill or leak must be trained in these procedures and have necessary spill response equipment available. If possible, one of these individuals should be a member of your Pollution Prevention Team.

4. Inspections - Qualified facility personnel should be identified to inspect designated equipment and areas of the facility at appropriate intervals specified in the SWP3. A set of tracking or follow-up procedures should be used to ensure that appropriate actions are taken in response to the inspections. Records of inspections should be maintained. The inspections should include the evaluation of all salt/brine storage and handling areas, all mixing areas, and the evaluation of the intended function of all BMP's (roofs, tarps, areas of secondary containment, good housekeeping practices and runoff treatment/collection areas)

5. Employee Training - Employee training programs should inform personnel at all levels of responsibility of the components and goals of the storm water pollution prevention plan. Training should address topics such as spill response, good housekeeping and material management practices. The SWP3 should identify periodic dates for such training.

6. Record-keeping and Internal Reporting Procedures - A description of incidents such as spills, or other discharges, along with other information describing the quality and quantity of storm water discharges should be included in the SWP3 required under this part. Inspections and maintenance activities should be documented and records of such activities should be incorporated into the SWP3.

7. Non-Storm Water Discharges: The SWP3 should include a certification that the discharge has been tested or evaluated (does not necessarily require discharge sampling) for the presence of non-storm water discharges. The certification should include the identification of potential significant sources of non-storm water at the site, a description of the results of any test and/or evaluation for the presence of non-storm water discharges, the evaluation criteria or testing method used, the date of any testing and/or evaluation, and the on-site drainage points that were directly observed during the test. A simple evaluation of all outfalls during dry weather would address this issue.

Management of Runoff: The SWP3 should contain a narrative consideration of the appropriateness of traditional storm water management practices (practices other than those which control the source of pollutants) used to divert, collect, reuse, or otherwise manage storm water runoff in a manner that reduces pollutants in storm water discharges from the site.

The SWP3 should provide measures determined to be reasonable and appropriate and they should be implemented and maintained.

Comprehensive Site Compliance Evaluation: Qualified personnel should conduct site compliance evaluations at appropriate intervals specified in the SWP3 at least once a year. Such evaluations should provide an overall evaluation of the SWP3 and a comprehensive review of all in house inspection to determine and trends and improvement opportunities.