ARC 8676B

ENVIRONMENTAL PROTECTION COMMISSION[567]

Notice of Intended Action

Twenty-five interested persons, a governmental subdivision, an agency or association of 25 or more persons may demand an oral presentation hereon as provided in Iowa Code section 17A.4(1)*"b."*

Notice is also given to the public that the Administrative Rules Review Committee may, on its own motion or on written request by any individual or group, review this proposed action under section 17A.8(6) at a regular or special meeting where the public or interested persons may be heard.

Pursuant to the authority of Iowa Code section 455B.474, the Environmental Protection Commission hereby proposes to amend Chapter 135, "Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks," Iowa Administrative Code.

These amendments propose to: (1) revise the risk-based evaluation process for water lines, adding in gasketed drinking water lines and different action levels based on material composition and usage; (2) allow consideration of "no action required" status if the contaminant plumes at low risk leaking underground storage tank (LUST) sites are demonstrated to be stable and when an institutional control is implemented; and (3) expand the Department's authority to require confirmation sampling prior to acceptance of a no action required classification or to waive "exit monitoring" criteria when a groundwater professional can justify a no action required classification for the site. Existing policy regarding confirmation soil sampling has been added to update the rules with the current practice.

Iowa State University (ISU) and the American Water Works Association Research Foundation (AWWARF) released the results of their laboratory study titled "Impact of Hydrocarbons on PE/PVC Pipes and Pipe Gaskets." The research suggested that polyvinyl chloride (PVC) pipe material was more resistant than previously believed, that polyethylene (PE) and polybutylene (PB) pipes were extremely susceptible to petroleum contamination, and that gaskets were potentially the weak link for exposure to petroleum in a water distribution system. Subsequent to the ISU study, the Department convened a technical advisory group to study these results and other technical literature. The group found that PVC was more resistant than previously believed when the Department's initial plastic water line rules were generated, but that PVC water lines were still deemed at risk in gross contamination. Additional research confirmed the findings related to PE/PB pipe and gaskets. Literature also reports that synergistic effects of mixed chemicals can magnify the potential for contaminant permeation. Amendments to Chapter 135 are proposed to incorporate these new findings in the evaluation process for potable water distribution lines near LUST sites.

Any interested person may submit written comments on the proposed amendments on or before May 7, 2010. Written comments should be sent to the Iowa Department of Natural Resources, Attn: Rochelle Cardinale, 502 East 9th Street, Des Moines, Iowa 50319; fax (515)281-8895; or E-mail: rochelle.cardinale@dnr.iowa.gov.

Also, three public hearings will be held as follows:

April 28, 2010	1 to 3 p.m.	Community Meeting Room Denison City Hall Clerk's Office 111 North Main Street Denison, Iowa
April 29, 2010	1 to 3 p.m.	Coralville Public Library Schwab Auditorium 1401 Fifth Street Coralville, Iowa
April 30, 2010	1 to 3 p.m.	Wallace State Office Building Fifth Floor Conference Rooms 502 East Ninth Street

Any persons who intend to attend a public hearing and have special requirements, such as those related to hearing or mobility impairments, should contact the Department of Natural Resources and advise of specific needs.

A fiscal impact summary prepared by the Legislative Services Agency pursuant to Iowa Code § 17A.4(3) will be available at http://www.legis.state.ia.us/IAC.html or at (515)281-5279 prior to the Administrative Rules Review Committee's review of this rule making.

These amendments are intended to implement Iowa Code section 455B.474.

The following amendments are proposed.

ITEM 1. Adopt the following **new** definitions in rule **567—135.2(455B)**:

"Asbestos-cement pipe" (AC refers to asbestos-cement) means a pipe or conduit constructed of asbestos fiber, Portland cement, and water, which can be used to transport water.

"Backflow preventer" means a check valve used to ensure water flows in one direction and designed to prevent contamination from an end user, such as a home, from getting into the general water supply. An approved backflow preventer shall be a reduced-pressure backflow preventer or an antisiphon device which complies with the standards of the American Water Works Association and has been approved by the Foundation for Cross-Connection Control and Hydraulic Research.

"Cast iron pipe" means a pipe or conduit used as a pressure pipe for transmission of water, gas, or sewage or as a water drainage pipe. It comprises predominantly a gray cast iron tube historically used uncoated, with newer types having various coatings and linings to reduce corrosion and improve hydraulics.

"Ductile iron pipe" means a pipe or conduit commonly used for potable water distribution and for the pumping of sewage. The predominant wall material is ductile iron, a spheroidized graphite cast iron, and commonly has an internal cement mortar lining to inhibit corrosion from the carried water and various types of external coatings to inhibit corrosion from the environment.

"Gasket" means any type of pipe seals made of a variety of rubbers including but not necessarily limited to styrene-butadiene rubber (SBR), nitrile-butadiene rubber (NBR or nitrile), ethylene propylene diene monomer (EPDM), neoprene (CR), and fluoroelastomer rubber (FKM), which are used to seal pipe connections.

"Polybutylene pipe" (PB refers to polybutylene) means a water supply pipe comprised of a form of plastic resin that was used extensively from 1978 until 1995. The piping systems were used for underground water mains and as interior water distribution piping. Polybutylene mains are usually blue in color, but may be gray, black, or white. The pipe is usually ½ inch or 1 inch in diameter, and it may be found entering a residence through the basement wall or floor, concrete slab or through the crawlspace; frequently it enters the residence near the water heater.

"Polyethylene pipe" (PE refers to polyethylene) means a water supply pipe comprised of thermoplastic material produced from the polymerization of ethylene. PE pipe is manufactured by extrusion in sizes ranging from ½ inch to 63 inches. PE pipe is available in rolled coils of various lengths or in straight lengths of up to 40 feet. PE pipe is available in many forms and colors, including single-extrusion colored or black pipe, black pipe with co-extruded color striping, and black or natural pipe with a co-extruded colored layer. PE pipe has been demonstrated to be very permeable to petroleum while still retaining its flexible structure.

"Polyvinyl chloride pipe" (PVC refers to polyvinyl chloride) means a pipe made from a plastic and vinyl combination material. The pipes are durable, hard to damage, and long-lasting. A PVC pipe is very resistant and does not rust, nor is it likely to rot or wear over time. PVC piping is most commonly used in water systems, underground wiring, and sewer lines.

"Portland cement" means hydraulic cement (cement that not only hardens by reacting with water but also forms a water-resistant product) and is produced by pulverizing clinkers consisting essentially of hydraulic calcium silicates, usually containing one or more forms of calcium sulfate as an inter ground addition.

"Service line" means a pipe connected to a business or residence from a water main, typically of a size not exceeding 6 inches in diameter, and including its gaskets and other appurtenances. For purposes of this chapter, service lines refer to pipes specifically used for drinking water transmission.

"Water line" means a hollow cylinder or tubular conduit that routinely contains and conveys potable water and is constructed of nonearthen materials, including but not limited to asbestos-cement, copper, high-density polyethylene (HDPE), polybutylene, polyethylene, and wood. Such piping includes any elbows, couplings, unions, valves, or other in-line fixtures, as well as the gaskets, which contain and convey potable water.

"Water main pipe" means a main line to the water distribution system with feeder lines or service lines connected to it and which typically is 6 inches or greater in diameter, and includes its gaskets and other appurtenances.

ITEM 2. Amend rule **567—135.2(455B)**, definitions of "Groundwater to plastic water line pathway" and "Soil to plastic water line pathway," as follows:

"Groundwater to ~~plastic~~ water line pathway" means a pathway through groundwater which leads to a ~~plastic~~ water line.

"Soil to ~~plastic~~ water line pathway" means a pathway which leads from soil to a ~~plastic~~ water line.

ITEM 3. Amend paragraph **135.9(1)"a"** as follows:

a. Pathway assessment. The pathways to be evaluated at Tier 1 are the groundwater ingestion pathway, soil leaching to groundwater pathway, groundwater vapor to enclosed space pathway, soil vapor to enclosed space pathway, soil to ~~plastic~~ water line pathway, groundwater to ~~plastic~~ water line pathway and the surface water pathway. Assessment requires a determination of whether a pathway is complete, an evaluation of actual and potential receptors, and a determination of whether conditions are satisfied for obtaining no further action clearance for individual pathways~~,~~ or for obtaining a complete site classification of "no action required." A pathway is considered complete if a chemical of concern has a route which could be followed to reach an actual or potential receptor.

ITEM 4. Amend subrule **135.9(1)**, Iowa Tier 1 Look-Up Table, as follows:

Iowa Tier 1 Look-Up Table

Media	Exposure Pathway	Receptor	Group 1				Group 2: TEH	
			Benzene	Toluene	Ethylbenzene	Xylenes	Diesel*	Waste Oil
Groundwater ~~(ug/L)~~(µg/L)	Groundwater Ingestion	Actual	5	1,000	700	10,000	1,200	400
		Potential	290	7,300	3,700	73,000	75,000	40,000
	Groundwater Vapor to Enclosed Space	All	1,540	20,190	46,000	NA	2,200,000	NA
	~~Groundwater to Plastic Water Line~~	~~All~~	~~290~~	~~7,300~~	~~3,700~~	~~73,000~~	~~75,000~~	~~40,000~~
	Groundwater to Water Line	PVC or Gasketed Mains	7,500	6,250	40,000	48,000	75,000	40,000
		PVC or Gasketed Service Lines	3,750	3,120	20,000	24,000	75,000	40,000
		PE/PB/AC Mains or Service Lines	200	3,120	3,400	19,000	75,000	40,000
	Surface Water	All	290	1,000	3,700	73,000	75,000	40,000
Soil (mg/kg)	Soil Leaching to Groundwater	All	0.54	42	15	NA	3,800	NA
	Soil Vapor to Enclosed Space	All	1.16	48	79	NA	47,500	NA
	~~Soil to Plastic Water Line~~	~~All~~	~~1.8~~	~~120~~	~~43~~	~~NA~~	~~10,500~~	~~NA~~

Media	Exposure Pathway	Receptor	Group 1				Group 2: TEH	
			Benzene	Toluene	Ethylbenzene	Xylenes	Diesel*	Waste Oil
	Soil to Water Line	All	2.0	3.2	45	52	10,500	NA

NA: Not applicable. There are no limits for the chemical for the pathway, because for groundwater pathways the concentration for the designated risk would be greater than the solubility of the pure chemical in water, and for soil pathways the concentration for the designated risk would be greater than the soil concentration if pure chemical were present in the soil.

TEH: Total Extractable Hydrocarbons. The TEH value is based on risks from naphthalene, benzo(a)pyrene, benz(a)anthracene, and chrysene. Refer to Appendix B for further details.

Diesel*: Standards in the Diesel column apply to all low volatile petroleum hydrocarbons except waste oil.

ITEM 5. Amend paragraph **135.9(3)"g"** as follows:

g. A receptor survey including but not limited to the following: existing buildings, enclosed spaces (basements, crawl spaces, utility vaults, etc.), conduits (gravity drain lines, sanitary and storm sewer mains and service lines), ~~plastic~~ water lines and other utilities within 500 feet of the source. For conduits and enclosed spaces, there must be a description of construction material, conduit backfill material, slope of conduit and trenches (include flow direction of sewers), burial depth of utilities or subsurface enclosed spaces, and the relationship to groundwater elevations.

ITEM 6. Amend subrule 135.9(8), introductory paragraph, as follows:

135.9(8) *Groundwater to ~~plastic~~ water line pathway assessment.* This pathway addresses the potential for creating a drinking water ingestion risk due to contact with ~~plastic~~ water lines and causing infusion to the drinking water.

ITEM 7. Amend paragraphs **135.9(8)"a," "c"** and **"d"** as follows:

a. Pathway completeness and receptor evaluation.

(1) Actual receptors. This pathway is considered complete for an actual receptor if there is an existing ~~plastic~~ water line within 200 feet of the source and the first encountered groundwater is less than 20 feet below ground surface.

(2) No change.

c. Utility company notification. The utility company which supplies water service to the area must be notified of all actual and potential ~~plastic~~ water line impacts as soon as knowledge of a potential risk is determined. ~~Notification of potential plastic water line impacts may be postponed until completion of Tier 2 if a Tier 2 assessment is required.~~

d. Corrective action response.

(1) For actual receptors, if the Tier 1 levels are exceeded for this pathway, all ~~plastic~~ water lines within 200 feet must be replaced with ~~nonplastic lines~~ water line materials and gasket materials of appropriate construction in accordance with current department standards with no less than nitrile or FKM gaskets or as otherwise approved by the department, or the ~~plastic~~ water lines must be relocated beyond the 200-foot distance from the source. A Tier 2 assessment must be conducted for this pathway if lines are not replaced or relocated.

(2) No change.

ITEM 8. Amend subrule 135.9(9), introductory paragraph, as follows:

135.9(9) *Soil to ~~plastic~~ water line pathway assessment.* This pathway addresses the potential for creating a drinking water ingestion risk due to contact with ~~plastic~~ water lines and infusion into the drinking water.

ITEM 9. Amend paragraphs **135.9(9)"a," "c"** and **"d"** as follows:

a. Pathway completeness and receptor evaluation.

(1) Actual receptors. This pathway is considered complete for an actual receptor if a ~~plastic~~ water line exists within 200 feet of the source.

(2) No change.

c. Utility company notification. The utility company which supplies water service to the area must be notified of all actual and potential ~~plastic~~ water line impacts as soon as knowledge of a potential risk is determined. ~~Notification of potential plastic water line impacts may be postponed until completion of Tier 2 if a Tier 2 assessment is required.~~

d. Corrective action response. For actual receptors, if the Tier 1 levels are exceeded for this pathway, ~~the plastic water lines may be replaced with nonplastic lines or the plastic lines must be relocated to a distance beyond 200 feet of the source~~ all water lines within 200 feet must be replaced with water line materials and gasket materials of appropriate construction in accordance with current department standards and with no less than nitrile or FKM gaskets or as otherwise approved by the department, or the water lines must be relocated beyond the 200-foot distance from the source. Excavation of soils to below Tier 1 levels may be undertaken in accordance with 135.9(7)*"h."* If none of these options is implemented, a Tier 2 assessment must be conducted for this pathway.

ITEM 10. Amend paragraphs **135.10(3)"i"** and **"k"** as follows:

i. Special procedure for the groundwater to ~~plastic~~ water line pathway.

(1) Target level. The applicable target level is the Tier 1 level for ~~plastic~~ the specific type of water ~~lines~~ line.

(2) High risk classification. A site designated as granular or nongranular bedrock shall be classified high risk for this pathway if the highest groundwater elevation is higher than three feet below the bottom of a ~~plastic~~ water line as provided in 135.10(8)*"a"*(1), risk classification cannot be determined as provided in 567—135.12(455B) due to limitations on placement of monitoring wells, and ~~plastic~~ water lines exist within 200 feet of a monitoring well which exceeds the Tier 1 level.

k. High risk corrective action response. Owners and operators have the option to conduct a Tier 3 assessment in accordance with 567—135.11(455B).

(1) and (2) No change.

(3) For water line pathways. For high risk sites, active remediation must be conducted to reduce concentrations below the applicable target levels, or water lines and gaskets must be replaced or relocated including the use of institutional and technological controls. If lines are polybutylene, polyethylene, or asbestos-cement, the lines must be removed or relocated. All water lines that are replaced must be replaced with water line materials and gasket materials of appropriate construction in accordance with current department standards and with no less than nitrile or FKM gaskets or as otherwise approved by the department.

~~(3)~~ (4) Other pathways. For high risk sites other than groundwater ingestion and water lines, active remediation must be conducted to reduce concentrations below the applicable target levels including the use of institutional and technological controls.

ITEM 11. Amend paragraph **135.10(5)"a"** as follows:

a. General. The soil leaching to groundwater pathway is evaluated using a one-dimensional model which predicts vertical movement of contamination through soil to groundwater and transported by the groundwater to a receptor. The model is used to predict the maximum concentrations of chemicals of concern that would be present in groundwater beneath a source which is representative of residual soil contamination and maximum soil concentrations. The predicted groundwater concentrations then must be used as a groundwater source concentration to evaluate its impact on other groundwater transport pathways, including the groundwater ingestion pathway, the groundwater vapor pathway, the groundwater ~~plastic~~ water line pathway and the surface water pathway.

ITEM 12. Amend subrule 135.10(8) as follows:

135.10(8) *Groundwater to ~~plastic~~ water line pathway assessment.*

a. Pathway completeness and receptor evaluation.

(1) Actual receptors include all ~~plastic~~ water lines where the highest groundwater elevation is higher than three feet below the bottom of the ~~plastic~~ water line at the measured or predicted points of exposure. The highest groundwater elevation is the estimated average of the highest measured groundwater elevations for each year. All ~~plastic~~ water lines must be evaluated for this pathway regardless of distance from the source and regardless of the Tier 1 evaluation, if the lines are in areas

with actual data above the applicable Tier 1 level and modeled data above the SSTL line. If actual data exceeds modeled data, then all ~~plastic~~ water lines are considered actual receptors if they are within a distance extending 10 percent beyond the edge of the contaminant plume defined by the actual data.

(2) No change.

(3) The point(s) of exposure is the ~~plastic~~ water line, and the points of compliance are monitoring wells between the source and the ~~plastic~~ water line which would be effective in monitoring whether the line has been or may be impacted by chemicals of concern.

b. Plume definition. If this pathway is complete for an actual receptor, the groundwater plume must be defined to the Tier 1 levels, with an emphasis between the source and any actual ~~plastic~~ water lines. The water inside the ~~plastic~~ water lines shall be analyzed for all chemicals of concern.

c. No change.

d. Pathway classification. Upon completion of analysis of field data and modeled data, the pathway must be classified high risk, low risk or no further action as provided in 567—135.12(455B). The water quality inside the ~~plastic~~ water lines is not a ~~criteria~~ criterion for clearance of this pathway.

e. Utility company notification. The utility company which supplies water service to the area must be notified of all actual and potential ~~plastic~~ water line impacts as soon as knowledge of a potential risk is determined. If the extent of contamination has been defined, this information must be included in utility company notification, and any previous notification made at Tier 1 must be amended to include this information.

f. Corrective action response.

(1) For actual receptors, unless the pathway is classified as no further action, corrective action for this pathway must be conducted as provided in 567—135.12(455B). If the concentrations of chemicals of concern in a water line exceed the Tier 1 levels for actual receptors for the groundwater ingestion pathway, immediate corrective action must be conducted to eliminate exposure to the water, including but not limited to replacement of the line with an approved ~~nonplastic~~ material.

(2) No change.

ITEM 13. Amend subrule 135.10(9), catchwords, as follows:

135.10(9) *Soil to ~~plastic~~ water line pathway assessment.*

ITEM 14. Amend paragraphs **135.10(9)"a," "c," "d"** and **"e"** as follows:

a. Pathway completeness and receptor evaluation.

(1) Actual receptors include all ~~plastic~~ water lines within ten feet of the soil plume defined to the Tier 1 level. All ~~plastic~~ water lines must be evaluated for this pathway regardless of distance from the source~~,~~ if the lines are in areas where Tier 1 levels are exceeded.

(2) No change.

c. Target level. The point(s) of exposure ~~include~~ includes all areas within ten feet of the ~~plastic~~ water line. The target level at the point(s) of exposure is the Tier 1 level.

d. Pathway classification. Upon completion of analysis of field data ~~and modeled data~~, the pathway must be classified high risk, low risk or no further action as provided in 567—135.12(455B). Measurements of water quality inside the ~~plastic~~ water lines may be required, but are not allowed as criteria to clear this pathway.

e. Utility company notification. The utility company which supplies water service to the area must be notified of all actual and potential ~~plastic~~ water line impacts as soon as knowledge of the potential risk is determined. If the extent of contamination has been defined, this information must be included in utility company notification, and any previous notification made at Tier 1 must be amended to include this information.

ITEM 15. Amend subrule **135.12(1)**, first unnumbered paragraph, as follows:

For the soil vapor to enclosed pathway and soil to ~~plastic~~ water line pathways, there are no horizontal transport models to use predicting future impacts. Therefore, for these pathways, sites are classified as high risk, low risk or no action based on specified criteria below and in 567—135.10(455B).

ITEM 16. Amend paragraph **135.12(2)"a"** as follows:

a. For the soil vapor to enclosed space and soil to ~~plastic~~ water line pathways, sites shall be classified as high risk if the target levels for actual receptors are exceeded as provided in 135.10(7) and 135.10(9).

ITEM 17. Reletter paragraphs **135.12(3)"b"** to **"h"** as **135.12(3)"c"** to **"i."**

ITEM 18. Adopt the following **new** paragraph **135.12(3)"b"**:

b. For the groundwater to water line and soil to water line receptors, these objectives are achieved by active remediation, replacement or relocation of water line receptors from areas within the actual plume plus some added site-specific distance to provide a safety factor to areas outside the site-specific target level line. In areas of free product, all water lines regardless of construction material must be relocated unless there is no other option and the department has approved an alternate plan of construction. If water lines and gaskets are replaced in an area of contamination, they must be replaced with water line materials and gasket materials of appropriate construction in accordance with current department standards and with no less than nitrile or FKM gaskets or as otherwise approved by the department. If a service line is replaced and remains in a contaminated area, a backflow preventer shall be installed to prevent impacts to the larger water distribution system.

ITEM 19. Amend relettered paragraphs **135.12(3)"c"** and **"i"** as follows:

c. For the soil vapor ~~and soil to plastic water line~~ pathway, these objectives are achieved by active remediation of soil contamination below the target level at the point(s) of exposure or other designated point(s) of compliance using the same measurement methods for receptor evaluation under 135.10(7) and 135.10(9).

i. Following completion of corrective action, the site must meet exit monitoring criteria to be reclassified as no action required as specified in 135.12(6)~~*"b."*~~ *"c."* At any point where an institutional or technological control is implemented and approved by the department, the site may be reclassified as no action required consistent with 135.12(6).

ITEM 20. Amend paragraphs **135.12(5)"a"** and **"d"** as follows:

a. Purpose. For sites or pathways classified as low risk, the purpose of monitoring is to determine if concentrations are decreasing such that reclassification to no action required may be appropriate or if the contaminant plume is stable such that reclassification to no action required can be achieved with implementation of an institutional control in accordance with 135.12(8), or if concentrations are increasing above the site-specific target level line such that reclassification to high risk is appropriate. Monitoring is necessary to evaluate impacts to actual receptors and assess the continued status of potential receptor conditions. Low risk monitoring shall be conducted and reported by a certified groundwater professional.

d. Soil monitoring.

(1) No change.

(2) For the soil leaching to groundwater pathway potential receptors, annual groundwater monitoring is required for a minimum of three years as provided in *"c"* above. If groundwater concentrations are below the applicable SSTL line for all three years ~~and a final soil sample taken from the source shows no significant vertical movement~~, no further action is required. If groundwater concentrations exceed the applicable SSTL line in any of the three years, corrective action is required to reduce soil concentrations to below the Tier 1 levels for soil leaching to groundwater. Therefore, annual monitoring of soil is not applicable.

(3) For the soil to ~~plastic~~ water line pathway potential receptors, notification of the utility company is required. Notification will result in reclassification to no action required. Therefore, annual monitoring of soil is not applicable.

ITEM 21. Amend paragraphs **135.12(6)"b"** and **"c"** as follows:

b. For initial classification, groundwater pathways shall be classified as no action required if the field data is below the site-specific target level line and all field data is at or less than the simulation line,

and confirmation monitoring has been completed successfully. Confirmation sampling for groundwater ~~and soil~~ is a second sample which confirms the no action required criteria.

c. For reclassification from high or low risk, a pathway shall be classified as no action required if all field data is below the site-specific target level line and if exit monitoring criteria have been met~~.~~, except as provided in 135.12(6)*"g."* ~~Exit~~ To satisfy exit monitoring criteria, ~~means~~ the three most recent consecutive groundwater samples from all monitoring wells must show a steady or declining trend and the most recent samples ~~are~~ must be below the site-specific target level line. Other criteria include the following: The first of the three samples for the source well and transition well must be more than detection limits; concentrations cannot increase more than 20 percent from the first of the three samples to the third sample; concentrations cannot increase more than 20 percent of the previous sample; and samples must be separated by at least six months.

ITEM 22. Adopt the following **new** paragraphs **135.12(6)"f"** and **"g"**:

f. Prior to acceptance of a request to classify the site as no action required, and in the event there is a question of validity of the data or sampling methods, laboratory analysis procedures, indication of plume movement, or the department obtains information about new conditions at the site, the department may conduct or require the owner to conduct confirmation sampling of the soil, groundwater, soil gas, or indoor vapor to confirm that the no action required criteria have been met.

g. The department may waive, at its discretion, the exit monitoring criteria based on a certified groundwater professional's written justification to support a no action required classification for the site based on a reasoned assessment of data, trends, receptor status, and corrective actions performed. One example is when steady and declining criteria have not been met due solely to variations among laboratory's lowest achievable detection limits.

ITEM 23. Amend rule 567—135.14(455B) as follows:

567—135.14(455B) Action levels. The following corrective action levels apply to petroleum regulated substances as regulated by this chapter. These action levels shall be used to determine if further corrective action under 567—135.6(455B) through 567—135.12(455B) or 567—135.15(455B) is required as the result of tank closure sampling under 135.15(3) or other analytical results submitted to the department. The contaminant concentrations must be determined by laboratory analysis as stated in 567—135.16(455B). Final cleanup determination is not limited to these contaminants. The contamination corrective action levels are:

	Soil (mg/kg)	**Groundwater (ug/L)**
Benzene	0.54	5
Toluene	~~42~~ 3.2	1,000
Ethylbenzene	15	700
Xylenes	~~No limit~~ 52	10,000
Total Extractable Hydrocarbons	3,800	1,200

ITEM 24. Amend **567—Chapter 135**, **Appendix A**, Iowa Tier 1 Look-Up Table, as follows:

Iowa Tier 1 Look-Up Table

Media	Exposure Pathway	Receptor	Group 1				Group 2: TEH	
			Benzene	Toluene	Ethylbenzene	Xylenes	Diesel*	Waste Oil
Groundwater ~~(ug/L)~~(µg/L)	Groundwater Ingestion	Actual	5	1,000	700	10,000	1,200	400
		Potential	290	7,300	3,700	73,000	75,000	40,000
	Groundwater Vapor to Enclosed Space	All	1,540	20,190	46,000	NA	2,200,000	NA
	~~Groundwater to Plastic Water Line~~	~~All~~	~~290~~	~~7,300~~	~~3,700~~	~~73,000~~	~~75,000~~	~~40,000~~

Media	Exposure Pathway	Receptor	Group 1				Group 2: TEH	
			Benzene	Toluene	Ethylbenzene	Xylenes	Diesel*	Waste Oil
	Groundwater to Water Line	PVC or Gasketed Mains	7,500	6,250	40,000	48,000	75,000	40,000
		PVC or Gasketed Service Lines	3,750	3,120	20,000	24,000	75,000	40,000
		PE/PB/AC Mains or Service Lines	200	3,120	3,400	19,000	75,000	40,000
	Surface Water	All	290	1,000	3,700	73,000	75,000	40,000
Soil (mg/kg)	Soil Leaching to Groundwater	All	0.54	42	15	NA	3,800	NA
	Soil Vapor to Enclosed Space	All	1.16	48	79	NA	47,500	NA
	~~Soil to Plastic Water Line~~	~~All~~	~~1.8~~	~~120~~	~~43~~	~~NA~~	~~10,500~~	~~NA~~
	Soil to Water Line	All	2.0	3.2	45	52	10,500	NA

NA: Not applicable. There are no limits for the chemical for the pathway, because for groundwater pathways the concentration for the designated risk would be greater than the solubility of the pure chemical in water, and for soil pathways the concentration for the designated risk would be greater than the soil concentration if pure chemical were present in the soil.

TEH: Total Extractable Hydrocarbons. The TEH value is based on risks from naphthalene, benzo(a)pyrene, benz(a)anthracene, and chrysene. Refer to Appendix B for further details.

Diesel*: Standards in the Diesel column apply to all low volatile petroleum hydrocarbons except waste oil.

Assumptions Used for Iowa Tier 1 Look-Up Table Generation

1. Groundwater ingestion pathway. The maximum contaminant levels (MCLs) were used for Group 1 chemicals. The target risk for carcinogens for actual receptors is 10^{-6} and for potential receptors is 10^{-4}. A hazard quotient of one, and residential exposure and building parameters are assumed.

2. Groundwater vapor to enclosed space pathway. Residential exposure and residential building parameters are assumed; no inhalation reference dose is used for benzene; the capillary fringe is assumed to be the source of groundwater vapor; and the hazard quotient is 1 and target risk for carcinogens is $1x10^{-4}$.

3. Groundwater to ~~plastic~~ water line. This pathway uses the same assumptions as the groundwater ingestion pathway for potential receptors, including a target risk for carcinogens of 10^{-4}.

4. Surface water. This pathway uses the same assumptions as the groundwater ingestion pathway for potential receptors, including a target risk for carcinogens of 10^{-4}, except for toluene which has a chronic level for aquatic life of 1,000 as in the definition for surface water criteria in 567—135.2(455B).

5. Soil leaching to groundwater. This pathway assumes the groundwater will be protected to the same levels as the groundwater ingestion pathway for potential receptors, using residential exposure and a target risk for carcinogens of 10^{-4}.

6. Soil vapor to enclosed space pathway. The target risk for carcinogens is $1x10^{-4}$; the hazard quotient is 1; no inhalation reference dose is used for benzene; residential exposure factors are assumed; and the average of the residential and nonresidential building parameters ~~are~~ is assumed.

7. Soil to ~~plastic~~ water line pathway. This pathway uses the soil leaching to groundwater model with nonresidential exposure and a target risk for carcinogens of 10^{-4}.

In addition to these assumptions, the equations and parameter values used to generate the Iowa Tier 1 Look-Up Table are described below.

ITEM 25. Amend **567—Chapter 135**, **Appendix B**, Diesel and Waste Oil section, first, second and third tables, by striking the word “Plastic” in the phrases “Groundwater to Plastic Water Line” and “Soil to Plastic Water Line.”

ITEM 26. Amend **567—Chapter 135**, **Appendix B**, by adopting the following **new** paragraphs at the end thereof:

Explanation of Target Levels for
Petroleum Fuel-Derived BTEX Compounds in Groundwater and Soil

GROUNDWATER

PVC or Gasketed Mains

Benzene: 7,500 µg/L
Gasoline-saturated groundwater was considered to be an extreme condition of environmental contamination, and it was considered unacceptable to leave water lines, regardless of material, in contact with this level of benzene contamination. While Ong et al. (2008) showed that gasoline-saturated groundwater would not pose a significant risk of permeation exceeding the 5 µg/L MCL for benzene of gasketed DI or PVC water mains, a safety factor of 1/8th was applied to the level of benzene in premium gasoline-saturated water determined by Ong et al. (2008). A 1/2 safety factor was compounded for each of four potential safety risks: material defects in the pipe (= 1/2), presence of service line taps (= 1/4), stagnation of water (= 1/6), and water line breaks (= 1/8). This was an average of 67.5 mg/L ± 4.9 mg/L for multiple preparations of gasoline-saturated water and was rounded to 60.0 mg/L to conservatively account for the statistical uncertainty. Hence,

$$\textit{Target Level} = \frac{1}{8} \times 60{,}000\ \mu g/L = 7{,}500\ \mu g/L\ \textit{benzene}$$

Toluene: 6,250 µg/L
The target level for toluene was determined similarly to that for benzene. The level of benzene in premium gasoline-saturated water determined by Ong et al. (2008) to be 56.2 mg/L ± 4.9 mg/L and conservatively rounded to 50.0 mg/L. Hence,

$$\textit{Target Level} = \frac{1}{8} \times 50{,}000\ \mu g/L = 6{,}250\ \mu g/L\ \textit{toluene}$$

Ethylbenzene: 40,000 ug/L
The target level was set to be double that for PVC or Gasketed Service Lines (20,000 µg/L – see below).

Total Xylenes: 48,000 ug/L
The target level was set to be double that for PVC or Gasketed Service Lines (24,000 µg/L – see below).

PVC or Gasketed Service Lines

Benzene: 3,750 µg/L
The target level was set to be one-half of that for PVC or Gasketed Mains (7,500 µg/L as above) since service lines tend to be of higher risk than mains owing to their smaller diameter and greater potential for stagnation.

Toluene: 3,120 µg/L
Similar to benzene, the target level was set to be one-half of that for PVC or Gasketed Mains (6,250 µg/L as above) since service lines tend to be of higher risk than mains owing to their smaller diameter and greater potential for stagnation. Odd-even rounding to 3 significant figures was applied.

Ethylbenzene: 20,000 µg/L

The target level was based on two observations by Ong et al. (2008): (1) premium gasoline-saturated water has an average concentration of 3.4 mg/L ethylbenzene and (2) ethylene permeates high density polyethylene 46 times slower than does benzene (presumably, this is reasonably representative of other materials such as rubber gaskets). The 1/8 safety factor was also applied, as above. Odd-even rounding to 2 significant figures was applied. Hence:

$$\textit{Target Level} = \quad 3{,}400\ \mu g/L \times 46x \times \frac{1}{8} = 19{,}550\ \mu g/L = 20{,}000\ \mu g/L$$

Total Xylenes: 24,000 µg/L
Similar to ethylbenzene, the target level was based on (1) premium gasoline-saturated water has an average concentration of 19 mg/L total xylenes and (2) total xylenes permeate high density polyethylene 10 times slower than does benzene. The 1/8 safety factor was also applied, as above. Odd-even rounding to 2 significant figures was applied. Hence:

$$\textit{Target Level} = \quad 19{,}000\ \mu g/L \times 10x \times \frac{1}{8} = 23{,}750\ \mu g/L = 24{,}000\ \mu g/L$$

PE/PB/AC

Benzene: 200 µg/L
The target level was set at the concentration of benzene in groundwater surrounding a 1" HDPE service line (SIDR 9 IPS) that would result in a concentration of 2 µg/L benzene in the service line after a 24 hr stagnation period. This level was chosen because 2 µg/L is generally the minimum reportable concentration of benzene in laboratory reports received by the department.

The permeation rate is a function of the concentration of benzene in the groundwater as described by Ong et al. (2008), equation 3.4a:

$$P_m = 0.0079 C_{bulk}^{1.1323}$$

where P_m is the benzene permeation rate in µg/cm^2/day through the pipe described above (cm^2 refers to the inner surface of the pipe) and C_{bulk} is the concentration of benzene in the groundwater (mg/L).

For any length of exposed 1" SIDR 9 IPS pipe, l (cm), the concentration in the pipe after 24 hr stagnation, C_{24hr} (µg/L), can be computed from P_m and the ratio of the inner surface of the pipe to the internal volume:

$$C_{24hr} = P_m \times \left(\frac{2\pi r l}{\pi r^2 l/1000}\right) = 0.0079 C_{bulk}^{1.1323} \times \frac{2000}{r}$$

where r is the inside radius of the pipe (cm), l is the length of exposed pipe (cm), and dividing by 1000 converts from cm^3 to liters (and, therefore, 2000/r converts µg/cm^2/day to µg/L/day).

Solving for C_{bulk} (mg/L) with C_{24hr}= 2 µg/L and r = 1.28 cm (per manufacturer's specifications):

$$C_{bulk}^{1.1323} = \frac{2 \times 1.28}{0.0079 \times 2000}$$

and

$$C_{bulk} = \sqrt[1.1323]{0.162} = 0.200 mg/L = 200 \mu g/L$$

While the target level is expressed as 200 µg/L for clarity, the underlying data support only two significant figures. In a stricter treatment of the data, this would be expressed as 20×10^1 µg/L.

Toluene: 3,120 µg/L
The target level was set to be equal to that for PVC or Gasketed Service Lines. Calculations similar to those used above for benzene (Ong et al. (2008), equation 3.4b) indicate that 3,120 µg/L toluene in groundwater would result in 50 µg/L inside a 1" SIDR 9 IPS HDPE pipe after 24 hours of stagnation, which is 1/20th of the 1,000 µg/L MCL for toluene.

Ethylbenzene: 3,400 µg/L
The target level was set to be equal to the concentration of ethylbenzene in premium gasoline-saturated water (see discussion above for PVC or Gasketed Mains/Benzene). Unlike other target levels based on contaminant concentrations in gasoline-saturated water, the 1/8th safety factor was not applied because of the very low permeation rate of ethylbenzene through HDPE, the relatively low solubility of ethylbenzene in water, and the relatively high MCL (700 µg/L). Ong et al. (2008) found that permeation of HDPE by aqueous ethylbenzene was minimal and of no consequence for public health.

Total Xylenes: 19,000 µg/L
The target level was set to be equal to the concentration of ethylbenzene in premium gasoline-saturated water following the same reasoning for ethylbenzene (above). The permeation rate and water solubility are also very low, and the MCL is 10,000 µg/L. Ong et al. (2008) found that permeation of HDPE by aqueous xylenes was minimal and of no consequence for public health.

SOIL

Target levels for soil were set to be the same for mains and service lines of any material discussed above under "Groundwater." The underlying data support two significant figures for target levels in soil. Odd-even rounding was applied where appropriate.

Benzene: 2.0 mg/Kg
The target level was derived from the concentration of benzene (mg/Kg) that would result if soil that was 10% moisture and 1% organic matter was equilibrated with premium gasoline-saturated water (60 mg/L benzene – as per discussion of PVC or Gasketed Mains/Benzene above). The equilibrium concentration in soil was calculated using the approach of Chiou et al. (1983). The 1/8th safety factor discussed previously for groundwater was applied. Accordingly:

$$C_T = C_W K_d + C_W \theta$$

where C_T is the total concentration of benzene in soil (mg/Kg), θ is the fraction of moisture in the soil (Kg/Kg), and Kd is the partition coefficient from water to soil (L/Kg). Further:

$$K_d = K_{om} f_{om}$$

where K_{om} is the partition coefficient from water to organic matter in the soil, which is 16.8 L/Kg for benzene in soils with naturally occurring organic matter (Chiou et al. (1983)), and f_{om} is the fraction of organic matter in the dry soil (Kg/Kg).

For soil containing 1% naturally occurring organic matter and 10% moisture, the total concentration of benzene upon exposure to premium gasoline-saturated groundwater (60 mg/L benzene, as per above discussion of PVC or Gasketed Mains) would be:

$$C_T = \left(\frac{60\ mg}{L} \times \left(\frac{16.8\ L}{Kg} \times \frac{0.01\ Kg}{Kg}\right)\right) + \left(\frac{60\ mg}{L} \times \frac{0.1\ Kg}{Kg}\right) = \frac{16\ mg}{Kg}$$

Applying the 1/8th safety factor:

$$Target\ Level = \frac{1}{8} \times \frac{16\ mg}{Kg} = \frac{2.0\ mg}{Kg}$$

Toluene: 3.2 mg/Kg

The target level was derived in the same manner as for benzene except that the concentration of toluene in premium gasoline-saturated water is 50 mg/Kg and K_{om} is 42 L/Kg. Accordingly:

$$C_T = \left(\frac{50\ mg}{L} \times \left(\frac{42\ L}{Kg} \times \frac{0.01\ Kg}{Kg}\right)\right) + \left(\frac{50\ mg}{L} \times \frac{0.1\ Kg}{Kg}\right) = \frac{26\ mg}{Kg}$$

and

$$Target\ Level = \frac{1}{8} \times \frac{26\ mg}{Kg} = \frac{3.2\ mg}{Kg}$$

Ethylbenzene: 45 mg/Kg

The target level was based on the target level set for Groundwater/PVC or Gasketed Mains (40,000 µg/L, rounded from 39,100 µg/L, or 39.1 mg/L) and the principles of Chiou et al. (1983) discussed above. In a manner similar to that for benzene in soil, C_W was 3.4 mg/L, Kd was 0.106 L/Kg, and C_T was calculated to be 3.9 mg/Kg. The target level for soil that is equivalent to the target level set for groundwater was calculated as follows:

$$Target\ Level\ mg/Kg = 39.1\ mg/L \times \frac{3.9\ mg/Kg}{3.4\ mg/L} = 45\ mg/Kg$$

Total Xylenes: 52 mg/Kg

The target level was set in the same manner as for ethylbenzene (above), based on the groundwater target level of 48,000 µg/L (rounded from 47.5 mg/L). C_W was 19 mg/L, Kd was 1.001 L/Kg (assuming a mixture of m-, o-, and p-xylenes which is 60%, 20%, and 20%, respectively, which is typical of xylenes derived from petroleum), and C_T was calculated to be 21 mg/Kg. Hence:

$$Target\ Level\ mg/Kg = 47.5\ mg/L \times \frac{21\ mg/Kg}{19\ mg/L} = 52\ mg/Kg$$

NOTE: The 1/8th safety factor was applied above to the target levels for ethylbenzene and total xylenes for Groundwater/PVC or Gasketed Service Lines, from which the target levels for PVC or Gasketed Mains were derived. Consequently, the 1/8th safety factor has also been applied to the target levels for both ethylbenzene and total xylenes in soil.

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