

Chapter NR 746

RISK SCREENING AND CLOSURE CRITERIA FOR PETROLEUM PRODUCT CONTAMINATED SITES, AND AGENCY ROLES AND RESPONSIBILITIES FOR PETROLEUM CONTAMINATED SITES

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NR 746.01 Purpose. ~~One~~**The** purpose of this chapter is to identify the roles, processes and procedures that guide the departments of commerce and natural resources in the administration of their respective responsibilities under ss. 101.143, 101.144, 292.11 and 292.31, and ch. 160, Stats., for oversight and supervision of high, medium and low risk sites where petroleum products have discharged from petroleum storage tanks. This chapter codifies a memorandum of understanding that is required by s. 101.144 (3m), Stats. ~~Another purpose of this chapter is to establish standards to be applied by both agencies for determining when sites can be closed because it can be documented during either the investigation or remediation phase that the risk screening criteria in s. NR 746.06 and the closure criteria in s. NR 746.07 or 746.08 have been satisfied. The risk screening and closure criteria in this chapter, when used to make closure decisions, define on a site-specific basis when natural attenuation will achieve groundwater enforcement standards within a reasonable time.~~ Nothing in this chapter is intended to limit the independent authority of either agency to carry out responsibilities not specifically described in this chapter, including, without limitation, the authority of the department of commerce to apply ch. Comm 47.

Note: ~~This rule, adopted jointly by the Department of Commerce and the Department of Natural Resources, also appears in the Wisconsin Administrative Code as ch. Comm 46.~~

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.02 Applicability. This chapter only applies to sites where petroleum products have discharged from petroleum storage tanks.

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.03 Definitions. In this chapter:

(1) "Discharge" has the meaning specified in s. 292.01 (3), Stats.

Note: Under s. 292.01 (3), Stats., “discharge” means, but is not limited to, “spilling, leaking, pumping, pouring, emitting, emptying or dumping.”

(2) “DNR” means the department of natural resources.

(3) “Enforcement standard” has the meaning specified in s. 160.01 (2), Stats. Note: Section 160.01 (2), Stats., defines “enforcement standard” to mean “a numerical value expressing the concentration of a substance in groundwater which is adopted under ss. 160.07 and 160.09.”

(4)

~~“Free product” means petroleum product that is not in dissolved phase, and is present with a thickness of 0.01 feet or more as verified by more than one sampling event.~~

(54)

“Groundwater” has the meaning specified in s. 160.01 (4), Stats. Note: Section 160.01 (4), Stats., defines “groundwater” to mean “any water of the state, as defined in s. 281.01 (18), occurring in a saturated subsurface geological formation of rock or soil.” Section 281.01 (18), Stats., defines “waters of the state” to include “those portions of Lake Michigan and Lake Superior within the boundaries of this state, and all lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, marshes, watercourses, drainage systems and other surface water or groundwater, natural or artificial, public or private, within this state or its jurisdiction.”

(65) “High-risk site” has the meaning specified in s. 101.144 (1) (aq), Stats. (as created by 1999 Wis. Act 9).

Note: Section 101.144 (1)(aq), Stats., defines “high-risk site” to mean “the site of a discharge of a petroleum product from a petroleum storage tank if at least one of the following applies:

1. Repeated tests show that the discharge has resulted in a concentration of contaminants in a well used to provide water for human consumption that exceeds a preventive action limit, as defined in s. 160.01 (6).
2. Petroleum product that is not in dissolved phase is present with a thickness of 0.01 feet or more, as shown by repeated measurements.
3. An enforcement standard is exceeded in groundwater within 1,000 feet of a well operated by a public utility, as defined in s. 196.01 (5), or within 100 feet of any other well used to provide water for human consumption.
4. An enforcement standard is exceeded in fractured bedrock.”

~~(7) “Low permeability material” means subsurface material above bedrock, as defined in s. NR 141.05 (5), that is at or below the water table and has a hydraulic conductivity less than or equal to 1×10^{-5} centimeters per second that has been determined as required in s. NR 746.05.~~

Note: Section NR 141.05 (5) defines “bedrock” to mean “the solid rock underlying any loose surficial material such as soil, alluvium or glacial drift. Bedrock includes but is not limited to limestone, dolomite, sandstone, shale and igneous and metamorphic rock.” In the absence of evidence to the contrary, the agencies consider all bedrock in Wisconsin to be fractured.

(86)

- "Low risk site" means the site of a discharge of a petroleum product from a petroleum storage tank where contaminants are contained only within the soil on the source property and there is no confirmed contamination in the groundwater.
- (97)** "Medium risk site" means the site of a discharge of a petroleum product from a petroleum storage tank where contaminants have extended beyond the boundary of the source property, or there is confirmed contamination in the groundwater, but the site does not meet the definition of a high-risk site.
- (10)** ~~"Monitoring well" means a groundwater monitoring well designed, installed, constructed and developed in accordance with the requirements of ch. NR 141, for the purpose of monitoring groundwater or obtaining geologic or groundwater related data. The term "monitoring well" includes piezometers and water table observation wells.~~
- (11)** ~~"Natural attenuation" has the meaning specified in s. 101.143 (1) (cq), Stats. Note: Section 101.143 (1)(cq), Stats., defines "natural attenuation" to mean "the reduction in the concentration and mass of a substance, and the products into which the substance breaks down, due to naturally occurring physical, chemical and biological processes." These processes occur without human intervention or enhancement, and include, but are not limited to, dispersion, diffusion, sorption and retardation, and degradation processes such as biodegradation, abiotic degradation and radioactive decay.~~
- (12)** ~~"Permeable material" means a subsurface material that is at or below the water table and that is not a low permeability material.~~
- (138)** "Petroleum product" has the meaning specified in s. 101.143 (1) (f), Stats. Note: Section 101.143 (1)(f), Stats., defines "petroleum product" to mean "gasoline, gasoline alcohol fuel blends, kerosene, fuel oil, burner oil, diesel fuel or used motor oil." The term "petroleum product" includes substances that are, or once were, constituents of a petroleum product, including petroleum product additives.

(149) "Petroleum storage tank" has the meaning specified in s. 101.144 (1) (bm), Stats.

Note: Section 101.144 (1)(bm), Stats., defines "petroleum storage tank" to mean "a storage tank that is used to store petroleum products together with any on-site integral piping or dispensing system." The term "petroleum storage tank" does not include a pipeline facility.

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(1510) "Preventive action limit" has the meaning specified in s. 160.01 (6), Stats. Note: Section 160.01 (6), Stats., defines "preventive action limit" to mean "a numerical value expressing the concentration of a substance in groundwater which is adopted under s. 160.15."

(16) ~~"Property boundary" has the meaning specified in s. 160.01 (6m), Stats. Note: Section 160.01(6m), Stats., defines "property boundary" to mean "the~~

~~boundary of the total contiguous parcel of land owned by a common owner, regardless of whether public or private roads run through the parcel."~~

(17)

~~"Release" means the discharge to the environment from a petroleum storage tank.~~

(1811)

"Remedial action" means a response action taken to control, minimize or eliminate the discharge of petroleum products so that they do not present an actual or potential threat

to public health, safety or welfare or the environment. The term “remedial action” includes actions taken to restore the environment to the extent practicable and to meet applicable environmental standards, and includes natural attenuation. Examples include containment, treatment, excavation, disposal, recycling or reuse, and any monitoring required to assure that such actions protect public health, safety and welfare and the environment.

(19)

~~“Remediation target” means a goal that may be set for a site, to clearly establish the contaminant concentration in groundwater or soil, or both, that when achieved will result in the granting of site closure.~~

(2012)

“Responsible person” has the meaning specified in s. 101.144 (1) (d), Stats. Note: Section 101.144(1)(d), Stats., defines “responsible person” to mean “a person who owns or operates a petroleum storage tank, a person who causes a discharge from a petroleum storage tank or a person on whose property a petroleum storage tank is located.”

(2113)

“Site” means any area where a petroleum product has discharged.

Note: Because the term “discharge” has been interpreted by the Wisconsin supreme court to include the migration of hazardous substance contamination after it is released to the environment, the term “site” includes all areas to which petroleum product contamination has migrated, including areas not on the source property. The term “site” and “source property” are not synonymous. A “site” can be larger or smaller than a “source property.” The term “site” is synonymous with the term “occurrence” as that term is used by the department of commerce in ch. Comm 47. The term “site” is used here in order to establish common terminology that will be used by both the department of commerce and the department of natural resources in the implementation of ch. NR 746.

~~(22) “Site closure” or “site closed” means a determination made pursuant to this chapter and ch. NR 726 that applicable groundwater quality standards in ch. NR 140 have been met or will be met by relying on natural attenuation and that applicable soil cleanup standards in ch. NR 720 have been met or will be met by relying on a remedial action performance standard.~~

(2314) “Soil” has the meaning specified in s. NR 700.03 (58).

Note: Section NR 700.03(58) defines "soil" to mean "unsaturated organic material, derived from vegetation and unsaturated, loose, incoherent rock material, of any origin, that rests on bedrock other than foundry sand, debris and any industrial waste."

(24)

~~“Source control” means actions taken to remove or treat soil or groundwater contamination, or both, actions taken to minimize the leaching of soil contamination to groundwater, and actions taken to prevent the migration of groundwater contamination. The term “source control” includes tank removal, the removal of free product and contaminant hot spot removal or treatment. The term “source control” does not include groundwater monitoring, soil sampling, recycling or reuse of contaminants, reliance on natural attenuation to address residual contamination, or changes to a facility’s design, operation, construction or waste handling or disposal practices.~~

(25)

~~“Source property” means the parcel of land on which petroleum product contamination was originally released to the environment.~~

(26)

~~“Unsaturated” means soil or other material that is found above the water table.~~

~~(27)~~

~~“Utility corridor” has the meaning specified in s. NR 700.03 (66m).~~

~~**Note:** Section NR 700.03 (66m) defines “utility corridor” to mean “any utility line that runs underground and any backfilled trench that was constructed to install a water main or lateral, a sewer main or lateral or other utility line.”~~

~~(28) “Water table” has the meaning specified in s. NR 141.05 (45). Note: Section NR 141.05 (45) defines “water table” to mean “the surface of unconfined groundwater where the water pressure is equal to atmospheric pressure.” The term “water table” is used in this chapter to establish the upper elevation of~~

~~“groundwater” as that term is defined in s. 160.01 (4), Stats. Section 160.01 (4), Stats., defines “groundwater” to mean “any of the waters of the state, as defined in~~

~~s. 281.01 (18), occurring in a saturated subsurface geological formation of rock or soil.”~~

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.04 Site authority. (1) ADMINISTRATIVE AUTHORITY. The administrative authority of the department of commerce and DNR for a site includes enforcement, ~~setting remediation targets,~~ remediation supervision and direction, and decision-making regarding the granting or denying ~~case~~ closure and deciding whether or not further remedial action is required. DNR has the authority under s. 292.11 (7) (c), Stats., to issue orders to a person who possesses or controls a hazardous substance that was discharged, or who caused the discharge of a hazardous substance, specifying the remedial action that the responsible person is required to take under s. 292.11 (3), Stats. The department of commerce has the authority under s. 101.144 (2) (a), Stats., to issue orders to a person who owns or operates a petroleum storage tank, a person who causes a discharge from a petroleum tank or a person on whose property a petroleum storage tank is located, to require that person to take remedial action in response to those discharges of petroleum products from petroleum storage tanks over which the department of commerce has jurisdiction. The assignment of administrative authority for high-risk sites and medium and low risk sites, where discharges of petroleum products from petroleum storage tanks have occurred, shall be determined according to the following criteria:

(a) DNR shall have administrative authority for those sites that meet any of the following criteria:

1. Sites that have not been classified.
2. Sites that are classified as high-risk sites.
3. Sites with soil or groundwater that is contaminated by one or more hazardous substances other than petroleum products discharged from a petroleum storage tank, where the petroleum contamination is commingled with one or more hazardous substances other than petroleum products from a petroleum storage tank.

(b) The department of commerce shall have administrative authority for those sites that meet both of the following criteria:

1. Sites that have been classified as low risk or medium risk.

2. Sites where petroleum contamination is not commingled with one or more hazardous substances other than petroleum products discharged from a petroleum storage tank.

~~(2)~~

~~REMEDICATION TARGETS. (a) The department of commerce and DNR shall jointly determine remediation targets for high risk sites that are competitively bid or bundled with another site or sites pursuant to s. Comm 47.337 (4)(a) 3. and 4., and shall jointly review and select remedial bids.~~

~~(b)~~

~~The department of commerce shall set remediation targets for low risk and medium risk sites that are competitively bid or bundled with another site or sites pursuant to s. Comm 47.337 (4) (a) 3. and 4., and review and select remedial bids.~~

~~(c)~~

~~When a remediation target is not established under par. (a) or (b), the goal that shall be achieved to obtain site closure is prescribed by applicable provisions in this chapter and ch. NR 726.~~

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.05 Site investigation. (1) GENERAL. In conducting an investigation of a site where petroleum products have discharged from a petroleum storage tank, the responsible person shall meet the requirements of ch. NR 716 and minimize costs while providing sufficient data necessary for risk assessment screening and decision-making under this section and ss. Comm 47.337 and

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~~47.339, ss. NR 746.06, 746.07 and 746.08, and chs. NR 720, 722 and 726. If a responsible person does not have the expertise and qualifications required under ch. NR 712 to adequately respond to any of the requirements of this chapter, the responsible person shall retain the services of a qualified consultant to conduct the required work or analysis on behalf of the responsible person.~~

~~(2) SITE DATA. (a) General. The data collected by the responsible person during the site investigation shall include, but not be limited to, the following information:~~

- ~~1. Whether contamination is found in soil or groundwater, or both.~~
- ~~2. The degree and extent of soil contamination and groundwater contamination, if any.~~
- ~~3. Nature and distribution of geologic materials on the site and general hydrogeologic information.~~
- ~~4. The hydraulic conductivities of materials where contaminated groundwater is found, including the downgradient perimeter of the groundwater contaminant plume.~~
- ~~5. Whether the groundwater contaminant plume is contained within low permeability material or extends into permeable material.~~
- ~~6. Whether there is evidence of migration of petroleum product contamination within a utility corridor or a permeable soil layer along which vapors, free product or contaminated water may flow.~~
- ~~7. Whether there is evidence of migration or imminent migration of petroleum product contamination to building foundation drain tile, sumps or other points of entry into buildings.~~

~~(b) Hydraulic conductivity tests. During the site investigation, or during the gathering of additional information as directed by the agency with administrative authority under sub. (3), the responsible person shall determine the hydraulic conductivity of materials where contaminated groundwater is found at the site, in conformance with the following requirements:~~

- ~~1. Hydraulic conductivity shall be determined at a monitoring well located within but near the downgradient perimeter of the groundwater contaminant plume unless subd. 2. is applicable.~~
- ~~2. Notwithstanding the requirements in subd. 1., the agency with administrative authority for the site may determine that a hydraulic conductivity result from a monitoring well outside of the plume is representative of the hydraulic conductivity of materials within the plume, based on a comparison of monitoring well logs for monitoring wells installed inside and outside of the plume, and that it is not necessary to conduct a hydraulic conductivity test at a monitoring well within the plume.~~

~~(3)~~

~~SUPPLEMENTAL SITE INVESTIGATION INFORMATION. If the site investigation report was submitted prior to May 18, 2000, supplemental site information that is necessary to make the determinations required under sub. (1) may be required by the agency with administrative authority. The responsible person shall use existing site data unless the agency with administrative authority for the site determines that the existing site data are insufficient to make the determinations required in sub. (1). Existing site data may include, but are not limited to, monitoring well development data, monitoring well purging and sampling data, rising and falling head test data, yield test data, pump test data, monitoring well and boring logs, grain size analysis, local and regional geology, subsurface description, depositional environment, expected and actual degree and extent of contamination, or a combination of the data. If a determination is made by the agency with administrative authority for the site that existing site data are insufficient, the responsible person shall then gather the information necessary to make the determinations required under sub. (1), including determining the hydraulic conductivity of the materials where contaminated groundwater is found at the site in compliance with the requirements of sub. (2) (b).~~

~~(4)~~

~~GROUNDWATER CONTAMINANT BEHAVIOR. (a) Except where par. (b) is applicable, the responsible person shall collect data during~~

~~the site investigation to determine whether the groundwater plume margin is expanding. Whenever a responsible person is required by~~

~~s. Comm 47.335 (2) to contact the department of commerce to notify the agency that it will not be possible to complete the site investigation for less than \$40,000, the responsible person shall submit the notice to both DNR and the department of commerce that summarizes the reasons why the \$40,000 cost cap will be exceeded. In the notice, the responsible person shall enumerate which, if any, of the conditions described in s. NR 746.06 (2) (a), (g), (h) and (i) have been identified at the site.~~

~~(b) For sites where all groundwater contamination is contained within low permeability material, if no evidence is found of groundwater plume margin expansion during the site investigation, and no release of a petroleum product to the soil or groundwater at the site has occurred within the last 10 years, the assumption for agency decision making on remedial actions, closure and other related decisions shall be that the groundwater plume margin is not expanding.~~

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.06 Risk screening criteria. (1) GENERAL. ~~The risk screening criteria in sub. (2) shall be used by the agency with administrative authority over a specific site for all of the following purposes:~~

- ~~(a) To determine whether a remedial action shall be required, which could include, but is not limited to, source control and measures to address the risk screening criteria.~~
- ~~(b) To set remediation targets.~~

- ~~(c) To evaluate consultant reports required under s. 101.143 (2)(h) and (i), Stats.~~
- ~~(d) To determine whether the site may be closed, as provided in~~

~~s. NR 746.07 or 746.08, at the completion of the site investigation or after remedial action.~~

(2) RISK CRITERIA FOR SCREENING SITES. ~~The department of commerce and DNR shall use the following criteria, as provided in~~

~~s. NR 746.07 and 746.08 for identifying sites that are eligible for closure:~~

- ~~(a) None of the following environmental factors are present at the site:~~

~~1. Documented expansion of plume margin.~~

- ~~1. Verified contaminant concentration in a private or public potable well that attains or exceeds the preventive action limit.~~
- ~~2. Contamination within bedrock or within one meter of bedrock.~~
- ~~3. Petroleum product that is not in dissolved phase is present with a thickness of 0.01 feet or more, and has been verified by more than one sampling event.~~
- ~~4. Documented contamination discharges to a surface water or wetland.~~

~~(b) No soil contamination is present at the site that exceeds any of the soil screening levels in Table 1.~~

Table 1 Indicators of Residual Petroleum Product in Soil Pores

Substance

Benzene

1,2-DCA

Ethylbenzene

Toluene

Xylene

1,2,4-Trimethylbenzene

1,3,5-Trimethylbenzene

Naphthalene Soil Screening Levels (mg/kg)

8.5

- 1.—
- 2.—

38

42

83

11

2.7

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(c) There is no soil contamination within 4 feet of the ground surface that exceeds any of the direct contact soil contaminant concentrations for the substances listed in Table 2.

Table 2 Protection of Human Health from Direct Contact with Contaminated Soil

Substance	Soil Contaminant Concentrations (Top 4 ft of the soil) (mg/kg)
Benzene	1.10
1,2-Dichloroethane (DCA)	0.54

- (d) For substances not listed in Table 2 that are present within 4 feet of the ground surface and that have been approved by the agency with administrative authority for the site for analysis as contaminants of concern as defined in s. NR 720.03 (2), any potential human health risk from direct contact has been addressed.
- (e) Except for the substances listed in Table 2, there is no human health risk from direct contact for a substance listed in Table 1 if the substance's concentration is below the Table 1 soil screening level.
- (f) No release of a petroleum product to the soil or groundwater at the site has occurred within the last 10 years.
- (g) There is no evidence of migration of petroleum product contamination within a utility corridor or within a permeable material or soil along which vapors, free product or contaminated water may flow.
- (h) There is no evidence of migration or imminent migration of petroleum product contamination to building foundation drain tile, sumps or other points of entry into a basement or other enclosed structure where petroleum vapors could collect and create odors or an adverse impact on indoor air quality or where the contaminants may pose an explosion hazard.
- (i)

No enforcement standard is attained or exceeded in any groundwater within 1000 feet of a well operated by a public utility, as defined in s. 196.01 (5), Stats., or within 100 feet of any other well used to provide water for human consumption.

Note: The definition of “public utility” that is found in s. 196.01 (5), Stats., includes, with certain limited exceptions, “every corporation, company, individual, association, their lessees, trustees or receivers appointed by any court, and every sanitary district, town, village or city that may own, operate, manage or control . . . all or any part of a plant or equipment, within the state, for the production, transmission, delivery or furnishing of heat, light, water or power either directly or indirectly to or for the public.” This definition includes all wells operated by any entity (city, village, town or private company) that is in the business of distributing water to the public. It would not include wells operated by commercial establishments that conduct some other kind of business (for example, restaurants, bars or golf courses) where the well water is used by the business or by customers of the establishment.

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.07 Site closure decisions at the completion of a site investigation. The department of commerce and DNR shall make site closure decisions at the completion of a site investigation based on the following requirements:

(1)

~~SOIL CONTAMINATION ONLY.~~ A site that only has soil contamination shall be closed, at the completion of a site investigation that complies with the requirements of ch. NR 716, if the site closure request documents that all of the following requirements have been complied with:

(a)

~~The site meets all of the risk screening criteria in s. NR 746.06 (2).~~

~~(b) The requirements of ch. NR 726 have been satisfied, including inclusion on the GIS Registry and the signing and recording of any required deed restriction or deed notice.~~

(c)

~~There is at least a 5-foot separation between the soil contamination and the water table.~~

(2)

~~GROUNDWATER CONTAMINATION WITHIN LOW PERMEABILITY MATERIAL.~~ A site that has groundwater contamination within low

~~permeability material shall be closed, at the completion of a site investigation that complies with the requirements of ch. NR 716, if the site closure request documents that all of the following requirements have been complied with:~~

(a)

~~The site meets all of the risk screening criteria in s. NR 746.06 (2).~~

~~(b) The requirements of ch. NR 726, other than s. NR 726.05(2) (b)1.f. and 2, have been satisfied, including the signing and recording of any required deed restriction or deed notice.~~

~~(c) One of the following criteria is satisfied:~~

- ~~1. All groundwater contamination is contained within low permeability material and there is at least a 5-foot separation between the contamination in the low permeability material and any underlying or downgradient permeable material.~~

2. ~~If there is any groundwater contamination within downgradient or underlying permeable material, one of the following requirements is satisfied:~~

a.

~~All groundwater contaminant concentrations in permeable material are below preventive action limits.~~

b.

~~All groundwater contaminant concentrations in permeable material are below enforcement standards and where preventive action limits have been attained or exceeded, a preventive action limit exemption has been granted.~~

c.

~~The requirements of one of the tests listed in sub. (4) (c) have been satisfied for sites where enforcement standards are attained or exceeded in permeable material.~~

~~(3)~~

~~GROUNDWATER CONTAMINATION EXCEEDING PREVENTIVE ACTION LIMITS, BUT BELOW ENFORCEMENT STANDARDS, WITHIN PERMEABLE MATERIAL. A site that has groundwater contamination that attains or exceeds preventive action limits, but does not attain or exceed enforcement standards, within permeable material, shall be closed, at the completion of a site investigation that complies with the requirements of ch. NR 716, if the site closure request documents that all of the following requirements have been complied with:~~

~~(a)~~

~~The site meets all of the risk screening criteria in s. NR 746.06 (2).~~

~~(b) The requirements of ch. NR 726 have been satisfied, including inclusion on the GIS Registry and the signing and recording of any required deed restriction or deed notice.~~

~~(c) A preventive action limit exemption has been granted.~~

~~(4)~~

~~GROUNDWATER CONTAMINATION EXCEEDING ENFORCEMENT STANDARDS WITHIN PERMEABLE MATERIAL. A site that has groundwater contamination that attains or exceeds enforcement standards within permeable material shall be closed, at the completion of a site investigation that complies with the requirements of ch. NR 716, if the site complies with all of the following requirements:~~

~~(a)~~

~~The site meets all of the risk screening criteria in s. NR 746.06 (2).~~

~~(b) The requirements of ch. NR 726, other than s. NR 726.05(2) (b) 2., have been satisfied, including the signing and recording of any required deed restriction or deed notice.~~

~~(c) One of the following tests has been satisfied:~~

~~1. There is a minimum of 4 rounds of sampling data that are free of seasonal variation, and those sample results establish, through the use of the Mann-Kendall statistical test that is set forth in Appendix A, that the concentrations of contaminants with confirmed exceedances of enforcement standards are decreasing at the downgradient perimeter and along the centerline of the contaminant plume.~~

~~2. For sampling data not free of seasonal variation, an appropriate number and frequency of sampling rounds has been conducted consistent with the requirements of Appendix A, and the sample results establish, through the use of the Mann-Whitney U statistical test that is set forth in Appendix A, that the concentrations of contaminants with confirmed exceedances of~~

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enforcement standards are decreasing at the downgradient perimeter and along the centerline of the contaminant plume.

Note: In compliance with s. 160.21(2)(a), Stats., s. NR 140.22(2)(b) establishes the point of standards application to determine whether an enforcement standard has been attained or exceeded, for facilities, practices or activities that do not have an established design management zone, as “any point of present groundwater use and any point beyond the boundary of the property on which the facility, practice or activity is located and s. NR 140.22 (2)(c) establishes a point of standards application for “discharges, releases, sites or facilities” regulated under s. 292.11 or 292.31, Stats. (among other statutes) as “every point at which groundwater is monitored.” Groundwater contaminant concentrations at points of standards application have been taken into account in the development of the risk screening criteria in s. NR 746.06 (2) and the closure requirements in s. NR 746.07 and 746.08.

(5)

CLOSURE UNDER CH. NR 726. If the agency with administrative authority for a site determines that the site does not comply with the requirements of this section or s. NR 746.08, closure may still be granted on a case-by-case basis in compliance with the requirements of ch. NR 726.

(6)

ADDITIONAL REMEDIAL ACTION. If closure is not granted, the responsible person shall conduct additional remedial action in compliance with chs. NR 140 and 700 to 726.

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.08 Site closure decisions after remedial action to address one or more of the risk screening criteria. The department of commerce and DNR shall make site closure decisions after remedial action to address one or more of the risk screening criteria based on the following requirements:

(1)

SOIL CONTAMINATION ONLY. A site that has residual contamination only in soil shall be closed without requiring any additional remedial action other than natural attenuation monitoring, if the site closure request documents that all of the following requirements have been complied with:

(a)

A site investigation that complies with the requirements of ch. NR 716 has been conducted.

(b)

The site meets all of the risk screening criteria in s. NR 746.06 (2).

(c) The requirements of ch. NR 726 have been satisfied, including inclusion on the GIS Registry and the signing and recording of any required deed restriction or deed notice.

(d)

There is at least a 5-foot separation between the soil contamination and the water table.

(2)

GROUNDWATER CONTAMINATION WITHIN LOW PERMEABILITY MATERIAL. A site that has groundwater contamination within low permeability material shall be closed if the site closure request documents that all of the following requirements have been complied with:

(a)

~~A site investigation that complies with the requirements of ch. NR 716 has been conducted.~~

~~(b) The site meets all of the risk screening criteria in s. NR 746.06 (2).~~

~~(c) The requirements of ch. NR 726, other than s. NR 726.05(2) (b)1.f. and 2., have been satisfied, including the signing and recording of any required deed restriction or deed notice.~~

~~(d) One of the following criteria is satisfied:~~

~~1. All groundwater contamination is contained within low permeability material and there is at least a 5-foot separation between the contamination in the low permeability material and any underlying or downgradient permeable material.~~

~~2. If there is any groundwater contamination within downgradient or underlying permeable material, one of the following requirements is satisfied:~~

~~a.~~

~~All groundwater contaminant concentrations in permeable material are below preventive action limits.~~

~~b.~~

~~All groundwater contaminant concentrations in permeable material are below enforcement standards and where preventive action limits have been attained or exceeded, a preventive action limit exemption has been granted.~~

~~c. The requirements of one of the tests listed in sub. (4)(d) have been satisfied for sites where enforcement standards are attained or exceeded in permeable material.~~

(3)

~~GROUNDWATER CONTAMINATION EXCEEDING PREVENTIVE ACTION LIMITS, BUT BELOW ENFORCEMENT STANDARDS, WITHIN PERMEABLE MATERIAL. A site that has groundwater contamination that attains or exceeds preventive action limits, but does not attain or exceed enforcement standards, within permeable material, shall be closed if the site closure request documents that all of the following requirements have been complied with:~~

~~(a)~~

~~A site investigation that complies with the requirements of ch. NR 716 has been conducted.~~

~~(b)~~

~~The site meets all of the risk screening criteria in s. NR 746.06 (2).~~

~~(c) The requirements of ch. NR 726 have been satisfied, including inclusion on the GIS Registry and the signing and recording of any required deed restriction or deed notice.~~

~~(d) The site has been granted a preventive action limit exemption.~~

(4)

~~GROUNDWATER CONTAMINATION EXCEEDING ENFORCEMENT STANDARDS WITHIN PERMEABLE MATERIAL. A site that has groundwater contamination that attains or exceeds enforcement standards within permeable material shall be closed if the site closure request documents that all of the following requirements have been complied with:~~

~~(a)~~

~~A site investigation that complies with the requirements of ch. NR 716 has been conducted.~~

~~(b)~~

~~The site meets all of the risk screening criteria in s. NR 746.06 (2).~~

~~(c) The requirements of ch. NR 726, other than s. NR 726.05(2) (b)1.f. and 2, have been satisfied, including the signing and recording of any required deed restriction or deed notice.~~

~~(d) One of the following tests has been satisfied:~~

- ~~1. There is a minimum of 4 rounds of sampling data that are free of seasonal variation, and those sample results establish, through the use of the Mann-Kendall statistical test that is set forth in Appendix A, that the concentrations of contaminants with confirmed exceedances of enforcement standards are decreasing at the downgradient perimeter and along the centerline of the contaminant plume.~~
- ~~2. For sampling data not free of seasonal variation, an appropriate number and frequency of sampling rounds has been conducted consistent with the requirements of Appendix A, and the sample results establish, through the use of the Mann-Whitney U-statistical test that is set forth in Appendix A, that the concentrations of contaminants with confirmed exceedances of enforcement standards are decreasing at the downgradient perimeter and along the centerline of the contaminant plume.~~

~~**Note:** Deed restrictions and deed notices may be required as a condition of site closure under s. NR 726.05 (8) (a) or (b). Under some circumstances, deed restrictions and groundwater use restrictions are mandatory under s. NR 726.05 (8) (am) and (9). For example, a deed restriction is required if the responsible person is relying on an industrial land use classification in order to satisfy the requirements of ch. NR 720. A groundwater use restriction is required if groundwater enforcement standards are attained or exceeded.~~

~~(5)~~

~~CLOSURE UNDER CH. NR 726. If the agency with administrative authority for a site determines that the site does not comply with the requirements of this section or s. NR 746.07, closure may still be granted on a case-by-case basis in compliance with the requirements of ch. NR 726.~~

~~(6)~~

~~ADDITIONAL REMEDIAL ACTION. If closure is not granted, the responsible person shall conduct additional remedial action in compliance with chs. NR 140 and 700 to 726.~~

~~History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.~~

~~**NR 746.09 Remediation and remediation funding for conditionally closed sites. (1)**~~

~~Additional remedial action, other than natural attenuation, may not be required at sites that are eligible for closure under s. NR 746.07 or 746.08, unless the agency with administrative authority for the site determines~~

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~~that an actual or potential risk to public health, safety or welfare or the environment exists.~~

~~(2) Funding under s. 101.143, Stats., shall be terminated by the department of commerce for sites that are eligible for closure under s. NR 746.07 or 746.08, even if a groundwater use restriction, deed restriction or deed notice is not signed or recorded for one or more properties, and the site shall be ineligible for additional reimbursement except for post closure costs that are otherwise eligible for reimbursement under ch. Comm 47.~~

~~(3) Sites requiring no action under this chapter other than the signing and recording of a groundwater use restriction, deed restriction or deed notice shall be classified for tracking~~

~~purposes as "conditionally closed" which means that a closure application has been submitted and the site will be closed when the conditions are satisfied.~~

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.1005 Tracking of remediation progress. By no later than January 1, 2001, and annually thereafter, responsible persons shall submit an annual report to the agency with administrative authority for the site, as required by s. 101.143 (2) (i) 2., Stats., with a summary of all monitoring data that have been collected, the status of remediation that has been conducted to date and an estimate of the additional costs that must be incurred to achieve ~~site~~ case closure.

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.1106 Classification and transfer of sites.

(1)

GENERAL. (a) The responsible person shall make a preliminary determination as to the classification of a site as high-risk, or medium or low risk based on the definitions in s. 101.144 (1) (aq), Stats., and s. NR 746.03 (6), (8) and (9), and the data that have been collected during the site investigation.

(b)

Until a classification determination is made by the agency that receives a submittal under sub. (2) or (3), DNR has administrative authority for the site.

(2) SUBMITTAL OF SITE INVESTIGATION REPORTS TO THE APPROPRIATE AGENCY. Site investigation reports submitted after May 18, 2000 shall include a statement as to whether a site is believed to be high-risk, or medium or low risk and shall be submitted directly to the agency with administrative authority for the site under s. NR 746.04 (1). If a site falls under the authority of the department of commerce, the responsible person shall provide DNR with a copy of the letter that transmits the site investigation report to the department of commerce, which includes the WTM coordinates for the site and supporting information, as required under s. NR 716.15(2)(d)7. The DNR shall transfer the site file to the department of commerce within 14 days after receipt of a copy of the transmittal letter that indicates that the site falls under the authority of the department of commerce.

(3) SUBMITTAL OF ~~CASE CLOSURE REPORTS~~ REQUESTS TO THE APPROPRIATE AGENCY. If the ~~submittal of a site investigation report is not required or the site investigation report was submitted without a determination of whether the site is believed to be high-risk, or medium or low risk, the closure report~~ request shall be submitted directly to the agency that is believed to have administrative authority for the site under s. NR 746.04 (1). If a site falls under the authority of the department of commerce, the responsible person shall provide DNR with a copy of the letter that transmits the closure ~~report~~ request to the department of commerce. The DNR shall transfer the site file to the department of commerce within 14 days after receipt of a copy of the transmittal letter that indicates that the site falls under the authority of the department of commerce.

(4) CHANGES IN CLASSIFICATION. If a site has been classified as high-risk, or medium or low risk, and the agency receiving the site investigation report or case closure ~~report~~ request determines that the classification is incorrect and the site, as reclassified, falls under the other agency's administrative authority, the agency making the determination shall transfer the site file and all related data to the other agency within 14 days after making the determination that the site was incorrectly classified. The agency making the determination shall provide written notice to inform the responsible person that the site has been reclassified, which can be done by sending to the responsible person a copy of the reclassification letter that is addressed to the other agency. The written notice shall state the reasons for the reclassification.

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.1207 Interagency staff training. In order to ensure that employees understand the requirements of this chapter and the NR 700 rule series, and to ensure that the agencies will issue approvals when the requirements of this chapter and the NR 700 rule series are satisfied, **interagency staff training shall be held when necessary, as jointly determined by** the department's of commerce and DNR ~~shall~~:

- (1) ~~Identify interagency staff training needs at least once each year. Each agency shall list interagency staff training needs that have been identified in order of priority and shall provide that list to the other agency by May 1 of each year.~~
- (2) ~~Agree by July 1 of each year on the staff training that is to be jointly conducted before July 1 of the following year. This agreement is to include the subject of the training, the approximate date on which it will be conducted, the preferred training provider, and the estimated cost of training.~~
- (3) ~~Develop procedures to receive recommendations on interagency staff training needs from interested parties outside the agencies before finalizing training plans.~~

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

NR 746.1308 Dispute resolution. Any disputes between the department of commerce and DNR under this chapter shall be subject to the following dispute resolution process:

- (1) Project managers shall discuss their differences, and the basis for them, in an attempt to resolve the dispute.
- (2) If the dispute is not resolved by the project managers, the decision shall be referred to the ~~project managers' supervisors~~ **DNR petroleum team leader and the commerce advanced hydrogeologist.**
- (3) If the dispute is not resolved by the ~~project managers' supervisors~~ **petroleum team leader and the commerce advanced hydrogeologist**, the decision shall be referred to the appropriate **DNR regional team supervisor and Commerce site review section chief.**
- (4) **If the dispute is not resolved by the appropriate DNR regional team supervisor and Commerce site review section chief, the decision shall be referred to the division administrators or deputy administrators.**
- (5) If the dispute still remains unresolved at the division administrator level, the department secretaries shall make the final decision.

History: Cr. Register, January, 2001, No. 541, eff. 2-1-01.

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APPENDIX A

~~Nonparametric Statistical Tests for Determining the Effectiveness of Natural Attenuation~~
~~Two nonparametric statistical tests are described here: the Mann-Kendall (S) and Mann-Whitney (U) statistical tests. These tests can be used to show whether groundwater contaminant concentrations in a monitoring well are increasing, stable or decreasing. However, neither test is~~

able to determine the rate in which the concentrations are changing over time. The Mann–Kendall Test can be used with a minimum of 4 rounds of sampling results; however, the Mann–Kendall Test is not valid for data that exhibit seasonal behavior. The Mann–Whitney U Test is applicable to data that may or may not exhibit seasonal behavior, but the test requires 8 consecutive rounds of quarterly or semi–annual sampling results. To demonstrate that natural attenuation is effective, the chosen statistical test must show decreasing contaminant concentrations at an appropriate confidence level, given in the test methodologies that follow.

Mann–Kendall Test

1. Assemble well data for at least 4 sampling events for each contaminant in the order in which the data was collected. Include all contaminants that have exceeded the ES at one or more monitoring wells. Include data from:

a.

One or more contaminated monitoring wells near the downgradient plume margin, which may include piezometers,

b.

A monitoring well near the source zone, and

c.

At least one monitoring well along a flow line between the source zone well and plume margin well.

1. ——— For purposes of the Mann–Kendall test, all non–detect data values should be assigned a single value that is less than the detection limit, even if the detection limit varies over time.

1. ——— Tests for Seasonality in Data. For seasonally affected data, either remove the seasonality in the data (e.g., by only testing data from the seasons with the highest contaminant concentrations) or use a statistical test that is unaffected by seasonality, such as the Mann–Whitney U Test. To test for data seasonality:

1. ——— Determine if groundwater flow direction changes with season by comparing a water table map from each season that the contaminant concentrations are measured. If the flow direction changes from one sampling period to another and shifts the plume away from the wells being used in the statistical test, then data from those seasons that are shifted away from the centerline monitoring wells can not be used in the Mann–Kendall Test.

2. ——— Determine if groundwater elevation and contaminant concentration change seasonally. Plot contaminant concentration versus groundwater level for each well to be assessed by the Mann–Kendall Test. If groundwater concentrations change as water level changes, then the data is seasonally affected. The seasons with the highest contaminant concentrations should be included in the Mann–Kendall Test.

4. Calculate the Mann–Kendall Statistic (S) using a manual method or a DNR-supplied spreadsheet. Assess all contaminants in the plume for the selected wells being assessed with the Mann–Kendall Test. Enter data for each contaminant in the order it was collected.

a. Manual Method to Calculate Mann–Kendall Statistic. Compare data sequentially, comparing sampling event 1 to sampling events 2 through n, then sampling event 2 to sampling events 3 through n, etc. Each row is filled in with a 1, 0 or –1, as follows:

Along row 2, if:

–

Concentration of event $x_i >$ event 1: Enter +1

–

Concentration of event $x_i =$ event 1: Enter 0

–

Concentration of event $x_i <$ event 1: Enter –1

Where: n = total number of sampling events

x_i = value of given sample event, with $i = 2$ to n

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Continue for the remaining rows. Sum each row and enter result at the end of the row. Add the sum of each row down to obtain the Mann–Kendall Statistic (S). See Table A as an example.

Table A Mann–Kendall Statistic

Sampling Sampling Sampling Sampling Sampling Event 1 Event 2 Event 3 Event 4 Event 5

Contaminant concentration	100	50	85	75	50	Sum Rows
Compare to Event 1			1	1	1	4
Compare to Event 2			+1	+1	0	+2
Compare to Event 3				1	1	2
Compare to Event 4					1	1
Mann Kendall Statistic (Total) =						5

b. Manual Mann-Kendall Statistic Look up Table. Table B gives the maximum S statistic (S_{max}) to accept a declining trend alternative at an α level of significance. If the computed S is greater than S_{max} (or S is a smaller negative number than S_{max}), then there is either a no trend or an increasing trend in the data.

Table B Mann-Kendall Statistic Look Up Table

N	Range of S	$\alpha = 0.2^*$
4	6 to +6	4
5	10 to +10	5
6	15 to +15	6
7	21 to +21	7
8	28 to +28	8
9	36 to +36	10
10	45 to +45	11

* The probability that the computed Mann-Kendall statistic $S \leq S_{max}$ is at most α .

5. Test for a declining trend. Evaluate data trends for each contaminant identified in the plume. Evaluate the null hypothesis of no trend against the alternative of a decreasing trend. The null hypothesis can be rejected in favor of a decreasing trend if both of the following conditions are met:

a.

S is a large negative number (see Table B for magnitude of S)

b.

The probability value, given n (number of data) and the absolute value of S, is LESS than the a priori significance level, α , of the test. An $\alpha \leq 0.2$ is acceptable.

6. Test for an increasing trend. An increasing trend alternative (i.e., an advancing plume) is shown if both of the following conditions are met:

a.

S is positive.

b.

$S \geq S_{max}$ at a given α level of significance (see Table B). If the computed S is equal to or greater than the absolute value of S_{max} , then it can be concluded the plume is advancing at an α level of significance. An $\alpha \leq 0.2$ is acceptable for this test.

7. Test for Plume Stability. If the Mann-Kendall Test indicates no trend is present, perform the coefficient of variation test. As a non-parametric test, the Mann-Kendall Test does not take into account the magnitude of scatter in the data. A data set with a great deal of scatter may return a Mann-Kendall test indicating there is no trend, when, in fact, no conclusion can be drawn regarding trend because of data variability. In this case, additional data collection may be necessary to determine that the plume is stable, declining or advancing. As a simple test, the coefficient of variation can assess the scatter in the data:

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135 NIL!

standard deviation

$CV =$

arithmetic mean

Where: CV = coefficient of variation

CV should be ≤ 1 to say that the no trend hypothesis also indicates a stable plume configuration.

Mann-Whitney U Test. This test is equivalent to the Wilcoxon Rank Sum Test.

1. Assemble well data for the most recent 8 consecutive quarterly or semi-annual sampling events for each contaminant that has exceeded the ES at one or more monitoring wells. Include data from:

a.

One or more contaminated monitoring wells near the downgradient plume margin, which may include piezometers,

b.

A monitoring well near the source zone, and

c.

At least one monitoring well along a flow line between the source zone well and plume margin well.

1. Enter the data into a DNR-supplied spreadsheet or manually assemble the data into a table (e.g., Table C) in the order the data was collected. Assign a rank to each sample value, with the smallest value ranked #1 and the largest value ranked #8.

2. For purposes of the Mann-Whitney U test, all non-detect values should be assigned a data value of zero (0).

Table C Example Data Set for the Mann-Whitney U Statistical Test

Year/Date	Benzene Concentration (ug/l)	Rank	Sum of Rank 1st Year (Wrs)
1st Year, 1st Quarter	160	8	
1st Year, 2nd Quarter	130	8	7
1st Year, 3rd Quarter	80	4	25
1st Year, 4th Quarter	100	6	
2nd Year, 1st Quarter	89	5	
2nd Year, 2nd Quarter	0	1	
2nd Year, 3rd Quarter	53	3	
2nd Year, 4th Quarter	24	2	
			U = 26 - Wrs = 1

1. Sum the ranks for the data in the 1st year. Denote this sum as Wrs (or the Wilcoxon rank sum).

2. Calculate the U Statistic. $U = 26 - Wrs$

3. Interpreting U Statistic. For 2 groups of 4 samples, at $U \leq 3$, the probability that year 2 data show a decrease relative to year 1 data is at least 90%, and so $U \leq 3$ will be acceptable to show that contaminant concentration is declining.

4. If there are ties in sample data, calculate an average rank value for the tied data and assign this average rank to the tied sample data. See example in Table D.

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Table D Example of Rank Sum Value for Tied Data

Year/Date	Benzene Concentration (ug/l)	Check for Ties	Rank	Sum of Rank 1st Year (Wrs)
1st Year, 1st Quarter	300		8	
1st Year, 2nd Quarter	280		7	24.5
1st Year, 3rd Quarter	105		4	
1st Year, 4th Quarter	110	*	5.5	
2nd Year, 1st Quarter	83		3	
2nd Year, 2nd Quarter	50	√	1.5	
2nd Year, 3rd Quarter	110	*	5.5	
2nd Year, 4th Quarter	50	√	1.5	
			U = 26 - Wrs = 1.5	

8. Probability and the U Statistic. Table E shows the α value and the confidence level for values of U calculated for 2 groups of 4 samples each.

Table E Probability and U Statistic

(For 2 Groups of 4 samples each)

U Statistic	Level of significance α	Confidence Level (%)
0	0.014	98.6

~~1 — 0.029 — 97.1~~

~~2 — 0.057 — 94.3~~

~~3 — 0.100 — 90.0~~

~~9. If more than 8 consecutive rounds of data are available, a Mann-Whitney U statistic can be calculated similar to the method presented here. Each set of data to be compared should represent the same span of time (e.g. 1 year) and the same time interval between samples (e.g., quarterly). The test must be conducted at a level of significance (α) of ≤ 0.10 .~~

~~References:~~

~~Conover, W.J., Practical Nonparametric Statistics, 2nd Ed., John Wiley & Sons, 1971, pp. 216–223.~~

~~Gilbert, R.O., Statistical Methods for Environmental Pollution Monitoring, Van Nostrand Reinhold, 1987, pp. 204–240 and 272.~~

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