Illinois Environmental Protection Agency

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Guidance for Preparing RCRA Closure Plans
July 2003

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1. Introduction

1.1 Purpose, Scope and Applicability

This document sets forth guidance regarding development and implementation of plans to close hazardous waste management units (HWMUs) subject to the requirements of 35 Ill. Adm. Code (Ill. Adm. Code), Part 724 and 725. Specifically this document discusses: (1) the general procedures associated with RCRA closure projects; (2) development of RCRA closure plans; (3) execution of approved closure plans and (4) the procedures which must be followed to complete RCRA closure projects.

This document was developed to be an all-encompassing document addressing all aspects of RCRA closure. For certain projects, it may be best to break the project down into phases and only develop detailed plans for that phase of the project of concern. This is an acceptable way of completing closure of a unit, provided the initial closure plan contains a conceptual description of the efforts necessary to complete closure of the HWMU of concern of the overall closure process (including a schedule for entire project) as well as detailed plans for the activities associated with the first phase of the plan.

For the most part, "RCRA closure" means that some type of investigation/remediation effort is being carried out at a unit where hazardous wastes were once managed. Since, as stated above, this document is meant to be all-encompassing, it provides guidance regarding all aspects of closure, from characterization to investigation to remediation. Thus, it can be used as general guidance for any type of investigation/remediation effort and provides insight regarding various issues associated with these efforts.

1.2 Definitions

Closure - the action taken to secure a hazardous waste management unit in a manner which will protect human health and the environment in accordance with the closure requirements of 35 Ill. Adm. Code 724 or 725, Subpart G.

Hazardous Waste Management Unit - (HWMU) - a unit, used for treating, storing or disposing of hazardous waste subject to: (1) the RCRA permit requirements of 35 Ill. Adm. Code 708, 703 and 705; and (2) the requirements of 35 Ill. Adm. Code 724 and 725. This may include, for example, a container storage area, an above or below grade storage or treatment tank, a waste pile, a surface impoundment, a land treatment unit, a miscellaneous treatment unit or a landfill.

It must be noted that there are certain exclusions to the RCRA permit program which are specified in Ill. Adm. Code 703.123. In addition, there are RCRA permit exemptions for: (1) small quantity generators in 721.105; and (2) for generators of hazardous waste in 35 Ill. Adm. Code 722.134. There are several requirements which must be met to be eligible for these generator exemptions. Failure to comply with the requirements associated with the aforementioned generator exemptions will subject a facility to the requirements of 35 Ill. Adm. Code 724 and 725 and the permit requirements of 35 Ill. Adm. Code 702, 703 and 705. Once this happens, the facility will be operating in violation of these regulations, as it will not have the necessary permits in place.

Partial Closure - the closure of a discrete portion of a hazardous waste facility (such as a surface impoundment, landfill trench, container storage unit or tank) while other units or cells remain operating.

"Clean" Closure - a RCRA closure which includes the removal of all wastes, waste residues, leachate, liners and soils (including groundwater) contaminated with waste or leachate that pose a present or potential threat to human health or the environment. Soil remediation objectives achieved in a clean closure must meet the requirements of 35 Ill. Adm. Code 742. Clean closure of surface impoundments, land treatment units and waste piles must meet the requirements of 35 Ill. Adm. Code 724 and the closure by removal requirements of 35 Ill. Adm. Code 703.160. Soil and groundwater beneath the hazardous waste management unit must meet cleanup objectives established by the Illinois EPA to assure this ultimate goal is met.

"Dirty" Closure - a RCRA closure in which a determination has been made that "clean" closure of a given HWMU cannot be achieved. Such a unit must close as a landfill in accordance with 35 Ill. Adm. Code 724.410 or 725.410, receive post-closure and eventually obtain a post-closure permit as required by 35 Ill. Adm. Code 703.159.

SW-846 - a USEPA guidance document for the collection and analysis of samples associated with the RCRA program. This document is entitled Test Methods for Evaluating Solid Wastes. The procedures in the most recent edition and finalized updates of this document must be used when carrying out activities in accordance with SW-846.

1.3 Overview of the RCRA Closure Process

The regulations pertaining to the management of hazardous waste can be found in 35 Ill. Adm. Code 700 thru 729. Interim status facilities with hazardous waste management units (HWMUs) subject to these regulations which decided not to obtain a final RCRA operating permit must close their HWMUs in accordance with an Illinois EPA-approved interim-status closure plan (see 35 Ill. Adm. Code 725.212). Such a plan must meet the requirements of 35 Ill. Adm. Code 725. In addition, facilities found to be operating HWMUs without a permit must also close their unpermitted HWMUs in accordance with an Illinois EPA-approved closure plan which meets the requirements of 35 Ill. Adm. Code 724 and 725.

Typically, the procedures involved in closing a hazardous waste management unit include:

1. Removal, as appropriate, of the waste in the HWMU;
2. Decontamination, as appropriate of the HWMU;
3. An evaluation, as appropriate, to determine if there is a possibility that hazardous wastes/constituents may have been released from the HWMU;
4. Collection and analysis of soil samples, as appropriate, to determine if hazardous wastes/constituents have been released from the HWMU;
5. Determination, as appropriate, of the extent of any soil contamination which may be present beneath and around the HWMU (this includes possible investigation of the groundwater, if soil contamination is found to extend to near the groundwater);
6. Determination of the need for soil and/or groundwater remediation by developing remediation objectives in accordance with 35 Ill. Adm. Code 742;
7. Development, execution and completion of any required remediation efforts;
8. Verification that the required remediation efforts met the remediation objectives set forth in the approved plan;
9. Certification by the owner/operator that the requirements of the approved plan were met.

It must be noted that Items 1 thru 9 above assume that a facility will achieve "clean closure" (i.e., proper remediation of all contaminated soil and groundwater) of the HWMU of concern. If a HWMU is to be "dirty closed", (i.e. closure as a landfill) then it will be necessary to: (1) construct a final cover over the unit; (2) develop and implement a groundwater monitoring program for the unit; and (3) provide for 30 years of post-closure care of the unit. In addition, it will be necessary for the facility to obtain a RCRA post-closure permit (see Ill. Adm. Code 703.121(b)).

The general administrative steps for closing a HWMU is as follows:

1. The facility develops a closure plan for the HWMU. As stated above, this plan must meet the requirements of 35 Ill. Adm. Code 724 or 725. This guidance document has been developed to aid in the development and implementation of a closure plan.
2. The Illinois EPA reviews and eventually approves the closure plan, with conditions and modifications, as necessary. A more detailed discussion of this subject is provided in Section 1.5 below.

3. The facility implements the approved closure plan. Section 1.4 below contains information regarding the time frame over which a closure project must be completed.

4. Typically, additional information is obtained while implementing the closure plan which requires that the approved plan be modified. If this is the case, then the facility must submit for Illinois EPA review and approval a request to modify the approved plan. Such a request should contain sufficient information to justify the proposed modification. The Illinois EPA will either: (1) approve the request; (2) disapprove the request; or (3) approve the request with conditions and modifications. All modifications made to the approved closure plan must be approved by the Illinois EPA.

   Requests to modify an approved closure plan must contain a detailed description of the proposed activities necessary to complete closure in accordance with 35 Ill. Adm. Code 724 or 725 and a demonstration that the proposed modifications meet these requirements. This submittal must also contain: (1) a revised schedule for completing closure; (2) a demonstration that the owner/operator has taken and will continue to take all steps to prevent threats to human health and the environment from the subject unit; and (3) a demonstration that the facility is in compliance with all applicable interim status regulations. In general, these submittals should follow the same format and informational content described in Section 2 of this document. Approval and/or disapproval of modification request will be handled in a manner similar to that as described for new plans above.

5. Once the facility has completed closure of HWMU, it submits certification of this to the Illinois EPA. This certification is accompanied by a documentation report which contains detailed information about the closure activities.

6. The Illinois EPA reviews the certification and documentation report to ensure that the HWMU has indeed been closed in accordance with the approved plan. The Illinois EPA also carries out an inspection of the closed HWMU.

7. If the Illinois EPA determines that the HWMU was closed in accordance with the approved plan, then the certification will be accepted. If the Illinois EPA finds that the HWMU was not closed properly, then it will notify the facility in writing of the deficiencies it found.

In certain circumstances, it may not be possible (due to the presence of several unknowns associated with the project) to develop a closure plan at the on-set of a project which describes all the activities which must be carried out to complete closure of the HWMU. In such cases, it may be more appropriate to break the closure effort up into several phases and only initially develop detailed plans for the first phase of the project. This is acceptable provided that the initial closure plan contains: (1) a conceptual discussion of the overall closure effort (including a schedule for the entire project); (2) detailed background information on the project; and (3) detailed plans for the first phase of the plan. Detailed plans and specifications for each subsequent phase of the closure process can be submitted as closure plan modification requests.

All closure plans, modification requests, and certifications of closure must be signed by a person of responsibility associated with the facility undergoing closure (see 35 Ill. Adm. Code 702.126); this issue is further discussed in Section 2.17 below. Furthermore, it must also be noted that certain statutory and regulatory requirements must be met regarding the people who develop, implement and oversee a closure project; this issue is further discussed in Section 1.6 below.

1.4 Time Required to Complete a RCRA Closure Project

In accordance with 35 Ill. Adm. Code 725.213(b), all activities necessary to complete closure of a RCRA unit must be completed within 180 days of the date of Illinois EPA's letter approving the closure plan for the unit. Illinois EPA may approve an extension of this deadline if a facility submits a closure plan modification request which contains information demonstrating that: (1) the closure activities will, of necessity, take longer than 180 days to complete; and (2) the facility has taken and will continue to take all steps to prevent threats to human health and the environment from the unit, including compliance with all applicable interim status requirements.

Requests to extend the deadline to complete closure must be submitted to Illinois EPA as a closure plan modification request at least 30 days prior to the expiration of the 180 day closure period. These requests must contain the information identified above and also contain a revised schedule which: (1) identifies the various tasks which must be conducted to complete closure of the subject unit; (2) identifies the estimates dates during which the afore-mentioned tasks will be completed; and (3) the final data when closure will be completed (such a schedule is required to be in a closure plan, see 35 Ill. Adm. Code 725.212(b)(6)).

1.5 Closure Review Process

Review of New Plans (35 Ill. Adm. Code 725.212(d) - All RCRA interim status closure plan must be submitted to the Permit Section in the Bureau of Land at Illinois EPA. All closure plans and requests to modify approved plans should be submitted to the following address:

Illinois Environmental Protection Agency
Bureau of Land
Permit Section
2520 West Iles Avenue
Post Office Box 19276
Springfield, Illinois 62794-9276

When the Permit Section receives a new closure plan, it is logged in and assigned to a reviewer. The Illinois EPA is allowed 90 days from the date of receipt to review the plan. A Public Notice will be published in a local newspaper and the public will be given an opportunity to submit written comments regarding the closure plan. A public hearing may be conducted at the Illinois EPA's discretion.

The plan is reviewed by the Illinois EPA to determine if it should be approved, with or without modification, or disapproved. If the closure plan is approved, a letter acknowledging approval will be sent to the owner/ operator. The Illinois EPA letter serves as the approved closure plan and will include any conditions which the Illinois EPA feels are necessary to ensure that the requirements of 35 Ill. Adm. Code 725, Subpart G are met. If the closure plan is disapproved, a letter stating the reasons for disapproval is sent. The owner/operator must modify and resubmit the closure plan within 30 days after receipt of the disapproval letter. Failure to submit a revised closure plan within this time frame may result in enforcement action being filed against the facility. The Illinois EPA must approve or modify the revised closure plan, within 60 days. If the facility submits the revised closure plan after the 30 day time period has expired, the revised closure plan will be considered a new closure plan again allowing the Illinois EPA a 90 day review period and the Illinois EPA the option of disapproval.

Modification of Closure Plan (35 Ill. Adm. Code 725.212(d) and 725.213) - Following closure plan approval, a request may be made to modify the provisions of the approved closure plan. Such modification requests should be developed in general accordance with Section 2 of this document incorporating as appropriate: (1) the proposed revisions to the plan; (2) a demonstration that the proposed revisions meet the requirements of 35 Ill. Adm. Code 725; (3) a revised schedule for the various activities necessary to complete the closure project; and (4) information demonstrating that the facility will continue to take all steps to prevent threat to human health and the environment, including compliance with all applicable interim status regulations. Approval and/or disapproval of modification request will be handled in a manner similar to that as described for new plans above.

Review of a Closure Certification (35 Ill. Adm. Code 725.243) and Closure Documentation Report (35 Ill. Adm. Code 725.215) - After a facility has completed closure in accordance with the approved closure plan, a certification of closure statement and a report documenting the efforts carried out during closure must be submitted to the Illinois EPA. These documents will be reviewed to determine if closure was completed in accordance with the approval plan. The Illinois EPA Field Operation Section will also perform a site inspection. If the Illinois EPA's evaluation determines that closure was conducted in accordance with the approved closure plan, the Illinois EPA will send a letter to the owner/operator indicating closure has met the requirements of 35 Ill. Adm. Code 725. Financial assurance documents will be returned to the facility with this letter as appropriate. If it is determined that closure was not completed in accordance with the approved plan, the Illinois EPA will send a letter to the facility specifying deficiencies found in the certification and the date by which they must be corrected.

Appeal Provisions - Facilities have the opportunity to appeal all actions taken regarding closure activities in accordance with Sections 39 and 40 of the Illinois Environmental Protection Act. Specifically, a facility may petition for a hearing before the Illinois Pollution Control Board to contest a decision made by Illinois EPA. This petition must be filed within 35 days after the date of Illinois EP✡ s mailing of the final decision. The 35-day period for petitioning for a hearing may be extended for a time period not to exceed 90 days by written notice to the Board from the facility and the Illinois EPA within the 35-day initial appeal permit. The procedures set forth in the Illinois Environmental Protection Act and the rules/regulations adopted thereunder must be followed in such actions.

1.6 Work Required to be Completed by Licensed Professionals

Once RCRA closure of a hazardous waste management unit has been completed, 35 Ill. Adm. Code 724.215 and 725.215 require that the owner/operator and an independent licensed professional engineer certify that the closure effort was completed in accordance with the approved plan. This regulation goes on to require that the engineer provide documentation supporting this certification. Thus, to satisfy these requirements, it is necessary for a licensed professional engineer to oversee and document completion of all required closure activities. The engineer must be present for all critical closure activities, including (but not limited to) such activities as soil sampling, decontamination of structures, soil removal, backfilling and final cover placement. The frequency of inspections by the engineer must be sufficient to determine whether or not each closure activities was carried out in accordance with the approved plan.

Work required by closure plans may also be subject to other laws governing professional service, such as the Illinois Professional Surveyor Act of 1989, the Professional Engineering Practice Act of 1989, the Professional Geologist Licensing Act, and the Structural Engineering Licensing Act of 1989. No one involved in developing and/or implementing RCRA closure plans are relieved from compliance with these laws and the regulations adopted pursuant to these laws. All work that falls with the scope and definitions of these laws must be performed in compliance with them. The Illinois EPA may refer any discovered violation of these laws to the appropriate regulating authority.

2. Content of Closure Plan

This section describes the information which should be provided in a RCRA closure plan. In addition, any request to modify an approved closure plan should contain the applicable information below regarding the proposed modified closure activities. The order in which the information is presented below has been developed following a format that may be used directly in the development of a closure plan.

2.1 Introduction

An introductory section should be provided in the work plan to provide general information regarding the facility. This section should contain the following information:

1. An identification of the facility where the HWMU being closed is located;
2. The reason for submittal of the closure plan;
3. An identification of the parties involved in closure activities;
4. The unit(s) closing and those, if any, remaining open;
5. Whether this is a partial or a final closure;
6. A chronological overview of activities completed/modifications submitted to date;
7. A summary of what is contained in the closure plan; and
8. The goals of the proposed closure activities.

2.2 Overall Description of Facility

The following general information regarding the facility where the HWMU being closed is located should be provided in the closure plan:

1. The address of facility and the township, range and section in which the facility is located;
2. The USEPA and Illinois EPA identification numbers;
3. The type of facility, based on the Standard Industrial Code of the US Department of Labor;
4. A description of the manufacturing processes carried out at facility and products manufactured;
5. The size of facility;
6. The past operations/operational practices at facility;
7. Scaled maps which identify:
    a. The location of the facility on USGS topographic or county map;
    b. The layout of the facility (scale of one inch equal to no more than 200') showing site boundaries and all hazardous waste management units and identifying those unit(s) closing; and
    c. The surrounding land use.
8. A description of local land use, such as commercial, residential, industrial. The proximity to public areas, such as parks, schools, shopping areas, nursing homes, etc. should also be discussed (also depicted on a map).

2.3 Description of Waste Management Units

The following information should be provided in the closure plan regarding each hazardous waste management unit undergoing closure (35 Ill. Adm. Code 721 and Facility/Generator Annual Reports should be used to develop information and define wastes managed in the units):

1. Name and EPA process code of unit undergoing closure;
2. An identification of each waste managed in the unit, including, for each waste:
    a. Chemical name;
    b. EPA Hazardous Waste Number(s);
    c. Hazardous properties; and
    d. Hazardous constituents and degradation compounds;
    e. Chemical Analysis.
3. Volume of each waste managed in unit, including:
    a. Current volume for each waste type;
    b. Maximum inventory of each waste type since first generated at facility; and
    c. Total past and total current volume.
4. A description of how and where wastes are routed from the point generation to each pile;
5. The size/volume capacity of each unit including current as well as former dimensions (if applicable);
6. Time period unit was used;
7. Prior use/activity in location of the HWMU (if applicable);

8. Scaled drawings which show:
   a. Dimensions of the HWMU
   b. Drains, sewers, sumps, trenches and other appurtenant structures in the HWMU and within 15 feet of the HWMU;
   c. Piping, vents, fill, waste removal, etc.;
   d. Nature of surrounding operations;
   e. Secondary containment features of the HWMU;
   f. Loading/unloading area(s) associated with the HWMU;
   g. Drainage pathways around the HWMUs (direction indicated by arrows);
   h. Any significant cracks or fractured joints greater than 1/4" in thickness in the base of the HWMU;
   i. Barriers, support structures within, just outside of the HWMU;
   j. Cross-section diagrams of the HWMU (as appropriate);
9. A description of any primary or secondary containment structure associated with the HWMU, including:
   a. A description of the material from which it is constructed (asphalt, concrete, etc.);
   b. Integrity of surface;
   c. Approximate age, date of last resurfacing; and
   d. Thickness of pad/base.
10. A description of the material underlying the HWMU.
11. Photographs of the HWMU identifying the date the photograph was taken and the orientation of the photograph depicted on a scaled drawing.

2.4 Description of Areal Geology, Hydrogeology and Water Usage

The geology, hydrogeology and water usage of the area around and within the facility conducting a RCRA closure project play quite a significant role in several aspects of the overall project. Specific areas where these characteristics are of importance include: (1) movement of any releases contaminants through the soil; (2) the potential for releases to contaminate groundwater; (3) actual movement of a release through groundwater; (4) the actual impacts a site may have on the groundwater beneath it; and (5) the potential direct impacts any release to groundwater may have on people using that groundwater. Thus, information regarding the geologic, hydrogeologic and water usage characteristics of the area around the facility and within the facility itself should be provided in the closure plan, as it is available. This information should include:

1. A detailed description of the geologic and hydrogeologic characteristics of the area in which the site is located. Specifically, the geography, geology, lithology, stratigraphy and hydrogeology of the area within a 1 to 2 mile radius of the site based upon existing information should be described. In addition, the presence and location of any "Class I aquifers" (as defined in 35 Ill. Adm. Code 620) must be identified and discussed, if present. Additional guidance regarding development of this information can be found in Attachment E.

   Existing information which should be relied upon includes, but is not limited to, information from the Illinois Scientific Surveys, the Illinois EPA, other State and Federal organizations, water well investigation logs and previous investigations (including subsurface investigations for building foundations). The Illinois State Water Survey and the Illinois State Geological Survey should be contacted to obtain existing information related to the hydrogeology of the area. References should be provided in the report for all sources of information utilized.

2. An identification of any private water supply wells within a one mile radius of the site. A scaled drawing showing the location of these wells must be provided along with actual logs and documentation of the efforts made to obtain this information;
3. An identification of any public water supply wells within a two mile radius of the site. A scaled drawing showing the location of these wells must be provided along with actual logs and documentation of the efforts made to obtain this information;
4. An identification of the geologic units beneath the site which are used for private water supply within a one mile radius of the site (including bedrock units) and an indication of whether these units contain groundwater subject to the Class I Standards;
5. An identification of the geologic units beneath the site which are used as a public water supply (including bedrock units) and an indication of whether these units contain groundwater subject to the Class I standards.

2.5 **Initial Closure Activities**

This section describes the information that should be provided by the facility in describing the various initial activities performed during the closure process (waste removal, decontamination of structures, soil sampling/analysis efforts).

2.5.1 **Waste Removal**

Information should be provided in the closure plan describing the procedures which will be used to: (1) remove the waste from the HWMU and send it to a permitted TSD facility; and (2) manage all waste generated during the closure effort. In managing this waste, the following factors should be considered:

1. **Definition of Hazardous and Non-Hazardous Waste** - Waste exhibiting any of the characteristics of hazardous waste in 35 Ill. Adm. Code 721, Subpart C or listed as a process waste as defined by 35 Ill. Adm. Code 721, Subpart C and Subpart D, must be managed in accordance with 35 Ill. Adm. Code 722, 723, 728, 809, and any other applicable requirements. Wastes generated by closure activities (such as decontamination water and contaminated soil) containing listed hazardous waste must be managed as a hazardous waste. Waste determined to be non-hazardous must be managed as a special waste in accordance with Sections 3.45 and 22.48 of the Illinois Environmental Protection Act and 35 Ill. Adm. Code 809.

2. **Creating a Regulated Unit** - It is recommended that necessary permits for waste disposal be obtained prior to initiating excavation activities. Storage on site of excavated hazardous waste prior to off-site disposal is allowed for less than 90 days. The ninety (90) day accumulation time exemption (35 Ill. Adm. Code 722.134) only applies to containers and tanks. The stockpiling of hazardous waste (including soil contaminated with listed hazardous waste) on the ground of even short periods of time result in the creation of a RCRA waste pile. The design and operation of a new waste pile unit is subject to the requirements of 35 Ill. Adm. Code 724, Subpart L and includes installation of a liner and leachate collection system (or equivalent protection) meeting the requirements of 35 Ill. Adm. Code 724.351. The waste pile would also be subject to RCRA closure and possible post-closure, including groundwater monitoring requirements, after its use is discontinued.

3. Disposal of Asphalt and Concrete - If it is determined that any concrete/asphalt surfaces associated with the unit undergoing closure should be disposed of, two options are available for disposal:

   a. The material may be taken to an off-site hazardous waste disposal facility and disposed of as a hazardous waste; or

   b. The material may be disposed of as non-hazardous waste if the top of it is scraped and/or brushed to remove any residue adhering to it and then steam-cleaned and triple rinsed. All scrapings and wash water must be managed as described by 2.5.2 below. The bottom of the material must also be scraped and/or brushed to remove all soil, gravel, etc. adhering to it.

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2.5.2 Decontamination of Structures

Information should be provided in the closure plan regarding the decontamination procedures to be utilized and the proposed management of any rinsate generated during the closure activities. Recommended procedures for decontamination and management of waste generated from decontamination is as follows:

1. **Decontamination of Concrete/Asphalt Surfaces** - The concrete/asphalt surface associated with the HWMU (such as primary or secondary containment structures) should be decontaminated. The first step of the decontamination process is to visually inspect and photograph the surface. Residue adhering to the surface must be removed by scraping and/or brushing. Following this, the surface must be steam cleaned or pressure washed with an appropriate solvent and triple rinsed. All wash and rinse water must be collected and managed as described by Item 3 below.

2. **Decontamination of Tank Systems** - Tank systems (i.e., tanks, paved areas, containment systems, equipment, structures, soils, pipes, pumps, sumps and any other appurtenances to the hazardous waste management unit containing hazardous waste) should be subject to all reasonable means of decontamination before they may be considered Aclean. Typically decontamination of tank systems should consist of removal of all material in the tank system followed by a pressure wash or steam cleaning and a final triple rinsing.

   Tanks to be used for temporary storage of hazardous waste after closure (not to exceed ninety days) of the same or similar waste(s) should be drained and inspected. The owner or operator and an independent engineer must certify, using procedures recommended by professional/technical entities, that the tank and its appurtenances meet the requirements of 35 Ill. Adm. Code 725, Subpart J, as required by 35 Ill. Adm. Code 722.134. All hazardous waste residues and contaminated containment system components, equipment structures and soils must be removed or decontaminated to satisfy the closure performance standard [35 Ill. Adm. Code 725.212(b)(4)].

3. **Management of Scrapings, Washwater and Rinsewater** - An estimated volume of the waste material to be generated from decontamination should be provided in the closure plan, as well as a description of how the waste material will be managed. This waste material should be analyzed for all the hazardous constituents listed in 35 Ill. Adm. Code 721, Appendix H associated with the hazardous wastes which were managed in the HWMU. If the analysis detects the presence of any constituent of listed hazardous waste(s) managed in the unit above the PQL, then waste material should be managed as a listed hazardous waste. In addition, an analysis of this waste material should be performed to determine if it exhibits any of the characteristics of hazardous waste as set forth in 35 Ill. Adm. Code 721, Subpart C. Waste material exhibiting any characteristic of a hazardous waste must also be managed as a hazardous waste. At a minimum, the waste material must be managed as a special waste as described in Section 2.5.1 above. Rinsate may be disposed in an on-site wastewater treatment plant (WWTP) if documentation is provided that the rinsate is compatible with the WWTP waste and introduction of rinsate into the WWTP would not be in violation of any permit.

4. **Decontamination of Equipment** - Any equipment, including heavy earth-movers or smaller tools, should be scraped and washed to remove waste residues. The residues should be managed in general accordance with the procedures set forth in Item 3 above, and this cleaning and management should be described in the closure plan.

2.5.3 Integrity Inspection

HWMUs with primary and/or secondary containment structures have been designed and constructed to minimize the impact any release from the HWMU will have on the environment. As part of the closure activities for each unit, an evaluation of the structural integrity of the structures must be made to ensure that they have indeed been able to operate as designed and constructed. Information should be provided in the closure plan regarding the procedures which will be used to evaluate the structure integrity of the HWMU. This evaluation will determine if there is a possibility that there has been release of hazardous waste from the HWMU to the environment. Soil sampling/analysis will be required at units with poor integrity.

1. **Concrete/Asphalt Surfaces** - After cleaning concrete/asphalt surfaces associated with a HWMU, an independent registered professional engineer should inspect the integrity of the surfaces. These surfaces must be inspected for cracks which penetrate through the concrete/asphalt. In addition, all construction joints must be inspected to ensure they are watertight. The goal of this inspection must be inspected to ensure they are watertight. The goal of this inspection must determine if cracks, joints, etc. are present in the base of the HWMU which would allow any released waste to migrate through the base and into the underlying soil. This inspection must be carried out in accordance with standards and recommendations of professional/technical entities such as the American Concrete Institute, the Portland Cement Association, the American Society for Testing and Materials, the American Society of Civil Engineers, etc., relating to the ability of concrete/asphalt structures to contain liquids. The results of this inspection must be submitted in the form of a report within the Closure Documentation Report or submitted to the Illinois EPA (if necessary) in the form of a closure modification request (see Section 1.3). The integrity inspection report must include (1) the results of the inspection, (2) scaled drawings showing the location of all cracks and construction joints observed during the investigation, (3) conclusions reached regarding any cracks or construction joints observed in the areas of concern, (4) justification for the conclusions reached (e.g., information must be provided which indicates that any construction joints in the areas of concern are indeed watertight), (5) photographs to support the conclusions, and (6) certification by an independent registered engineer in accordance with 35 Ill. Adm. Code 702.126. IEPA RCRA Closure Guidance (7/03) Page 15 of 39 If it is determined that cracks, joints, etc. present in the concrete/asphalt surface have the potential of allowing any released waste to migrate through the base into the underlying soil, collection and analysis of soil samples from beneath the base will be necessary. A soil sampling/analysis plan, as described in Section 2.5.5 below, must be developed and implemented to evaluate this situation.

2. **Tank Systems** - The owner or operator and an independent registered professional engineer should evaluate the integrity of the tank system and its appurtenances. This inspection must be carried out in accordance with standards and recommendations of professional/technical entities such as the American Society for Testing and Materials, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Petroleum Institute, the America Institute of Chemical Engineers, etc. It will be necessary to collect soil samples if it is found that the tank has poor integrity. In addition, it will be necessary to collect soil samples from (1) around the tank if it did not have secondary containment, (2) along underground piping, (3) around any fill/emptying appurtenances, and (4) around and beneath the tank, if it is an underground tank.

2.5.4 Requirements For Underground Tanks/Piping Not to Be Used in the Future

Underground tanks and piping undergoing closure which are not to be used in the future should be removed from the ground, if at all possible. Such removal activities must meet any applicable requirements of the Office of the State Fire Marshal. At a minimum, removal efforts are subject to review and approval by the Illinois EPA as part of closure of the unit. As such, the closure plan should clearly describe the procedures which will be used in the removal of the underground tanks and underground appurtenances.

Under certain circumstances, it may be acceptable for underground tanks and underground piping to be closed in-place, particularly if their removal may impair the stability of nearby structures. For in-place closure to be acceptable, the facility should provide information in the closure plan indicating that the only viable alternative for closure is in-place closure. In addition, information must also be provided indicating that in-place closure will not have an adverse impact on human health and the environment. Finally, the closure plan must also describe the procedures which will be followed carrying out in-place closure of the unit. In general, in-place closure should consist of: (1) removing all waste and waste residue from the tank/pipe; (2) decontaminating the tank/piping, generally by steam-cleaning and triple rinsing; (3) filling the tank/piping with concrete; (4) collecting soil samples from around the tank/piping with analyzing it for possible contamination; (5) remediating any detected contamination and (6) meeting any applicable requirements of the Office of the State Fire Marshal.

2.5.5 Soil Sampling/Analysis Plan

Closure of certain HWMUs may require collection and analysis of soil samples to demonstrate that no hazardous wastes or hazardous constituents have been released to the soil from the HWMU. If contaminants are detected in the soil within, beneath and/or around the SWMU, then it may be necessary to remediate the contamination (See Section 2.6 and 2.7 below.). Examples of HWMUs where soil sampling/analysis will be necessary include: (1) units founded on soil or gravel; (2) units with primary or secondary containment structures which have poor integrity (See Section 2.5.3 above regarding integrity inspections); (3) units which do not have secondary containment (e.g., curbs) and have unpaved areas adjacent to them (soil samples should be collected from these areas to determine if any releases have flowed from the paved area onto the unpaved area); (4) underground tanks; and (5) underground piping.

When soil sampling/analysis is necessary, a plan must be developed describing the procedures which will be followed in this sampling/analysis effort. At a minimum, such a plan should contain the following information (and rationale for the selection of the specified procedures):

1. **Goals and Objectives of Effort** - A discussion of the goals and objectives of the soil sampling/analysis effort should be included in the plan. This will have an impact on the overall plan, as the sampling/ analysis effort required to demonstrate that an area is clean is very different than that required to determine the horizontal and vertical extent of contamination.

2. **Parameters to be Analyzed** - A list of proposed parameters along with a discussion justifying their inclusions should be included in the plan. The proposed parameters should include those hazardous constituents which may be present in the soil, based upon a knowledge of the wastes managed at the unit and the facility overall. This list should include degradation products. Additional parameters for analysis may be required by the Illinois EPA, depending on its review of the wastes and other materials managed at the facility.

3. **Sampling Locations** - A scaled map should be provided in the plan showing the location where the samples will be collected.

   a. If the goal of the sampling effort is to demonstrate that no contamination exists in a given area, then a grid system should be used. A grid system uses a regular pattern is based on the collection of soil samples from the grid intersections, including the intersections along the boundary of the area of concern. A circular pattern of sampling around a central point may also be used. Variations of regular sampling could include linear sampling along a drainage way, boundary or perimeter of a container storage area. A directed system would focus samples on an area of suspected contamination such as the down slope or downwind side of a waste storage unit. Grid sampling and directed sampling may both be used in the same closure plan. For grid sampling, the following equations should be used as guidance to determine grid intervals and the number of samples in a given area when the goal is to show that no contamination exists in the area:

      (1) $GI = (A\pi/GL)^{0.5}$ or (2) $GI = (A/\pi)^{0.5}/2$

      The equations above establish grid point intervals, proportioned to the size of waste management unit, where:

      GL = greatest length of the area to be gridded (feet)

      A = area to be gridded (feet^2), and

      GI = grid interval (feet).

      Equation 1 results in a heavy sample weighting for small sites, so it should be used for sites larger than 3 acres. Equation 2 should be used for units smaller than 3 acres.

      Actual sample locations should be biased, as necessary, to visually discolored/contaminated areas (such as dead vegetation) and to low-lying areas where any release of waste would tend to flow. It should be noted that the above equations are <u>only</u> guidance; larger grid intervals are also acceptable <u>provided</u> information justifying the proposed grid interval is contained in the plan. Random sampling in an area is discouraged.

b. If the goal of the sampling/analysis effort is to determine the horizontal extent of contamination, it will be necessary to collect soil samples in as dense as matter as in Item a above. Rather, the location from which such samples should be chosen in a strategic manner so that the horizontal extent of contamination can be determined with a minimum number of samples. In making this determination, it must be noted that contamination should be assumed to extent to the first locations where Aclean soil is encountered. The general guidance set forth above should be used in collecting these samples, including the use of some type of grid system.

c. If joints, cracks or other defects are found during a required integrity inspection (see Item 2.5.3 above) which would potentially allow hazardous constituents to migrate through them, then soil samples <u>must</u> be collected from beneath them to determine if hazardous waste or hazardous constituents have been released to the underlying soil. This sampling/analysis effort should be carried out in accordance with the general procedures listed below:

   1. Samples should be collected from at least one location along each joint or crack that provides a potential for hazardous waste or hazardous constituents to migrate to underlying soil. If the crack/joint is more than 10' long, then samples should be collected from along crack/joint at 10' intervals. Such locations shall be biased to stained areas or low-lying areas where spills would tend to accumulate.

   2. Samples should be collected from 0"-6" and from 18"-24" below the subgrade/natural soil interface.

   The sampling/analysis plan should describe the procedures which will be used to meet these requirements.

4. **<u>Soil Sampling Depth Increments</u>** - The depths from which soil samples are to be collected should be identified in the plan. The soil sampling intervals and total depth may be independent on several factors, including: (1) soil type and hydraulic conductivity; (2) suspected magnitude of surface contamination; (3) physical state of the waste and its mobility; (4) length of time that waste was present at the site; (5) relative toxicity of the waste; (6) location of waste management unit (inside vs. outside); (7) the quality of pavement and secondary containment provided for the unit, if any; and (8) the goal of the sampling/analysis effort.

   Soil sampling increments should be 6 inches for the upper two feet of soil and 12 inches below a depth of two feet. Sampling must continue to at least the depth at which the Illinois EPA established cleanup objective is met. If the owner/operator wishes to limit the extent and cost of sampling, they may propose larger depth increments than 6 inches for the upper two feet and 12 inches below a depth of two feet. However, the Illinois EPA will assume contamination extends down to the depth of the first sample obtained that meets the Illinois EPA established cleanup objectives. This will require the owner/operator to consider the trade-offs between benefits of additional sampling to limit the volume of soil considered to be contaminated and its associated additional cost.

   Soil samples for underground tank closures should be taken beneath the tank invert, and as close to the tank as possible. Soil samples should also be collected from the walls of the initial excavation created to install the tank. Near-surface soil samples should also be taken in areas adjacent to all storage tanks where waste is added to or taken from the tank and also along any underground piping associated with the tank.

5. **<u>Sample Collection Procedures</u>** - The procedures which will be used to collect the soil samples must be described in the closure plan. The following should be considered in developing these procedures:

   a. Collection of all soil samples should be carried out in accordance with ASTM or SW-846 procedures. Acceptable ASTM procedures include:

      1. Method D 4700-91 (Method for Soil Sampling from the Vadose Zone);

      2. Method D 6001-96 (Guide for Direct-Push Sampling for Geoenvironmental Investigations); and

      3. Method 6169-97 (Guide for Selection of Soil and Rock Sampling Devices Used with Drill Rigs for Environmental Investigations).

b. Soil samples collected for volatile organics analysis require specialized sampling and handling procedures, as specified in Attachment A or Method 5035 of SW-846. Unless extenuating circumstance dictate otherwise, soil samples collected for volatile organic analysis should not be mixed, composited or otherwise aerated. If extenuating circumstances prevail, then procedures must be made to minimize: (1) the time the sample is exposed to the air; (2) aeration of the sample; and (3) agitation of the sample.

c. All soil encountered during the sampling effort should be field classified in accordance with ASTM D-2488. Provisions should be made in the plan to make this classification, except for samples collected specifically for VOC analysis.

d. Soil samples should be collected continuously at several locations to provide information regarding the shallow geology of the area where the investigation is being conducted.

e. Horizontal/vertical locations where samples are collected should be biased, as appropriate, to stained/discolored areas or areas where contamination is suspected to be present (such as the highest field screening results).

f. Soil which is encountered in an area where VOC contamination is a concern should be field-screened for VOCs. However, the actual samples collected for analysis at the laboratory should not be field-screened.

g. In general, samples should never be composited, especially when sampling for VOCs. Collection of any composited samples must meet the requirements of 35 Ill. Adm. Code 742.225 and a plan for such an effort must be approved by Illinois EPA prior to its implementation.

h. The procedures which will be used to decontaminate the sampling equipment after each sample is collected should also be described. Decontamination procedures should be carried out in accordance with SW-846.

6. **Sample Handling Procedures** - The sampling plan should describe the procedures which will be used to store, preserve and transport the collected soil samples to the laboratory, including chain-of-custody procedures. These procedures should be carried out in accordance with the guidance in SW-846.

7. **Analytical Procedures** - The sampling/analysis plan should identify the procedures which will be used to prepare the samples for analysis and to analyze them. In general, such procedures should be carried out in accordance with those set forth in SW-846. The actual portion of the portion of the sample to be analyzed should be obtained from visually contaminated material if any is present. The procedures specified must be sufficient to analyze for all the parameters identified in the closure plan. The estimated quantitation limits and/or practical quantitation limits to be achieved should also be identified. Again, these limits should meet the requirements set forth in SW-846. It must be noted that it is especially important to achieve low detection limits if the goal of the sampling/analysis effort is to demonstrate that little or no contamination exists in a given area. To demonstrate a parameter is not present in a sample, the PQL achieved must be at least as low as that specified in SW-846. Low detection limits may not be as necessary when collecting samples in contaminated areas.

8. **Quality Assurance/Quality Control Procedures** - The sampling plan should describe the procedures which will be followed to ensure that the quality of the results of the effort is acceptable, from the collection of the sample to the actual analysis of the sample. This includes the use of trip blanks, field blanks and laboratory blanks as well as the calibration and verification of the laboratory procedures and equipment utilized. The quality assurance/quality control procedures employed during a RCRA closure action meet the guidelines set forth in SW-846.

Results of soil sampling/analysis efforts should be submitted to the Illinois EPA using the guidance set forth in Section 6 below.

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2.6 Development of Remediation Objectives

Soil and groundwater remediation objectives (ROs) for RCRA closure projects should be developed using 35 Ill. Adm. Code 742, Tiered Approach to Corrective Action Objectives (TACO). These regulations can be obtained by contacting the Corrective Action Unit and/or RCRA Groundwater Assistance Unit of the Permit Section of the Bureau of Land (217/524- 3300) or they can be found on the Internet at http://www.ipcb.state.il.us/title 35/. Fact sheets regarding TACO are also available from Illinois EPA at the afore-mentioned telephone number. General guidance for developing soil ROs for RCRA closure projects and for submitting proposals for such ROs for Illinois EPA review is provided as Attachment B. It must be noted that 35 Ill. Adm. Code 742.120 requires that the contamination at a site be adequately characterized before remediation objectives can be developed using the procedures set forth in TACO.

The soil and groundwater remediation objectives developed for a RCRA project are subject to Illinois EPA review and approval. If soil and/or groundwater is found at the site which exceeds the approved remediation objectives, then it will be necessary to conduct some type of remedial action. Once a remediation effort has been completed, it will be necessary for a facility to demonstrate that soil and groundwater remaining at the site meet the approved remediation objectives.

If the remedial action is not sufficient to remove the waste and all soil to meet the approved remediation objectives then the unit must be closed as a landfill in accordance with 35 Ill. Adm. Code 725, Subpart G. In such a case, it will also be necessary to provide at least 30 years of post-closure care for the unit and eventually obtain a RCRA permit for the facility. Such postclosure care activities must meet the requirements of 35 Ill. Adm. Code 724, Subparts F and G and 725, Subparts F and G.

2.7 Soil Remediation

The closure plan should contain information regarding the procedures which will be followed to remediate any soil contamination detected above remediation objectives developed in accordance with Section 2.6 above. A description of remedial alternatives that may be chosen as a means for achieving clean closure should be provided. The alternative selected to achieve clean closure must be thoroughly described in the closure plan. It must be noted that the initial alternative chosen may need to be modified as a facility proceeds with closure of the HWMU and determines the actual horizontal and vertical extent of soil contamination.

2.7.1 Procedures for Removing Contaminated Soil

If removal is the chosen remedial action for any contaminated soil encountered at the site, the closure plan must fully describe each step to be used in removing the contaminated soil from the property. This includes a description of: (1) the equipment utilized in the removal effort, (2) the pattern followed in removing the soil; (3) the depth to which soil will be removed; (4) management of the soil on-site after it is removed from the ground; (5) loading areas; (6) the ultimate destination of the soil and (7) any other steps critical to the removal effort.

Unlike CERCLA cleanups, there is no permit exemption available for on-site hazardous waste storage and treatment units created during RCRA closure. Interim status facilities may request the addition of such units to their Part A if proper justification is provided (35 Ill. Adm. Code 703.155). Facilities with a RCRA permit, however, must obtain a permit modification prior to adding the unit. Facilities has neither interim status nor a permit may be required to obtain a permit before a storage or treatment unit can be constructed for closure purposes.

Temporary storage (accumulation) of hazardous waste in containers or tanks for a period of less than ninety (90) days can be conducted without a permit if the requirements defined in 35 Ill. Adm. Code 722.134 are met. The stockpiling of hazardous waste (including soil contaminated with listed hazardous waste) on the ground for even short periods of time results in the creation of a RCRA waste pile.

One way to conduct a soil removal effort is to collect and analyze a sufficient number of soil samples to clearly determine the horizontal and vertical extent of soil contamination prior to conducting the soil removal effort. The boundaries of soil which must be removed are defined by the Illinois EPA established cleanup objectives. Soil excavation must extend to sample locations where soil test results indicate that the cleanup objectives are met. Verification sampling is not necessary in such cases, if a registered professional engineer oversees the soil removal effort and certifies that the excavation limits were established as described above.

Another way to conduct a soil removal effort is to collect and analyze a limited number of soil samples prior to the soil removal effort and to rely mainly on field observations to determine the extent of the soil removal. In such cases verification sampling is necessary. Soil samples must be collected for analysis from the bottom and sidewalls of the final excavation. The following sampling analysis effort is necessary to demonstrate that the remaining soil meets the established cleanup objectives:

1. A grid system as set forth in Section 2.5.5 above should be established over the excavation.
2. Samples should be collected from the floor of the excavation at each grid intersection, including intersections along the perimeter of the excavation.
3. Samples should be collected 6"-12" below the ground surface at each grid intersection around the excavation perimeter. Samples must also be collected at the midpoint of the excavation wall at each grid intersection along the excavation perimeter.
4. Collection/analysis of all required samples must be in accordance with the procedures set forth in the approval plan.
5. Soil samples which must be analyzed for volatile organic compounds must be collected using the procedures in Attachment A or Method 5035 of SW-846. In addition, such samples must be collected 6"-12" beneath the floor/sidewalls of the excavation to minimize the possibility of volatilization of the contaminants prior to the collection of the samples.
6. No random sampling may be conducted to verify that the cleanup objectives have been met.
7. Additional soil must be removed, as necessary, until it can be demonstrated that the remaining soil in and around the area of concern meets the established cleanup objectives. Additional samples must be collected and analyzed in accordance with the procedures described above from areas where additional soil has been removed.

2.7.2 In-situ or Ex-situ Soil Treatment

Instead of removing, transporting and disposing of contaminated soil off-site, facilities remediating soil during closure of a RCRA hazardous waste management unit (HWMU) may choose to treat waste on-site using in-situ or ex-situ treatment methods. Such an alternative is acceptable to the Illinois EPA, providing that the treated soil meets the remediation objectives established for the remediation effort. Verification soil sampling must be performed as described by 2.7.1 above.

In-situ or ex-situ treatment systems are an integral part of a HWMU's closure and must be included in the Illinois EPA approved RCRA closure plan for the HWMU. Therefore, the Illinois EPA must review and approve the design, installation (if applicable), and operation of any proposed treatment system before it is actually used at the facility. Attachment C contains guidance regarding the procedures which should be followed and the information which should be provided to the Illinois EPA for approval of the treatment system.

1. **In-situ treatment systems** are a viable remedial alternative to address soil and/or groundwater contamination for facilities involved in RCRA closure or RCRA Corrective Action. Such technologies might include: soil flushing, solidification and stabilization, degradation, control of volatile materials, chemical and physical separation, and delivery and recovery systems. The type of information which must be provided to the Illinois EPA regarding an in-situ treatment system is as follows:

    a. Sufficient information must be provided in the design reports described in Attachment C to demonstrate that the treatment process and associated activities will effectively attempt to achieve the remediation objectives established. In-situ treatment which is expected to take longer than 180 days must be authorized by the Illinois EPA.

b. Operating procedures for the treatment system;

c. Documentation that the designed system should be able to remediate the soil such that the established cleanup objectives are achieved throughout the area where contamination exists;

d. Results of all field investigations conducted to establish design criteria for the system;

e. A detailed description of the procedures which will be utilized to verify that the remediation objectives have been achieved in the soil. These procedures should meet the general requirements of Section 2.5.5 above.

f. The two design reports discussed in Attachment C.

2. **<u>Ex-situ</u>** treatment systems may also prove a viable alternative for on-site treatment of contaminated soil. Soil may be exhumed, conveyed to a treatment unit and left on-site provided again that the established remediation objectives for the remediation effort are attained. The proposed treatment system, if possible, should take advantage of the permit exclusions set forth in 35 Ill. Adm. Code 722.134 for less than 90 day storage/treatment of hazardous wastes in containers, tanks and containment structures. Certain treatment units may require a RCRA permit, such as waste piles, incinerators, miscellaneous treatment units. Finally, a new type of RCRA permit, a Remedial Action Plan, is now available for the treatment, storage or disposal of remediation waste (guidance on these permits is available from Illinois EPA). As such, it is recommended that a facility meet with the Illinois EPA to discuss the procedures which should be followed to us a given treatment system for the remediation phase of the RCRA closure activity.

   All necessary RCRA permits must be obtained before any treatment can occur in a proposed system. If it does not appear that a given system needs a RCRA permit, then information must be provided to Illinois EPA as a closure plan modification in support of the proposed treatment process. Such information must include:

   a. A detailed description of the procedures which will be utilized to remove the contaminated soil from the ground and convey it to the treatment process. Of special concern is the fact that contaminated soil should not be placed in a pile as this may result in the creation of a hazardous waste pile subject to the RCRA permitting requirements of 35 Ill. Adm. Code 702, 703 and 705.

   b. A description of the design, construction and operation of the process which will be utilized to treat the contaminated environmental media. The information to be included in this description should be equivalent to the information required by Illinois EPA, DLPC Permit Section to obtain a state permit for a treatment facility (see Application for a Solid Waste Management Permit to Develop Treatment and/or Storage Facilities (LPC-PA3) and associated instructions. In addition, the reports described in Attachment C must also be provided. Finally, the facility must submit all necessary permit applications for DWPC and DAPC to the appropriate sections of Illinois EPA and include copies of these applications in the information submitted to DLPC.

   c. Sufficient information demonstrating that the proposed process can achieve the required level of treatment. This should include site-specific bench-scale or pilot-scale test results.

   d. A demonstration that the proposed unit meets the permit exemptions set forth in 35 Ill. Adm. Code 722.134.

   e. A detailed description of the procedures which will be utilized in verifying that the concentration of contaminants in the treated residue is below the RO for the project. This description must include justification for the frequency at which verification samples will be collected.

   f. A detailed description of the management of the treated residue, including final disposition of the material. Scaled drawings must be provided to supplement this description as necessary.

   The information identified in a-f above must also be provided as part of a closure plan modification request for those units requiring a RCRA permit.

2.8 Groundwater Monitoring and Remediation

Closure plans for certain hazardous waste management units must provide for: (1) an evaluation to determine if the groundwater beneath the unit has been impacted; and (2) as necessary, remediation of the groundwater, if it is found that the groundwater has been adversely impacted by the unit. The type of information which should be provided in a closure plan regarding groundwater monitoring and/or groundwater remediation is provided below.

2.8.1 Monitoring for Land Disposal Units

The closure plan for any land treatment unit, surface impoundment or landfill must include a groundwater monitoring program which meets the requirements of 35 Ill. Adm. Code 725, Subpart F. In addition, if the goal of this monitoring program is to demonstrate that the groundwater beneath such a unit has not been impacted, then it will be necessary for the program to be similar to that required by 35 Ill. Adm. Code 724.198 (Detection Monitoring). The major attribute associated with this latter goal is that the groundwater will have to be monitored for those all constituents expected to be present in the wastes managed in the unit. Guidance for the development of such a plan can be found in the USEPA guidance documents entitled RCRA Groundwater Technical Enforcement Guidance Document and Suggested Practices for the Installation of Groundwater Monitoring Wells and the guidance in Attachment D to this document.

2.8.2 Groundwater Monitoring at Other Units

If groundwater is encountered during any soil sampling activities or soil removal effort prior to reaching soil which meets the cleanup objectives, then the closure plan must provide for an investigation to determine if the groundwater beneath the unit has been impacted by the unit. If this is known to be the case when developing the initial closure plan, then a plan for conducting this investigation must be provided in the plan. If, however, this is not discovered until after the closure plan has been approved and closure activities have started, then such a plan should be submitted within sixty (60) days after the date that the analytical results are received which indicate that soil contamination extends to the water table. In addition, the Illinois EPA should be notified in writing of this discovery within fifteen (15) days after these analytical results are received.

The proposed groundwater investigation plan should be developed in a manner similar to that required for groundwater monitoring programs set forth in 35 Ill. Adm. Code 724, Subpart F. Guidance for the development of such a plan can be found in the USEPA documents entitled RCRA Groundwater Technical Enforcement Guidance Document and Handbook of Suggested Practices for the Installation of Groundwater Monitoring Wells and in the information in Attachment D to this document.

2.8.3 Groundwater Remediation Activities

The requirements of 35 Ill. Adm. Code 742 may be utilized if the goal of closure is clean closur❋ with restrictions (i.e., closing in such a fashion that the unit in question is not closed as a landfill). Units not being clean-closed and thus being closed as landfills must receive 30 years of post-closure care and eventually obtain a RCRA post-closure permit. Section 2.9 of this document contain information regarding the requirements associated with closure and postclosure care of units being closed as landfills.

If the goal of a closure effort is clean closure and groundwater is encountered which exceeds the applicable Tier 1 groundwater remediation objective (RO), then the facility must take appropriate action to address the contaminated groundwater.

1. This may include following the procedures in TACO and developing site-specific RO based upon background values, the elimination of the groundwater ingestion exposure route, Tier 2 calculations or a Tier 3 evaluation. Sufficient information must be submitted to Illinois EPA for review and approval in support of ROs developed using any of these alternatives. Such information must demonstrate that all the applicable requirements associated with developing the proposed ROs are met. It must be noted 35 Ill. Adm. Code 742.120 requires that the groundwater contamination of concern be adequately characterized before TACO is used to develop ROs for the project.

2. Part of this effort may require that the facility develop and implement a groundwater remediation program. Such remediation must be sufficient to eventually meet the requirements of 35 Ill. Adm. Code 742.

The design and operation of any groundwater remediation program must be approved by the Illinois EPA as part of the initial closure plan submittal or as a request to modify the approved closure plan. The type of information which should be provided to the Illinois EPA regarding the remediation plan is described in Item 3 of Section II of Attachment D (The Phase III effort described in this attachment is groundwater remediation).

2.9 Closure/Post-Closure Care as a Disposal Unit

Any unit where waste is to be left in place, including landfills, waste piles, tanks and surface impoundments to be closed as landfills, obviously has several additional important considerations beyond that required for a "clean closure". These include liners, caps, final cover, vegetation, groundwater monitoring and post-closure care and permit requirements. Full descriptions and detailed engineering drawings will be required for each unit undergoing closure. Details of liners, cover, wells, final contours or any other relevant structure must be provided.

Note that there are several additional regulatory requirements for closed disposal units in 35 Ill. Adm. Code 703.159, 724 and 725. These requirements concern groundwater monitoring, post-closure plans, post-closure care, notice to local land authority, notice in deed to property and the need to obtain a post-closure permit.

2.9.1 Closure as a Landfill

The information which should be submitted to the Illinois EPA for review and approval regarding the closure of unit as a landfill includes:

1. Scaled drawings showing the boundaries of the unit being closed as a landfill area;
2. Scaled drawings showing the existing contours of the unit;
3. Scaled drawings showing the proposed final contours of unit;
4. An evaluation of the existing and proposed final contours. This evaluation should identify any slopes which are too steep and would result in erosion problems, as well as any slopes which are two flat which would allow almost all the precipitation which falls onto the area to percolate into the landfill, rather than running off. Modifications should be made to the existing contours, as necessary during closure of the landfill, to correct any such problems;
5. The type of cover material to be used. Provide information for the quality and quantity to be used as well as engineering properties;
6. Scaled drawings showing the design of the final cover system. This design should meet the requirements of 35 Ill. Adm. Code 725.410 and the USEPA guidance document entitled <u>Final Covers on Hazardous Waste Landfill and Surface Impoundments</u> (EPA/530-89-047);
7. The design specifications to be used in construction of the cap to include compacted depth of each lift, total depth, etc.;
8. The testing and documentation procedures to be used to insure the approved design specifications have been met. Such procedures should be carried out in accordance with the USEPA guidance document entitled Construction Quality Assurance for Hazardous Waste Disposal Facilities (EPA/530-SW-86-031; PB87-132825);
9. Record keeping and certification of test results;
10. The source and type of material to be used for a vegetative layer (on top of the compacted layer);
11. The total depth of the vegetative layer. The depth selected for the vegetative layer must be accompanied by a discussion demonstrating it will be adequate to:
    a. Provide moisture for cover species;

b. Prevent root penetration into the cover based on the species of vegetation selected; and

c. Support the planted species without continued maintenance.

12. The procedures which will be followed in establishing the vegetative cover.

13. Any gas control system that will be provided prior to post-closure care. Include monitoring and collection or venting systems.

14. Calculations and cross-sections for the design of the run-on and run-off control systems that will prevent run-on and run-off from affecting the closed unit(s) during the post-closure care period. Include a map showing the drainage and erosion control system design for control of run-on and run-off.

15. A schedule of the closure activities to include:

   a. Placement of final cover;

   b. Placement of vegetative layer; and

   c. Seeding, fertilizing and mulching.

2.9.2 **Post-Closure Care**

The closure plan for any disposal unit (hazardous waste left in the unit) must include an interim status post-closure plan in accordance with 35 Ill. Adm. Code 725, Subpart G. The information which must be submitted to the Illinois EPA regarding post-closure care should include:

1. A description of the inspection program that will be followed to monitor the site for subsidence, cracks, erosion, establishment of vegetation and gas migration. This should include frequency of inspections, and what procedures will be followed during the inspection. The frequency should be quarterly at a minimum and additional inspections when needed.

2. The number of years post-closure care will be provided (a minimum of thirty (30) are necessary).

3. A description of the quantitative criteria which will be used to determine what problems discovered during the inspection will require corrective action.

4. A description of what corrective actions will be taken to correct each type of problem that is discovered.

5. A discussion of any proposed changes to the groundwater monitoring program identified in Section 2.8.1 which will be implemented during the post-closure care period. (Such a groundwater monitoring program must be implemented throughout the post-closure care period).

6. A description of what recordkeeping procedures will be used to document site inspections, problems found, corrective actions taken, groundwater monitoring results, leachate monitoring, impact of the site on groundwater, etc.

7. A description of the security measures that will be provided to prevent unauthorized entry to the site during the post-closure care period.

8. A description of the procedure to evaluate all data collected during the post-closure care period. This should be able to demonstrate that the site will not cause future violations of the Illinois Environmental Protection Act or 35 Ill. Adm. Code 725.

2.9.3 **Location Documentation for Disposal Units**

35 Ill. Adm. Code 725.219 contains requirements regarding the need to notify officials and future owners of the facility of the presence of the hazardous waste disposal unit. A closure plan for a disposal unit must contain information describing how the following requirements will be met:

1. In accordance with 35 Ill. Adm. Code 725.219(a) and 725.219(b), no later than 60 days after certification of closure of the disposal area has been submitted to the Illinois EPA, the owner or operator must:

1. Submit a record of the type, location and quantity of hazardous wastes disposed of within each disposal unit. For hazardous wastes disposed of before January 12, 1981, the owner or operator must identify the type, location and quantity of the hazardous wastes to the best of the owner or operator’s knowledge and in accordance with any records the owner or operator has kept. The record must be submitted to the same entities listed above.

2. Record, in accordance with Illinois law, a notation on the deed to the facility property, or on some other instrument which is normally examined during title search, that will in perpetuity notify any potential purchaser of the property that:

   a. The land has been used to manage hazardous wastes; and

   b. Its use is restricted under 35 Ill. Adm. Code 725, Subpart G; and

   c. The survey plat and record of the type, location and quantity of hazardous waste disposed of within each surface impoundment have been filed the County Recorder, the local zoning authority or any authority with jurisdiction over local land use, and the Illinois EPA.

   The owner or operator must submit to the Illinois EPA a certification that the requirements described above have been met. This certification must meet the requirements of 35 Ill. Adm. Code 702.126 and must be submitted to the Illinois EPA with sixty (60) days of the date that the closure certification for the impoundments is submitted to the Illinois EPA. A copy of the document in which the notation was placed must accompany this certification.

2. Within 60 days after Illinois EPA approval of certification of closure of the disposal unit(s) the facility must provide the Illinois EPA with copies of the post-closure notification documents required under 35 Ill. Adm. Code 725.219(a) and 725.219(b).

   A survey plat must be developed which shows the location of and dimensions of the units being closed as land disposal units, relative to the legal boundaries of the site. The plat must be prepared and certified by a professional land surveyor and must be developed with respect to permanently surveyed benchmarks. As required by 35 Ill. Adm. Code 725.216, the plat must be submitted to the following entities no later than the date that the closure certification for the impoundments is submitted to the Illinois EPA:

   a. The local zoning authority or other authority with jurisdiction over local land use;

   b. The County Recorder;

   c. The Illinois EPA, Division of Land Pollution Control.

   The plat filed with the entities identified in items (a) and (b) above must contain a note, prominently displayed, which states the owner’s and operator’s obligation to restrict disturbance of the closed impoundments in accordance with 35 Ill. Adm. Code 725, Subpart G. In addition, the plat submitted to the Illinois EPA must be accompanied by a certification from the owner or operator that plats were submitted to the entities identified in (a) and (b) above. This certification must meet the requirements of 35 Ill. Adm. Code 702.126.

2.10 Conceptual Contingent Landfill Closure/Post-Closure Plans for Certain Tank Systems

Pursuant to 35 Ill. Adm. Code 725.297(c), a facility that did not provide an adequate secondary containment system for its hazardous waste storage tanks must develop a contingent closure/post-closure care plan for the tank system. A conceptual plan must be submitted in the closure plan for such a tank which contains a brief description of provision that will be taken to close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills (35 Ill. Adm. Code 725, Subpart G and 725.410). A more detailed plan will be required if it is determined that the tank system must indeed close as a landfill.

The conceptual contingent closure/post-closure care plan must also contain cost estimates for closing the tank system as a landfill and providing post-closure care of the closed unit. All data used in preparing the cost estimates must be included. This data must include items such as unit cost, hours and rates for labor, and analytical cost per sample, number of samples, equipment cost (including personal protective devices and emergency equipment), material cost and amounts, etc. In addition, justification must be included for all data utilized in developing the closure/post-closure care cost estimates. The cost estimates must be based upon the most expensive closure/post-closure care estimates scenario, e.g. cost for a third party to implement the closure/post-closure care plan and assuming that any waste generated must be disposed as hazardous waste. Financial assurance must be established meeting the requirements of 35 Ill. Adm. Code, 725, Subpart H to cover the estimated costs. Financial assurance must be provided until the subject unit(s) are determined to be clean-closed.

2.11 **Schedule for Closure**

35 Ill. Adm. Code 725.213 requires the owner/operator to: (1) treat, remove or dispose of all hazardous waste in accordance with the approved closure plan within 90 days after receiving the final volume of hazardous wastes or 90 days after approval of the closure plan by the Illinois EPA; and (2) complete all closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of wastes or 180 days after approval of the closure plan, if that is later. These dates may be extended by Illinois EPA if the facility demonstrates in a closure plan modification request that: (1) additional time is necessary to complete the required closure activities; and (2) it will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable interim status requirements. Sections 1.3, 1.4 and 1.5 above contain more information about closure plan modification requests and the time allowed for closure.

The closure plan should contain a timetable which shows all critical dates for closure, including waste removal, sampling, soil removal, critical points when the independent engineer or his representative will be present, backfilling, survey plat preparation, independent engineer’s certification, and other relevant activities. This timetable should generally start at the point of approval or some other definable date (e.g., award of contract), and not rely on calendar dates.

The Illinois EPA may require that the owner/operator contact the Illinois EPA Field Operations Section regional office in advance of certain critical activities, such as soil sampling or removal, so that an inspector may be present to observe these activities.

2.12 **Closure Cost Estimates**

All closure plans and closure plan modification requests should include an estimate of the cost of closing the facility in accordance with the proposed/approved plan (See 35 Ill. Adm. Code 725.242). This estimate must be based on the costs of hiring a third party to carry out the required closure activities.

The cost estimate for closing the facility must be accompanied by a detailed breakdown of the estimated cost of each task necessary to the required closure project. The actual amount of resources needed to complete each task must be provided as well as the unit cost associated with each required resource. Finally, justification must be provided for all values used in conducting these calculations.

2.13 **Air Emissions** (35 Ill. Adm. Code 725.211)

The plan should specify how the owner/operator will minimize or eliminate air emissions related to closure, including nuisance problems such as dust or odors. Examples include solvent emissions during transfers or decontamination operations, or fugitive emission (dust) problems related to soil excavation or solidification.

2.14 **Personnel Safety and Fire Prevention** (35 Ill. Adm. Code 725.211)

In addition to obvious measures needed to protect the health of nearby residents, the owner/operator must clearly show that measures will be taken to protect all personnel (including contractors and visitors) involved in the closure or possibly exposed to hazardous waste by the closure activity, including personnel decontamination. Thus, the closure plan must describe these measures and also contain a health and safety plan.

Under the provisions of 29 CFR 1910, cleanup operations must meet the applicable requirements of OSHA's Hazardous Waste Operations and Emergency Response standard. These requirements include hazard communication, medical surveillance, health and safety programs, air monitoring, decontamination and training. General site workers engaged in activities that expose or potentially expose them to hazardous substances must receive a minimum of 40 hours of safety and health training off site plus a minimum of three days of actual field experience under the direct supervision of a trained experienced supervisor. Managers and supervisors at the cleanup site must have at least an additional eight hours of specialized training on managing hazardous waste operations.

2.15 **Status of Facility After Closure**

The closure plan should clearly state the status of the hazardous waste facility after closure is completed. For example, it should state if a storage facility is to be operated as a generator (less-than-90-day storage), and it should describe whether closure is partial or final. If the closure is partial, it should name both the units covered by the closure plan as well as those remaining in operation. It should also indicate whether the facility will continue to be a generator and transporter (if applicable). Possible options for the status of the facility after closure include:

a. No treatment, storage or disposal will occur at this facility.

b. Disposal will continue at this facility.

c. This facility will continue to treat hazardous wastes.

d. Less than 1,000 kg/month will be generated, and storage will be for less than 90 days.

e. The facility will generate and store more than 1,000 kg/month for less than 90 days.

f. The facility will generate and store more than 1,000 kg/month for more than 90 days.

g. The facility will generate and store more than 100 kg/month, bust less than 1,000 kg/month for less than 180 days (270 days if applicable).

h. The facility will be exempt from treatment storage and disposal (TSD) regulation under RCRA.

i. The facility will be a transporter of hazardous waste.

Tanks which will be used for short-term accumulation of waste will still be subject to closure when removed from service and will be subject to many of the inspection and secondary containment requirements of the new tank regulations.

2.16 **Certification/Signatory Requirements**

The initial closure plan submittal and closure plan modification requests are subject to the signatory requirements of 35 Ill. Adm. Code 702.126. The submittal must be signed as follows:

a. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

   1. A president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or

   2. The manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned/delegated to the manager in accordance with corporate procedures.

b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;

c. For a municipality, State, federal or other public agency: by either a principal executive officer or ranking elected official. For purposes of this Section, a principal executive officer of a federal agency includes:

1. The chief executive officer of the agency; or

2. A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of USEPA).

A duly authorized representative may also sign the application, but a written authorization must be signed by the appropriate officer as defined above, and must be on file with the Illinois EPA.

As identified in 35 Ill. Adm. Code 702.126(d), the following certification language must be attested to as part of the certification required above:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

All submittals which contain engineering reports, plans, specifications and/or calculations, etc. subject to the requirements of the Illinois Professional Engineer's Act must be signed and certified by an Illinois licensed professional engineer. The engineer must also attest to accuracy and completeness of the information using the same certification statement as above.

Work required as part of a RCRA closure effort or the RCRA regulations may also be subject to other laws governing professional services, such as the Illinois Professional Land Surveyor Act of 1989, the Professional Engineering Practice Act of 1989, the Professional Geologist Licensing IEPA RCRA Closure Guidance (7/03) Page 35 of 39 Act, and the Structural Engineering Licensing Act of 1989. Closure plan approval letters or letters approving closure plan modification requests do not relieve anyone from compliance with these laws and the regulations adopted pursuant to these laws. All work that falls within the scope and definitions of these laws must be performed in compliance with them. The Illinois EPA may refer any discovered violation of these laws to the appropriate regulating authority.

The Illinois EPA has developed a form provided as Attachment F which should be used to ensure that the above signatory and certifications are met. This form should be completed and accompany each closure plan submittal, including closure modification requests. As can be seen, the information which is to be provided on the form includes: (1) background information regarding the project and submittal in question and (2) the required signatures and certifications.

3 **Certification of Closure** (35 (AC 702.126 and 725.215)

Once all closure activities are complete, certification of closure must be submitted to the Illinois EPA, as required by 35 Ill. Adm. Code 725.215, by the owner/operator and an independent licensed professional engineer (See Section 2.14 above for further discussion of the requirements of 35 Ill. Adm. Code 702.126). The Illinois Professional Engineering Act (Paragraph 5101, Section 1) requires that any person who practices professional engineering in the State of Illinois or implies that he (she) is a professional engineer must be registered under the Illinois Professional Engineering Act. Therefore, any certification or engineering services which are performed for a closure plan in the state of Illinois must be done by and Illinois P.E. The certification statement must meet the requirements of 35 Ill. Adm. Code 702.126; a copy of an acceptable statement is provided in Attachment G. Closure certifications should not be made before the Illinois EPA has approved the closure plan.

The independent engineer should be present at all critical, major points (activities) during the closure. These might include soil sampling, decontamination, soil removal, backfilling, final cover placement, etc. The frequency of inspections by the independent engineer must be sufficient to determine the adequacy of each critical activity.

A report must be developed and submitted along with the closure certification to document the completed closure activities. Guidance regarding the development of such a Closure Documentation Report is provided in Attachment H.

4 Part A Modification and Withdrawals (703.181)

The owner/operator must revise their Part A application when they certify closure. In the case of a final closure (all remaining units closed and no units will require post-closure care), the owner/operator should submit a letter requesting withdrawal of the Part A application to the Illinois EPA with their closure certification. In the case of a partial closure (some units will remain open), a revised Part A application should be submitted which includes the remaining units, and if necessary, a corrected copy of the existing Part A application and associated financial assurance documents along with the closure certification.

5 Submittal of Closure Plan and Certifications

The owner/operator of the facility should submit the original and two copies of all closure plans, closure modification request and certification of closure to the Illinois EPA. The extra copies are needed so that the initial plans, modification requirements and closure certifications can be distributed to the appropriate Illinois EPA personnel, including Regional office for review. As previously indicated, completed LPC-PA18 forms must accompany all information submitted to Illinois EPA regarding RCRA closure projects.

All submittals regarding RCRA closure activities should be sent to the following address:

Illinois Environmental Protection Agency
Division of Land Pollution Control -- #33
Permit Section
2520 West Iles Avenue
Post Office Box 19276
Springfield, Illinois 62794-9276

6 Content of Soil Sampling/Analysis Reports

Many closure projects will involve the execution of soil sampling and analysis efforts. The results of all such soil sampling/analysis efforts should be documented in the form of a report and submitted, as appropriate, to the Illinois EPA. At a minimum, such a report must be contained in the final Closure Documentation Report required by Section 3. Such reports may also need to be submitted at intermediate points during the closure project. Reports documenting soil sampling/analysis effort should contain as applicable:

1. A discussion of the reason and/or goal of the sampling/analysis effort;
2. A scaled drawing showing the horizontal and vertical location where all soil samples were collected;
3. Justification for selecting soil sampling locations;
4. A description of the procedures used for:
   a. Sample collection;
   b. Sample preservation:
   c. Chain of custody;
   d. Decontamination of sampling equipment;
5. Visual classification of each soil sample collected for analysis;
6. A discussion of the results of any field screening efforts;
7. A description of the soil types encountered during the investigation, including scaled cross-sections;
8. A description of the procedures used to analyze the soil samples, including:
   a. The analytical procedure used, including preparation of the sample for analysis;

b. Any dilutions made to the original sample;

c. Any interferences encountered during the analysis of each sample;

d. The practical quantitation limit (PQL) achieved, including justification for reporting PQLs which are above those set forth in SW-846.

9. A description of all quality control/quality assurance (QA/QC) efforts and analyses conducted, including the analysis of lab blanks, trip blanks and field blanks;
10. Copies of the final laboratory sheets reporting the results of the analyses and QA/QC data;
11. A summary of all analytical data, including QA/QC results, in tabular form;
12. A discussion of summarized data. This discussion should include a description of the amount of contamination present in the area, focusing on both the horizontal and vertical extent of contamination and the distribution of the contamination within the area;
13. Colored photographs documenting the sampling effort; and
14. Scaled drawings showing the horizontal/vertical extent of soil contamination above established objectives, and the distribution of the contaminant concentration within this area.

7 Conclusion

This document has been developed to provide guidance regarding the development and execution of RCRA closure plans in Illinois. Questions regarding the soil-related contents of this document or on RCRA closure requirements in general should be directed to the Corrective Action Unit of the Permit Section of the Bureau of Land (telephone number 217/524-3300); questions related to the groundwater aspects of a RCRA closure project should be directed to the RCRA Groundwater Unit of the Permit Section at the same telephone number. It is highly recommended that facilities work closely with the Illinois EPA during the development of the initial closure plan and during the implementation of the approved plan. Such interaction should minimize any confusion or misunderstandings which may occur during the project.

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IEPA RCRA CLOSURE PLAN GUIDANCE

July 2003

ATTACHMENT A

Soil Sampling Procedure for Volatile Organic Compounds

Attachment A

Soil Sampling Procedure for Volatile Organic Compounds (VOCs)

The procedures set forth in Method 5035 of Test Methods for Evaluating Solid Waste (SW-846), Third Edition and finalized updates or this document must be used to collect soil samples which will be analyzed for VOCs in RCRA remediation projects.

1. A tube sampling device at least 6" long may be used to collect soil samples to be analyzed for (VOCs). Examples of acceptable samplers include shelby tubes, split-barrel samples with inserts and California samplers. The sampling device must be constructed of stainless steel, brass, bronze, copper teflon, or some other type of inert material.

2. Preparation/decontamination of a tube sampling device should be carried out in accordance with the following (* = Consult the laboratory for specific recommendations):

   *a. Wash tubing/sampler with hot water and a nonfoaming detergent.

   b. Rinse with hot water.

   *c. Rinse with a solvent, such as hexane or acetone.

   d. Rinse with very hot water to drive off solvent and then deionized distilled water.

   e. Air dry and then store sampler in aluminum foil until ready for use.

3. Actual sample collection procedures:

   a. Push or drive a properly decontaminated sampler into the soil.

   b. DO NOT remove sample from sample tube in the field. The laboratory should remove the sample from the sampling tube.

   c. Immediately add clay or other cohesive material (i.e., wetted bentonite) to the ends of the sample to eliminate head space, if necessary.

   d. Cover both ends of the sampler with aluminum foil and if possible, a cap.

   e. Immediately place the sample in storage at 4 centigrade.

   f. Transport the samples to lab as soon as possible (typically within 24 hours).

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IEPA RCRA CLOSURE PLAN GUIDANCE

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ATTACHMENT B

TACO Requirements for Soil Remediation Objectives Associated with RCRA Projects

TACO REQUIREMENTS FOR SOIL REMEDIATION OBJECTIVES ASSOCIATED WITH RCRA PROJECTS

July 2003

1.0 Introduction/Purpose

Soil and groundwater remediation objectives (ROs) for RCRA closure/corrective action projects should be developed using 35 Ill. Adm. Code 742, Tiered Approach to Corrective Action Objectives (TACO). If these ROs are met at a site, then the environmental conditions present there should not pose a threat to human health or the environment. The purpose of this document is to: (1) provide a brief overview of TACO; and (2) describe how proposed soil ROs developed for RCRA projects should be submitted to Illinois EPA for review and approval.

2.0 Overview of TACO

TACO provides five different procedures (or tiers) for developing ROs that achieve acceptable risk levels at a given site. As indicated in 35 Ill. Adm. Code 742.100(b), "the purpose of these procedures is to provide for the adequate protection of human health and the environment based on the risks to human health posed by environmental conditions while incorporating site related information." The TACO procedures are in large part based upon the Soil Screening Level (SSL) approach of U.S. EPA and the Risk Based Corrective Action (RBCA) approach of ASTM.

There are several basic or key elements associated with the development of ROs under TACO. These elements are (the first three are specifically identified in 35 Ill. Adm. Code 742.115):

1. The exposure routes of concern (inhalation; soil ingestion; groundwater ingestion; and in certain instances, dermal contact with soil);
2. The contaminants of concern (COC);
3. Land use (generally residential or industrial/commercial);
4. Physical, chemical and toxicological properties of the contaminants of concern. Of special concern is whether a given contaminant is carcinogenic (i.e., cancer causing) or not;
5. The classification of the groundwater at the site (as set forth in 35 Ill. Adm. Code 620);
6. The point at which human exposure to a COC may reasonably be expected to occur. The point of human exposure is at the source, unless an institutional control limiting human exposure for the applicable exposure route has been or will be in place, in which case the point of human exposure will be the boundary of the institutional control;
7. Certain physical properties of the area for which RO are being developed, (e.g., certain properties of the soils at the site, the actual point of human exposure, the hydraulic gradient of the groundwater beneath the site);
8. Acceptable risk associated with exposure to the soil and/or groundwater at the site. In general, acceptable risks are: (1) one in 1,000,000 for carcinogens; and (2) a hazard quotient of one for non-carcinogens. Other risks are also acceptable in certain cases.
9. The use of engineered barriers to restrict future exposure to soil/ groundwater;
10. The use of institutional controls to restrict future exposure to soils/ groundwater;
11. Adequate characterization of the potential contamination at the site. 35 Ill. Adm. Code 742.120 requires that the extent and concentration of contaminants at a site must be characterized before beginning development of ROs;
12. Mathematical models which can be used to represent: (1) the human exposure to the soil and groundwater at the site; and (2) calculate contaminant concentrations which can remain in the soil and groundwater and not cause an exceedance of the established acceptable risk.

As indicated above, TACO provides five options for developing ROs. If ROs are developed assuming an industrial/commercial land use, then the construction worker exposure scenario must also be evaluated when developing these ROs. The following table provides a brief description of each of these five options and identifies where the regulations associated with each option can be found in TACO:

Option	**Subpart in TACO**	**Brief Description of Option**
Exclusion of Exposure Route	Subpart C	Allows certain exposure routes to be excluded from consideration, if facility demonstrates they are not complete. Typically requires an engineered barrier and/or an institutional control to ensure the route will not be completed in the future.
Area Background	Subpart D	Allows demonstration that the concentration of COCs are consistently present in the vicinity of the site as a result of natural conditions or human activities, and not the result solely of releases at the site.
Tier 1	Subpart E	Use tables containing ROs developed using conservative assumptions. Only need to know land use and classification of groundwater. May also need to know soil pH.
Tier 2	Subpart F, G, H	Calculate ROs using site-specific physical characteristics. Use mathematical models similar to those used to calculate Tier 1 ROs.
Tier 3	Subpart I	Allows for use of alternative parameters and factors not allowed in other options. May require gathering of more data and additional evaluations. Includes provisions for: modification of parameters; alternative models; formal risk assessment; impractical remediation; elimination of exposure routes; derivation of toxicological data.

Subparts J and K of TACO set forth the requirements for using institutional controls and/or engineered barriers, respectively, in the development of the ROs. Additional requirements regarding the use of institutional controls and engineered barriers in the development of ROs will be found in the regulations associated with the option chosen to develop the RO.

One or more options discussed above may be used in developing an RO for a given COC or for a given project overall. Unless the RO for a COC is being developed using area background, it is necessary to address, in some manner, each of the following exposure routes:

1. Inhalation
2. soil ingestion; and
3. groundwater ingestion, which has a migration from soil to groundwater component and a direct ingestion of groundwater component.

Dermal contact with soil must also be taken into account when developing Tier 2 soil RO using the RBCA approach or when conducting formal risk assessments under Tier 3.

The overall RO for a given COC is: (1) the lowest of the ROs developed for each of the three exposure routes or (2) the established background level. In addition, certain maximum limits are placed on these ROs. Specifically, the soil attenuation capacity requirements of 35 Ill. Adm. Code 742.215 and the soil saturation limits of 35 Ill. Adm. Code 742.220 must be met. There are also other limitations which must be met if ROs are developed using the elimination of pathways using Subpart C of TACO; these limits are also set forth in Subpart C. Institutional controls restricting exposure to the contamination must be established if any of the criteria set forth in 35 Ill. Adm. Code 742.1000 are used in developing the remediation objectives.

Demonstration of compliance with ROs must meet the requirements of 35 Ill. Adm. Code 742.225. Typically, this requires compliance on a point by point basis. As described in 35 Ill. Adm. Code 742.225(b), (c), (d) and (e), there are certain cases where averaging/compositing is acceptable for soil. In general: (1) averaging/compositing cannot be used for the construction worker scenario; (2) no compositing may be done when the COCs are volatile organic compounds; (3) averaging/compositing for the soil inhalation or ingestion exposure routes must be carried out in accordance with an Illinois EPA approved plan; (4) averaging and compositing requirements for the soil component of the groundwater ingestion route are set forth in 742.225(c); and (5) the procedures for handling "non-detects" when averaging are set forth in 742.225(e).

3.0 Guidance on Making TACO Submittals for Soil ROs for RCRA Projects

Given all the options and requirements in TACO, it is imperative that a report be developed and submitted to Illinois EPA which clearly identifies all the TACO procedures used in the development of the ROs for a given project and which also clearly demonstrates that they have been developed in strict compliance with the TACO regulations. It is the responsibility of the facility to organize, format and develop this report such that compliance with all applicable TACO requirements is clearly demonstrated in the report.

Reports demonstrating compliance with TACO in developing soil ROs for RCRA projects should:

1. Contain background information about the project in question;
2. Identify and provide information regarding the unit(s) for which the ROs are being proposed;
3. Contain information regarding the geology and hydrogeology of the site, as it is available;
4. Identify and provide justification for the selected contaminants of concern.
5. Contain sufficient information to demonstrate that the contamination at the site has been properly characterized, as required by 35 Ill. Adm. Code 742.120.
6. Identify the TACO option(s) and regulations being used to develop the RO for each COC. (The inhalation, soil ingestion and groundwater ingestion exposure routes must all be evaluated for a given COC unless the RO is developed using the area background option, the lowest RO for each of these exposure routes is the overall RO for a given COC.)
7. Demonstrate compliance with TACO for each option chosen to calculate a RO for each COC.
8. Contain all supporting information used in developing the RO for each COC, including:
    a. Identification of all data used to calculate the ROs;
    b. Documentation that the information used was appropriate, including a description of all testing procedures and their results;
    c. All calculations which were made in developing the ROs; and
    d. A description of how all the information used in developing the ROs was obtained.
9. Contain a discussion of how any required engineered barrier or institutional control will be incorporated into the project. Documentation must also be provided that the applicable requirements associated with engineered barriers and/or institutional controls have been met. Any engineered barrier or institutional control relied upon to develop ROs must be approved by Illinois EPA prior to its actual implementation and be in place before Illinois EPA accepts certification of closure or issues a no further action letter for a corrective action project. Documentation of compliance with all TACO requirements associated with engineered barriers/institutional controls must be submitted to Illinois EPA before these final letters can be issued.
10. Contain a detailed description of how compliance with the proposed ROs is being achieved. This description must demonstrate compliance with all TACO regulations, especially 35 Ill. Adm. Code 742.215 (limitations on ROs based on soil attenuation capacity); 742.220 (limitations on ROs based on soil saturation limits); and 742.225 (demonstration of compliance with ROs).

Such reports must be well organized and logically present the TACO procedures which were used in developing the ROs for the project. The attached summary tables for presenting ROs developed under TACO should be completed and included in the executive summary section of this report.

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Attachment: Summary Tables for Reporting Soil Remediation Objectives for RCRA Projects

SUMMARY TABLES FOR REPORTING SOIL REMEDIATION OBJECTIVES FOR RCRA REMEDIATION PROJECTS

July 2003

Introduction

The document entitled "TACO Requirements for Soil Remediation Objectives Associated with RCRA Projects," February 2003, indicates a report must be developed and submitted to Illinois EPA for review and approval which clearly identifies: (1) all the procedures used to develop soil remediation objectives (ROs) for a RCRA remediation project; and (2) demonstrates that the ROs were properly developed in accordance with 35 Ill. Adm. Code 742. Among other things, this report should:

1. Identify the options and associated regulations used to develop the ROs for a given contaminant of concern (COC);
2. Demonstrate compliance with the identified regulations;
3. Provide all supporting information used in developing the ROs, including:
   a. Identification of all data used to calculate the ROs;
   b. Documentation that the information used was appropriate, including a description of all testing procedures and their results;
   c. All calculations and equations used in developing the ROs;
   d. A description of the procedures used to gather all the required information and documentation that these procedures are acceptable.

Illinois EPA has developed several reporting tables which should be used to present and summarize the efforts which went in to developing soil ROs for a RCRA remediation project. These tables should be included in an overall report which demonstrates that the soil ROs have been properly developed in accordance with 35 Ill. Adm. Code 742. Use of these tables will not only aid in the presentation of the procedures used to develop ROs for a given project, but they will also aid in the Illinois EPA's review of the proposed ROs. This document provides guidance regarding the use of these tables.

Discussion of the Summary Tables

A basic summary table has been developed in which the actual RO for each exposure route can be identified as well as an overall description of the procedure used to develop the RO. Four other Tables have also been developed which allow a facility to identify the values of the various site-specific input parameter used in calculating Tier 2 objectives and where the information supporting these values can be found in the overall report developed to support the proposed ROs (these tables are for: (1) physical soil and groundwater properties; (2) physical and chemical properties of COCs; (3) toxicological values for COCs; and (4) miscellaneous site specific information).

A more detailed discussion of the various reporting tables and instructions regarding their use is as follows:

1. **TACO Summary Table**--this table should be used to summarize the ROs developed for each of COCs and for each exposure route. General information regarding the development of the ROs should also be identified in the table. In completing this table:
   a. Identify the land use for which the remediation objectives are being presented.
   b. Identify the exposure scenario for which the ROs were developed. If the land use is commercial/industrial, then ROs for the construction worker exposure scenario must also be developed. Individual summary tables must be developed for both the industrial/commercial exposure scenario and the construction worker exposure scenario. A third summary table ("combined") must also be developed which identifies the lower of the two values in these tables for each exposure scenario.

c. The inhalation, soil ingestion and groundwater ingestion (migration to groundwater component) exposure routes must be evaluated, unless the RO is based upon background.

   1. If the inhalation RO is being developed using the SSL system of equations, then it is necessary to be concerned with inhalation of: (1) fugitive dust for all contaminants; and (2) vapors from the evaporation of volatile organic compounds;

   2. If the RBCA system of equations is being used to develop a soil RO for the combined ingestion/inhalation/dermal contact exposure route and the soil of concern is more than one meter deep, then the ambient vapor inhalation exposure route must also be evaluated.

d. Record the soil RO developed for each exposure route identified in the table.

e. Identify the following in the "Comment" element regarding the RO developed for each exposure route:

   1. The option used to develop the RO (background; pathway elimination; Tier 1,2,3);

   2. The section (and subsection/paragraph, if appropriate) of regulation under which the RO was developed;

   3. The equations used to calculate the RO (if appropriate);

   4. The location in the "Remediation Objectives Report" or similar report containing detailed information supporting the development of the RO.

f. The lowest RO for all of the exposure routes is the final RO for that COC.

2. Physical Soil and Groundwater Properties Used to Calculate Tier 2 Soil Remediation Objectives for RCRA Projects

   a. This table should be used to identify the values used for various soil and groundwater properties at the site. Information supporting these values must be provided and referenced in this table.

   b. The default values in this table are from 35 Ill. Adm. Code 742, Appendix C (Table B for SSL parameters and Table D for RBCA parameters).

   c. The location where additional information can be found supporting the identified values should be provided in the "Comments" elements for each parameter.

3. Physical and Chemical Properties of COCs for TACO Soil ROs at RCRA Facilities

   a. This table should be used to report the values used for the physical and chemical properties of the contaminants of concern. The values must be taken from 35 Ill. Adm. Code 742, Appendix C, Table E; use of any other values is a Tier 3 issue.

   b. The location where additional information can be found supporting the identified values should be provided in the "Comments" element for each parameter.

4. Toxicological Values of COCs for TACO Soil ROs at RCRA Facilities

   a. This table should be used to report the values used for the toxicological properties of the COCs. These values must be obtained from IRIS, as incorporated by reference in 35 Ill. Adm. Code 742.210; use of any other values is a Tier 3 issue (see 35 Ill. Adm. Code 742.705(d)(2) and 742.930).

   b. If the proposed land use of the facility is industrial/commercial, then the construction worker exposure scenario must also be evaluated. It is necessary to use subchronic reference doses and concentrations when developing remediation objectives for the construction worker exposure scenario.

   c. The location where additional information can be found supporting the identified values should be provided in the "Source" element for each parameter.

5. Miscellaneous Site-Specific Information Necessary for TACO Soil ROs for RCRA Projects

   a. This table should be used to report values of various site-specific parameters necessary to conduct the following Tier 2 calculations:

1. Inhalation of fugitive dust based upon the SSL system of equations;
2. Inhalation of vapors based upon the SSL system of equations;
3. The soil saturation limit for each contaminant.
4. Migration to groundwater using both SSL and RBCA equations;

b. The location where additional information can be found supporting the identified values should be provided in the "Source" element for each parameter.

Attachments:

Summary Table for TACO Soil ROs for RCRA Projects
Physical Soil and Groundwater Properties
Physical/Chemical Properties of COCs
Toxicological Values for COCs
Miscellaneous Site-Specific Information (2 pages)

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Summary Table for TACO Soil ROs for RCRA Projects

Facility Name ______________________________ IEPA ID No. ______________

Land Use: Residential Industrial/Commercial

Exposure Scenario (for Industrial/Commercial only): Industrial/Commercial Construction Worker
Combined (lower of two scenarios)

Notes: (1) Table formatted for SSL soil ROs for ingestion and inhalation exposure routes. If using RBCA system to develop ROs for these exposure routes, then record the combined ingestion/inhalation/dermal contact RO in the "Soil Ingestion" row and the ambient vapor inhalation RO in the "Inhalation/Volatilization" row.
(2) Individual ROs cannot exceed soil saturation limit.
(3) Soil attenuation capacity cannot be exceeded.

Exposure Pathway	Contaminant of Concern (COC)		
Inhalation/ Fugitive Dust			
Comment			
Inhalation/ Volatilization(1)			
Comment			
Soil Ingestion (1)			
Comment			
Migration to Groundwater			
Comment			

Physical Soil and Groundwater Properties Used to Calculate

Tier 2 Soil Remediation Objectives for RCRA Projects

Facility Name ______________________________ IEPA ID No. ____________

Notes: (1) All regulatory citations are to 35 Ill. Adm. Code 742
(2) Default values are from Table B (SSL) and Table D (RBCA) of Appendix C
(3) May either use defaults given or obtain site-specific values using method identified. Sufficient information supporting all values identified in this table must be provided.
(4) All properties in this table are for the contaminated soil, except K and i. K and i are related to the water bearing unit beneath the contaminated soil whose water quality is of concern.

Property	Soil Type	Default Value(2)	Value Used and Source	Method (from App C, Table F) or Calculation
ρb (Soil bulk Density) (kg/L)	Surface or Subsurface	1.5		ASTM - D1556-90 Sand Cone Method (Surface)
	Gravel	2.0		ASTM - D2167-94 Rubber Balloon Method (Surface)
	Sand	1.8		ASTM - D2922-91 Nuclear Method (Surface)
	Silt	1.6		ASTM - D2937-94 Drive Cylinder Method (Subsurface)
	Clay	1.7		
ρs (Soil Particle Density) (g/cm^3)	Surface or Subsurface	2.65		ASTM-D 854-92 Specific Gravity for Soil
w (Moisture Content) g_{water}/g_{soil} (unitless)	Surface or Subsurface	0.1		ASTM - D2216-92 Lab Determination
	Surface	0.1		ASTM - D3017-88 (Reapproved 1993) Nuclear Method
	Subsurface	0.2		Equivalent USEPA Method (e.g., sample preparation procedures described in methods 3541 or 3550)
				ASTM - D4959-89 (Reapproved 1994) Direct Heating Method
				ASTM - D4643-93 Microwave Oven
f_{oc} (Organic Carbon Content) g/g(unitless)	Surface	0.006		Nelson and Sommers (1982)
	Subsurface	0.002		ASTM-D2974-87 (Reapproved 1995) Moisture, Ash, and Organic Matter
				USEPA Method 9060A Total Organic Content

Physical Soil and Groundwater Properties Used to Calculate
Tier 2 Soil Remediation Objectives for RCRA Projects

Property	Soil Type	Default Value(2)	Value Used and Source	Method (from App C, Table F) or Calculation
pH (unitless)				USEPA Method 9040B or 9045C
η(SSL) Θ_T (RBCA) (Total Soil Porosity) L_{pore}/L_{soil} (unitless)	Surface and/or Subsurface	0.43		S24: $\eta = 1 - \frac{\rho_b}{\rho_s}$ R23: $\Theta_T = \Theta_{as} + \Theta_{ws}$
	Gravel	0.25		
	Sand	0.32		
	Silt	0.40		
	Clay	0.36		
Θ_a (SSL) Θ_{as} (RBCA) (Air-Filled Soil Porosity) L_{air}/L_{soil}	Surface	0.28		S21: $\Theta_a = \eta - \Theta_w \Theta$ R21: $\Theta_{as} = \Theta_T - \Theta_{ws}$
	Subsurface	0.13		
	Gravel	0.005		
	Sand	0.14		
	Silt	0.16		
	Clay	0.17		
Θ_w (SSL) Θ_{ws} (RBCA) (Water-Filled Soil Porosity) L_{water}/L_{soil} (unitless)	Surface	0.15		S20: $\Theta_w = (I/K_s)_c$, $c = 1/(2b+3)$ (See App C, Table K for Ks and 1/(2b+3) values) I = infiltration (18 cm/yr) R22: $\Theta_{ws} = w\ \rho_b/\rho_{water}$
	Subsurface	0.30		
	Gravel	0.20		
	Sand	0.18		
	Silt	0.16		
	Clay	0.17		
K (see Note 4) (hydraulic conductivity) [cm/day or cm/yr]	Subsurface			ASTM - D5084-90 Flexible Wall Permeameter Pump Test Slug Test
i (hydraulic gradient) [unitless] (Note 4)	Groundwater Property			Site-Specific Field Measurement

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Physical/Chemical Properties of COCs for
TACO Soil ROs at RCRA Facilities

Facility Name ______________________________ IEPA ID No. ______________

Property	COC				
S (mg/l)					
Source					
D_{air} (cm^2/s)					
Source					
H					
Source					
K_{oc} (cm^3/g)					
Source					
λ (d^{-1})					
Source					
D_{water} (cm^2/s)					
Source					

Toxicological Values of COCs for
TACO Soil ROs at RCRA Facilities

Facility Name ____ IEPA ID No. ______________

Exposure Scenario: Residential Industrial/Commercial Construction Worker

Tox Value	COC				
RfD_o (mg/kg-d)					
Source					
RfC (mg/m^3)					
Source					
RfD_i (mg/kg-d)					
Source					
SF_o $(mg/kg\text{-}d)^{-1}$					
Source					
URF $(ug/m^3)^{-1}$					
Source					
SF_i $(mg/kg\text{-}d)^{-1}$					
Source					

Miscellaneous Site-Specific Information Necessary
for TACO Soil ROs for RCRA Projects

Facility Name ______________________________ IEPA ID No. ______________

Parameter	COC				
SSL-Inh/Dust					
PEF (m^3/kg)					
Source					
PEF [] (m^3/kg)					
Source					
Q/C (1)					
Source					
V					
Source					
SSL-Inh/Vol					
VF (m^3/kg)					
Source					
VF [] (m^3/kg)					
Source					
Q/C (1)					
Source					
D_A (cm^2s)					
Source					
d_s (m)					
C_{sat} (mg/kg)					
Source					

Miscellaneous Site-Specific Information Necessary
for TACO Soil ROs for RCRA Projects

Facility Name ______________________________ IEPA ID No. ____________

Parameter	COC				
SSL-GW					
GW_{obj} (mg/l)					
Source					
d (m)					
Source					
L (m)					
Source					
d_a (m)					
Source					
d_s (m)					
Source					
RBCA-GW					
GW_{comp} (mg/l)					
Source					
X (cm)					
Source					
S_d (δ_{gw}) (cm)					
Source					
S_w (cm)					
Source					
W (cm)					
Source					

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Table of Contents

IEPA RCRA CLOSURE PLAN GUIDANCE

July 2003

ATTACHMENT C

Information Which Should be Provided in Support of
Remediation Systems at Facilities Undergoing RCRA Closure

Attachment C
Information Which Should be Provided in Support of
Remediation Systems at Facilities Undergoing RCRA Closure

Introduction

Many times, some type of treatment system, either in-situ or ex-situ, is necessary to remediate soil and/or groundwater contamination encountered during the RCRA closure of a hazardous waste management unit (HWMU). Such systems are integral to the HWMU's closure, and thus must be included in the approved RCRA closure plan for that HWMU. Due to the fact that 35 Ill. Adm. Code 725, Subpart G requires that HWMUs be closed in accordance with Illinois EPA-approved closure plans, the Illinois EPA should approve any proposed treatment system before it is actually used in remediating contamination present at the HWMU being closed. The purpose of this document is to provide guidance regarding the procedures which should be followed in obtaining Illinois EPA approval of a treatment system which is going to be used in remediating soil/groundwater contamination as part of a RCRA closure effort.

Once it has been determined that some type of treatment system is necessary to properly close a HWMU, it is necessary to select, design, construct and operate the proposed system so that the desired remediation can take place. Two engineering reports should be developed and submitted to the Illinois EPA for review and approval of the treatment system prior to the action construction/installation of the treatment system. Development of these two reports, discussed in general below, should coincide with the procedures typically carried out in designing engineered solutions to problems based by engineers. A more detailed discussion of the contents of each of these reports is provided in the two sections which follow this introductory section.

The first report which should be developed and submitted to the Illinois EPA for review and approval is generally referred to a Basis for Design Report. This report should (1) contain background information regarding the project, (2) identify the goals of the remediation effort, (3) evaluate the existing situation at the area undergoing closure, (4) identify the selected treatment process and (5) contain a general plan for completing the detailed design of the remediation system. In summary, this report contains general information about the project and the procedures which will be used to complete the detailed design effort.

The second report which should be developed only after the Basis for Design Report is approved by the Illinois EPA is generally referred to as the Final Design Report. This report should contain detailed plans and specifications for the treatment system, including supporting calculations and procedures for constructing/operating the treatment system. The Illinois EPA approved Basis for Design Report should be used as the foundation for this second report. Once the Illinois EPA has approved this report, construction of the treatment system may begin.

<u>GUIDANCE REGARDING THE CONTENTS OF A BASIS FOR DESIGN REPORT</u>

Prior to beginning the detailed design of a treatment system, it will be necessary to gather background information regarding the existing conditions of the area requiring remediation and identify the goals and objectives of the desired remediation system. Once this is done, an evaluation should be made of the treatment systems available to determine which ones can achieve the goals and objectives within the existing conditions of the area where the remediation is necessary. Based upon this evaluation, one treatment system should be selected as the desired remediation system for the project at hand. Once this selection has been made, the following efforts must also be carried out prior to beginning the detailed review, including (1) identification of what information is necessary to conduct a detailed design of the system, (2) identification of any additional information which must be gathered; (3) identification of the design criteria, (4) development of a general outline of the procedures which will be used to complete the design of the site and (4) development of conceptual plans for the desired treatment.

The efforts described above should be documented in the form of a Basis of Design Report which is submitted to the Illinois EPA for review and approval prior to initiating the detailed design phase of the desired remediation system. Such Basis for Design Reports should contain the following information:

1. <u>Introduction/Purpose</u>. An introductory section should be in the report which contains: (1) general background information regarding the project; (2) the purpose and goals of the submittal and (3) the scope of the project.

2. <u>Existing Site Conditions</u>. The report should contain information regarding:

   a. The geology and hydrogeology, as appropriate, of the site, including;

      1. The types of soil/geologic units present beneath the facility and their thickness;

      2. The characteristics of each soil type/geologic unit present;

      3. The depth to saturated soil;

      4. The depth to bedrock;

      5. The presence of saturated units beneath the ground surface. The thickness and characteristics of these units is also important;

      6. The direction of groundwater flow in each saturated unit.

   b. The contamination at the site, including:

      1. A description of all investigations conducted to date

      2. Presentation of the results of all investigations conducted to date and a discussion of these results;

      3. Tables and drawings identifying the horizontal and vertical extent of contamination. Also of concern is the distribution of the contamination within the area of concern.

      4. The physical and chemical properties of the contaminants of concern.

3. <u>Objectives</u>. The report should discuss the general objectives of the proposed remediation system to be constructed/installed.

4. <u>Identification of Options Available</u>. The report should contain a discussion of the various remedial systems available to achieve the established clean-up objectives. This discussion should identify: (1) a general overview of each option available, including how the option will achieve the stated objective; (2) the advantages associated with each option; (3) the disadvantages associated with each option and (4) an estimate of the cost associated with choosing each option as a remediate.

5. <u>Description of Selected Corrective Measure</u>. The report should contain a qualitative discussion of the corrective measure chosen, along with the rationale which was used to select this measure from all those identified initially. In addition, a discussion should be provided regarding the estimated amount of time required to complete the remediation process.

6. <u>Demonstration of Selected Remediation System's Effectiveness</u>. The report must contain documentation that the selected system should be able to properly remediate the contamination. Information which should be provided includes:

   a. Results of pilot tests or actual full-scale projects at similar facilities;

   b. A detailed description of the pilot tests or full-scale projects;

   c. Documentation that the pilot tests/full-scale project were conducted over a sufficient amount of time and in a similar environment to indicate that the proposed method of treatment would properly perform in the geologic, hydrogeologic and hydrologic setting at the site in question.

   d. A discussion/engineering evaluation of the above information indicating that the proposed treatment method should work at the site in question.

7. Estimated Time to Complete Remediation Effort. Based upon knowledge of the existing site conditions and the characteristics of the selected remediation system and the report should contain an estimate of the amount of time necessary to complete the remediation effort.

8. Identification of Design Criteria. The report should identify what information must be available to design the selected corrective measure.

9. Review of Available Information. The report should contain an evaluation of the existing information to ensure that sufficient information is available to complete the design of the selected corrective measure. If insufficient information is available, then the report should contain procedures for collecting the required information. The level of detail required for this additional data collection should be similar to that provided in RFI workplans.

10. Procedures for Completing the Design. The report should contain a description of the procedures which will be followed to complete the design of the corrective measure. This should include:

    a. Identification of the references and established guidance which will be used in designing the selected corrective measure. Justification for the selection of this procedure should also be provided.

    b. A description of the procedures which will be used to (1) complete the design of the selected remediation system and (2) prepare the final design plans and specifications.

    c. Identification of assumptions to be used in the design, and the impact these assumptions have on the overall corrective measure;

    d. All data critical to the design effort;

    e. Identification and discussion of the major equations to be used in the design effort (including a reference to the source of the equations);

    f. Sample calculations to be used in the design effort;

    g. Conceptual process/schematic diagrams;

    h. A site plan showing a preliminary layout of the selected corrective measure;

    i. A site plan showing a preliminary layout of the selected corrective measure;

    j. Procedures for obtaining information necessary for the detailed design of the remediation system which is currently not available.

    k. Tables giving preliminary mass balances;

    l. Site safety and security provisions.

    m. A preliminary estimate of the cost of the design, installation and operation of the selected remediation system.

11. Identification of Required Permits. The report should identify and describe any necessary permits associated with the selected corrective measure, as well as the procedures which will be used to obtain these permits.

12. Long-lead Procurement Considerations. The report should identify any elements/components of the selected corrective measure which will require a large amount of time to obtain/install. The following issues should also be discussed: (1) the reason why it will take a large amount of time to obtain/install the item; (2) the length of time necessary for procurement and (3) recognized sources of such items.

13. Project Management. The report should contain information regarding the procedures and personnel which will be involved in completing the design of the selected corrective measure. A schedule for completing the design should also be provided.

The information presented in the Basis for Design Report will form the continuing technical basis for the detailed design of the system and the preparation of construction plans and specifications.

FINAL DESIGN REPORT

Once the Basis for Design Report has been approved by the Illinois EPA, efforts should be carried out to complete the design of the selected selection system. The Basis of Design Report should provide the foundation for carrying out these efforts and form the basis for the detailed design of the remediation system. Any deviations from the approved Basis for Design Report should be discussed with and approved by the Illinois EPA as the efforts to complete the detailed design of the treatment system are carried out.

A report should be developed which (1) documents the efforts put forth in designing the treatment system and (2) contains detailed plans and specifications for construction and operation of the treatment system. This Final Design Report should contain the following:

1. Final Design Documentation and Construction Workplan. This portion of the final report should contain the detailed plans, specifications and drawings needed to construct the corrective measure. In addition, the following should also be provided: (1) calculations, data etc. in support of the final design and (2) a detailed description of the overall management strategy, construction quality assurance procedures and schedule for constructing the treatment system. Any deviations from the approved Basis for Design Report should also be thoroughly discussed in this portion of the report. The information which should be provided in this portion of the report includes:

   a. Introduction/Purpose. This portion of the document should (1) provide background information regarding the project, (2) describe the purpose and goals of the project, and (3) describe the scope of the project.

   b. Detailed Plans of the Design System, including the following:

      1. Plan views;
      2. Section and supplementary views which, together with the specifications and general layouts, facilitate construction of the designed system;
      3. Dimensions and relative elevations of structures;
      4. Location and outline form of the equipment;
      5. Ground elevations; and
      6. Descriptive notations, as necessary, for clarity.

   c. Complete technical specifications for the construction of the system. The specifications accompanying construction drawings should include, but are not limited to, the following:

      1. All construction information, not shown in the drawings, which is necessary to inform the contractor in detail as to the required quality of materials, workmanship, and fabrication of the project;
      2. The type, size, strength, operating characteristics and rating of the equipment;
      3. The complete requirements for all mechanical and electrical equipment, including machinery, valves, piping and jointing of pipe;
      4. Electrical apparatus, wiring and meters;
      5. Construction materials;
      6. Chemicals, when used;
      7. Miscellaneous appurtenances;
      8. Instruction for testing materials and equipment as necessary; and
      9. Availability of soil boring information.

   d. Deviations from Basis for Design Report. A discussion of any deviations from the approved Basis for Design Report must be provided, as well as justification for these deviations.

e. Project Management. A description of the construction management approach, including the levels of authority and responsibility, lines of communication and qualifications if key personnel who will direct corrective measures construction/installation must be provided in the workplan.

f. Construction Quality Assurance/Quality Control. the workplan must contain a construction quality assurance/quality control plan describing the procedures which will be followed t ensure the corrective measure is constructed/installed in accordance with the approved plans and specifications.

g. Schedule. The workplan must contain a schedule for completion of all major activities associated with construction/installation of the selected corrective measures. All major points of the construction/installation should be highlighted, with a graphical representation of the project schedule included.

h. Waste Management Practices. This portion of the document should identify the wastes anticipated to be generated during the construction/installation of the corrective measures, and provide a description of the procedures for appropriate characterization and management of these wastes.

i. Required Permits. This portion of the workplan should provide list of the permits which will be required to be obtained prior to construction/installation and implementation of the selected Corrective Measures Plan Guidance corrective measures. If it is determined that no permit is required for construction/installation and implementation of the corrective measures, rationale and justification must be provided to support this contention.

2. Operation and Maintenance Plan. This plan should outline the procedures for operating/maintaining, and monitoring the corrective measure (remediation) system. It should contain the following:

a. Introduction and Purpose. -- Provide a brief description of the facility operations, scope of the corrective measures project, and summary of the project objectives.

b. System Description. -- Describe the corrective measure system and significant equipment, including manufacturer’s specifications. This portion should also include a narrative of how the selected system equipment is capable of complying with the final engineered design of the corrective measure.

c. Operation and Maintenance Procedures. -- Describe the normal operation and maintenance procedures for the corrective measures system, including:

1. Description of tasks for operation;
2. Description of tasks for maintenance;
3. Description of prescribed treatment or operation conditions; and
4. Schedule showing the frequency of each operation and maintenance task.

d. Inspection Schedule. -- Describe the procedures for inspection of the corrective measures system, including problems to look for during the inspection procedure, specific inspection items, and frequency of the inspections.

e. Waste Management Practices. -- Describe the wastes generated by operation of the system and the procedures for their proper management.

f. Contingency Procedures. -- Describe the following:

1. System breakdown and operational problems which may occur.
2. Alternative procedures which are to be implemented in the event that the corrective measure suffer complete failure. These procedures must be able to prevent the release or threatened release of hazardous constituents which may endanger human health and the environment.
3. The procedures to be used to notify facility and regulatory personnel of a breakdown in the system including written notification identifying what occurred, what response action is being taken and any potential impacts on human health and the environment.

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IEPA RCRA CLOSURE PLAN GUIDANCE

July 2003

ATTACHMENT D

Guidance for Developing a Groundwater Program for RCRA Clean Closures

Also includes:

Attachment D-1	Review of Available Regional Geologic and Hydrogeologic Information
Attachment D-2	Characterization of the Geology
Attachment D-3	Monitoring Well System
Attachment D-4	Guidance for Demonstrating Groundwater is Class II
Attachment D-5	Groundwater Remediation System

Guidance For Developing a Groundwater Program
for RCRA Clean Closures

I. Groundwater Program Overview

If contamination is found to extend to near the water table during "clean closure" of a hazardous waste container storage area or hazardous waste tank, then it will be necessary to conduct an investigation to determine if the groundwater has been impacted. Groundwater remediation may also be necessary to achieve "clean closure" the unit, if groundwater contamination exceeding the applicable groundwater quality standards of 35 Ill. Adm. Code 620 and/or 35 Ill. Adm. Code 742 remediation objectives. These activities are necessary to ensure the requirements of 35 Ill. Adm. Code 725, Subpart G are met during the "clean closure" of units where soil contamination is found to extend to the groundwater. This guidance document should be utilized as an aid in the development of a groundwater program to assess groundwater quality and remediate groundwater contamination for such projects. It should be noted that this guidance can also be used when developing a groundwater monitoring/remediation program for closing other small RCRA units and can also be used in general for any required RCRA closure groundwater monitoring/remediation program (some of the more detailed text in this document may not be appropriate for units larger than approximately 50' x 50' in size).

Groundwater quality should be assessed through the collection and analysis of a sufficient number groundwater samples from monitoring wells upgradient and downgradient of the unit undergoing closure. Analytical results from the groundwater sampling must be compared to groundwater clean-up requirements of the 35 Ill. Adm. Code 620 Groundwater Quality Standards. If this comparison indicates the groundwater meets the clean-up objective concentration for four consecutive quarters of sampling and analysis following remediation of contaminants present in unsaturated soil, then the subject RCRA unit may achieve "clean closure" relative to groundwater without restrictions. However, groundwater remediation may be required prior to completing closure of the unit when groundwater has been impacted by the unit to the point where contaminant concentrations are above established 35 Ill. Adm. Code 620 Groundwater Quality Standards and/or 35 Ill. Adm. Code 742 remediation objectives.

Groundwater remediation efforts must be designed to remove the contaminants to the clean-up objective level. The groundwater remediation effort will be considered successful and "clean closure" of the unit relative to groundwater may be achieved when: (1) the unsaturated soil has been properly remediated and (2) the analytical results from four consecutive quarters of groundwater monitoring meet the clean-up objectives. RCRA units with associated contamination that cannot be practicably removed or decontaminated to the clean-up objective level must be closed and post-closure care must be performed in accordance with the closure and post-closure requirements that apply to landfills (35 Ill. Adm. Code 725.410).

II. Groundwater Program Implementation

The Illinois EPA recommends the Groundwater Program required as part of a RCRA closure activity be implemented in three phases which are to be completed sequentially. However, it will not be necessary to complete Phases II and III if it is determined during Phase I that the groundwater has not been contaminated. Conversely, the groundwater monitoring fundamentals described in Phase I will not be necessary when the facility feels that groundwater contamination is present and verification of the presence of groundwater contaminants (e.g. Phase I groundwater monitoring) is unnecessary. In this case, the facility should complete the review of published regional and hydrogeologic information described in Attachment D-1 and implement Phase II of the Program whose intent is to acquire information sufficient to implement a groundwater remediation program.

The three phases of the Program are described below:

1. Phase I includes characterizing the geology-hydrogeology of the site and determining if the groundwater has been impacted by the unit undergoing RCRA closure. This information will be used to determine whether the groundwater meets the established clean-up objectives. If the groundwater does not meet these objectives, completion of Phases II and III is necessary due to the presence of groundwater contaminants.

The actions which should be carried out in Phase I include:

a. A review of published regional and hydrogeologic information (see Attachment D-1);

b. Characterization of the geology in the immediate vicinity of the unit (see Attachment D-2);

c. Groundwater monitoring to determine if groundwater has been contaminated due to the RCRA tank unit (see Attachment D-3); and

d. Classification of the groundwater according to 35 Ill. Adm. Code 620, if the facility feels Class I clean-up objectives are appropriate based upon site-specific hydrogeologic data (see Attachment D-4).

2. Phase II is necessary when groundwater is found to be contaminated from the RCRA unit. The intent of Phase II is to define the physical characteristics of the pathways for contaminant migration and to determine the extent and concentration of contaminants present in the groundwater. This information will be used for the design of a remediation system, if necessary.

   The actions of Phase II include:

   a. Characterization of the geology beneath the facility (see Attachment D-2);

   b. Groundwater monitoring to determine the extent and concentration of contaminants present (see Attachment D-3);

   c. Classification of the groundwater according to 35 Ill. Adm. Code 620, if the facility feels Class II clean-up objectives are appropriate at the facility based on site-specific hydrogeologic data (see Attachment D-4).

3. Phase III is required when groundwater does not meet the established 35 Ill. Adm. Code 620 cleanup objectives. Under Phase III the facility may utilize the following actions to address the exceedence of the established 35 Ill. Adm. Code 620 cleanup objectives:

   a. Demonstrate that the groundwater ingestion exposure route is excluded from consideration. The procedures found in 35 Ill. Adm. Code 742.300 must be used to make this demonstration; or

   b. Demonstrate that the groundwater contamination is at or below area background concentrations and if necessary, implement an institutional control restricting usage of the groundwater. The procedures found in 35 Ill. Adm. Code 742.405(b) must be used to make the background demonstration and the procedures found in 35 Ill. Adm. Code 742.1000 must be used to implement an institutional control; or

   c. Remediate to Tier 1 remediation objectives. Any remedial actions must include:

      1) Design and implementation of a groundwater remediation program (see Attachment D-5)

      2) Establishment of a Groundwater Management Zone (see Attachment D-5); and,

      3) Groundwater monitoring to evaluate the remediation program (see Attachment D-3); or

   d. Propose and obtain approval of Tier 2 groundwater remediation objectives in accordance with 35 Ill. Adm. Code 742.805 and achieve those levels. Any remedial actions must include:

      1) Design and implementation of a groundwater remediation program (see Attachment D-5);

      2) Establishment of a Groundwater Management Zone (see Attachment D-5); and,

      3) Groundwater monitoring to evaluate the remediation program (see Attachment D-3); and if necessary;

   e. Conduct a Tier 3 evaluation in accordance with 35 Ill. Adm. Code 742, Subpart I; or

   f. Obtain approval from the Board to:

      1) Reclassify the groundwater pursuant to 35 Ill. Adm. Code 620.260; or

      2) Use an adjusted standard pursuant to Section 28.1 of the Act.

III. Conclusions

Section II above has been provided to describe the steps which should be taken to investigate for possible groundwater contamination when soil contamination is found to extend to the water table during a RCRA "clean closure" project. The guidance in that section can also be used, in general, for most other small projects where groundwater monitoring and/or remediation is necessary. It must be noted that the text in this document is only guidance; facilities should work closely with Permit Section's RCRA Groundwater Assistance Unit when developing a specific groundwater monitoring and/or remediation system.

Attachments:

D-1 -- Review of Available Regional Geologic and Hydrogeologic Information (starts on page D-5)

D-2 -- Characterization of the Geology (starts on page D-6)

D-3 -- Monitoring Well System (starts on page D-10)

D-4 -- Guidance for Demonstrating Groundwater is Class II Groundwater (starts on page D-20)

D-5 -- Groundwater Remediation Systems (starts on page D-26)

ATTACHMENT D-1

Review of Available Regional Geologic and
Hydrogeologic Information

Prior to initiating any field investigation, a review of available information regarding the geology and hydrogeology of the area in which the site is located, should be conducted. The results of this review should be compiled in a report which contains the following information, as it is available:

1. A description of the geography and geology of the area within a 1 to 2 mile radius of the site, including a description of the stratigraphy, lithology, structural characteristics, and hydrogeology from the base of the first bedrock aquifer to ground surface;
2. A description and location of any "Class I groundwater" (as generally defined in 35 Ill. Adm. Code 620) beneath the facility;
3. Identification of any private potable water supply wells within a one mile radius of the site. A scaled map showing the location of these wells must be provided along with actual logs and documentation of the efforts made to obtain this information;
4. Identification of any public potable water supply wells within a two mile radius of the site. A scaled map showing the location of these wells must be provided along with actual logs and documentation of the efforts made to obtain this information;
5. Identification of the geologic units beneath the site which are used for private potable water supply within a one mile radius of the site (including bedrock units) and an indication of whether these units contain groundwater subject to the Class I Standards;
6. Identification of the geologic units beneath the site which are used as a public water potable supply (including bedrock units) and an indication of whether these units contain groundwater subject to the Class I standards; and,
7. Identification of the source of water for all municipalities located within a two mile radius of the facility.

The Illinois State Water Survey and Illinois State Geological Survey should be contacted, as well as other appropriate local, state and federal entities, to obtain existing information related to the hydrogeology of the area. Existing information from previous sub-surface investigations at the site should also be used, including investigations for building construction and other environmental remediation projects. The report must contain adequate documentation that information from the surveys was used in developing this hydrogeologic assessment. References should be provided for all sources of information utilized in the report, such references must identify the exact pages where the referenced information is present in the document.

ATTACHMENT D-2

Characterization of the Geology

The Characterization of the Geology should be completed during Phase I and Phase II of the Groundwater Program (Program). During Phase I, this characterization should be limited to the vicinity of the subject RCRA unit and should consist of a description of the geology and any adjacent area necessary to adequately determine the hydrologic character around the unit. The Phase II characterization effort should supplement the geologic information acquired during Phase I to include a description of the geology for all areas which may contain contamination including any area necessary for the identification of potential contaminant migration pathways beneath the facility. The characterization during Phase II should also identify the physical properties of all saturated units which may be contaminated. In general, the efforts associated with characterizing the geology will consist of: (1) field investigations, including soil borings, installation of piezometers and/or monitoring wells, and physical and chemical testing; and, (2) interpretation of data collected during the field investigations including supplementing the information gathered during the literature review of regional geologic characteristics (Attachment D-1).

The borings for this characterization of the geology must be continuously sampled, unless a continuously sampled boring over the geologic interval is already available from the immediate area of any planned boring. Soil borings must be made using either a split-spoon sampler (ASTM Method D-1586) or a Shelby tube sampler (ASTM Method D-1587). Logs of the borings should indicate where water was first encountered, the water levels(s) after the test boring was completed and allowed to stabilize for 24 hours, geologic descriptions of the materials encountered, the surveyed land surface elevations, the test boring locations, and textural classifications supported by sieve analysis and Atterberg limit testing. All field study work including, but not limited to, borings, field classification of soils and documentation of procedures shall be conducted in accordance with ASTM D-420 and ASTM D-2488 and certified by a qualified geologist or geotechnical engineer. Soils must also be classified in accordance with the Unified Soil Classification System. All borings must be properly plugged upon abandonment of the borehole in accordance with current Illinois EPA procedures and 35 Ill. Adm. Code 920 Illinois Water Well Code requirements.

A description of the information which should be obtained to characterize the geology during Phase I and II of the Program follows:

1. As stated above, the goal of the characterization of the Geology/Hydrogeology during Phase I of the Program is to characterize the geology and hydrogeology in the vicinity of the subject RCRA unit undergoing closure.

   a. Specific information which should be gathered and evaluated during Phase I include:

      1) the petrography of all significant formations/strata including a qualitative assessment of the porosity, texture, uniformity and lithology for each unit.

      2) significant structural features.

      3) stratigraphic contacts between significant formations/strata.

      4.) zones of high permeability, fracture, or significant channeling in the unconsolidated and consolidated deposits.

      5) perched aquifers.

      6) the location of each borehole and depth of termination.

      7) depth to the zone of saturation and the thickness of the unit.

      8) depth of invert of the tanks or unit.

      9) an interpretation of hydraulic interconnections between saturated zones.

The above information may be obtained from boring log information associated with installation of monitoring wells required for Phase I groundwater monitoring and appropriate existing boring information which is site-specific. However, depending upon the complexity of the geology beneath the facility, additional borings may be necessary to adequately characterize the geology in the vicinity of the unit. Laboratory or field testing may be necessary to obtain the above information. A boring log form and well completion form can be found at :
www.epa.state.il.us/land/forms/#groundwater-permits.

b. The results of the work carried out to obtain the information described above should be presented as a report in the following format:

   1) Written description of the information listed above.

   2) Two scaled geologic cross-sections normal to each other which contain the information required above and identifies the interval over which the wells are screened.

   3) Appropriately scaled map which show the location of borings and subject RCRA unit.

   4) Logs of the borings used during the Phase I Characterization of the Geology.

2. Phase II of the Program should characterize the geology and identify the physical properties of saturated units which may be contaminated including any area necessary for the identification of potential contaminant migration pathways beneath the facility. The additional borings necessary to collect this information should obtain data from ground surface to the first confining unit below the uppermost water saturated unit or the first confining unit beneath the extent of groundwater contamination, whichever is deeper. In addition, at least one boring should obtain data from the surface to the first confining unit within bedrock. The deep boring must be placed outside the area of known or believed contamination. Hydraulic properties of saturated units should be prepared from boring information, lab tests including chemical properties and permeameter, and slug or pump field test data. (Note: The actual depth to which borings should be advanced will be dependent upon the regional geology. As such, an effort should be made to coordinate this decision with Illinois EPA).

   a. The information necessary to characterize the geology during Phase II includes a description and identification of the Phase I requirements listed above for all saturated units which may contain groundwater contaminants including any area necessary for the identification of potential contaminant migration pathways. In addition, the following information should be determined for each unit which may be contaminated:

      1) determination of the vertical and horizontal extent beneath the facility;

      2) identification of the lower and upper confining unit, if present;

      3) determination of the vertical and horizontal components of groundwater flow, including gradient and velocity;

      4) determination of the hydraulic conductivity. In addition, it may be necessary to determine the hydraulic conductivity of confining layers; and,

      5) determination of the pertinent physical and chemical properties of the lower confining layer relative to the hazardous waste constituents which are expected to be present;

   b. The information gathered for the Phase II Characterization of the Geology should be presented in the form of a report which contains the following information:

      1) Written description of the information required above, including all methods used to determine hydraulic properties;

      2) All data gathered during the investigation;

      3) Two scaled geologic cross-sections normal to each other which contain the unit to be closed and the information required above. In addition, the interval over which wells are screened should be identified;

4) Scaled map which shows the location of borings, subject RCRA unit, and location of wells or borings used to identify the properties of the uppermost aquifer; and,

5) Logs of the borings used during the Phase I and II Characterization of the Geology.

ATTACHMENT D-3
Monitoring Well System

A satisfactory groundwater monitoring well system is composed of four components: (1) proper location and screening of the wells; (2) proper drilling operations; (3) proper construction, development and maintenance and of the wells (4) a sampling and analysis plan which describes the procedures to be used in collecting and analyzing groundwater samples. A monitoring well diagram can be found at: www.epa.state.il.us/land/forms/#groundwater-permits. A discussion of each of these items is given below.

1. Well Location and Screening

   a. Phase I

      Groundwater monitoring during Phase I of the Program should determine if groundwater has been contaminated due to the RCRA tank unit. To accomplish this monitoring wells should be placed in the most likely position to detect contaminants from the closing RCRA unit.

      The precise location of monitoring wells during this phase should be: (1) based upon the knowledge of groundwater flow and (2) in very close proximity to the tank unit. Knowledge of the groundwater flow direction will allow the implementation of a well system consisting of a limited number of monitoring wells located immediately downgradient, in very close proximity of the tank unit.

      Insufficient knowledge of the groundwater flow direction may result in the installation of more wells than if the groundwater flow direction was known, since wells must be installed in such a manner as to ensure that all potential directions of groundwater flow are monitored. Such a Phase I monitoring system would consist of an adequate number of wells to surround the tank unit. Further, if it is not practicable to locate monitoring wells in the immediate vicinity of the RCRA unit and as a result, the wells are located a significant distance from the closing unit, Illinois EPA will consider the area beneath the closing unit to the monitoring wells as containing groundwater contamination requiring remediation.

      The direction of groundwater flow for the purpose of locating a limited number of monitoring wells down-gradient of the RCRA unit during Phase I should be emonstrated to Illinois EPA prior to well installation. The direction of groundwater flow should be demonstrated by submitting the following minimum information: (1) boring logs which show that all wells are screened in the same geologic interval that is to be monitored during Phase I; (2) data sheets with water levels measurements and surveyed measuring points identified; and, (3) a scaled potentiometric map which identifies the location of wells and the tank unit.

      Monitoring wells for the Phase I Program should be screened in the first saturated geologic unit encountered beneath the tank unit/ground surface. The precise interval within the first saturated unit to monitor should be based upon the physical characteristics of the waste stored in the subject RCRA unit. If perched waters are encountered, it may be necessary to install additional wells to monitor the geologic units below the perched unit.

      The following procedures may be used to locate and screen monitoring wells during Phase I of the Program:

      1) If groundwater flow direction within the first saturated unit is unknown:

         (a) and no parameter with a specific gravity greater than water is listed in the Soil or Groundwater Clean-up Objectives:

             Groundwater monitoring wells should be located on each side of the RCRA unit and be located as close to the tank unit as possible. The maximum horizontal distance between any two wells should be 50 feet. The wells should be screened in the top of the first saturated unit. The screen length should be 10 feet. However if the first saturated unit is less than 10 feet in length, the screen length should be equal to the thickness of saturation including any seasonal fluctuation of groundwater elevation and no less than five feet without prior Illinois EPA approval.

(b) and a parameter with a specific gravity greater than water is listed in the Soil Clean-up Objectives:

The same procedures should be followed as detailed above, except when the saturated zone is greater than 10 feet in thickness, then multi-level sampling will be required. To accomplish the multilevel sampling, additional wells screened in the bottom of the saturated unit must be located in close proximity or nested to the wells placed from the procedures of (a) above.

2) If groundwater flow direction is known:

(a) and no parameter with a specific gravity greater than water is listed in the Soil Clean-up Objectives:

Wells should be located immediately downgradient of the subject RCRA unit as close to the unit as practicable and be in sufficient number to monitor all components of the closing unit. The maximum horizontal distance between individual wells should be 50 feet. The wells should be screened in the top of the first saturated unit. The screen length should be 10 feet. However if the first saturated unit is less than 10 feet in length, the screen length should be equal to the thickness of saturation including any seasonal fluctuation of groundwater elevation and no less than five feet without prior Illinois EPA approval.

(b) and no parameter with a specific gravity greater than water is listed in the Soil Clean-up Objectives:

The same procedures should be followed as detailed above except for monitoring a saturated zone which is greater than 10 feet in thickness, then multi-level sampling will be required. To accomplish the multilevel sampling, additional wells must be located in close proximity to wells placed from (a) above and which are screened in the bottom of the first saturated unit.

b. Phase II

Groundwater monitoring during Phase II of the Program should determine information fundamental for the design of a remediation system, including: (1) the horizontal and vertical extent of contamination; (2) contaminant concentration; and, (3) groundwater flow rate and direction. To accomplish this, the groundwater flow rate and direction must be determined through either previously acquired site-specific data or a characterization of the hydrogeology of the facility. Following the determination of groundwater flow rate and direction, a sufficient number of wells necessary to monitor the vertical and horizontal lead edge of groundwater contamination from the subject RCRA unit should be installed. A field screening method or temporary well sampling method may be used as an aid to help locate the lead edge of groundwater contamination prior to the installation of permanent monitoring wells. The installation of permanent monitoring wells is necessary to accurately define the extent of the plume. In addition, wells located within the contaminant plume may be necessary to determine the concentration of contaminants between the lead-edge wells and the tank unit.

It is recommended that the information acquired during Phase II be submitted to Illinois EPA for approval prior to the design of the remediation system.

c. Phase III

Groundwater monitoring during Phase III of the Program must determine the effectiveness of the remedial action. It may be necessary to locate groundwater monitoring wells within each plume of contamination, as well as outside each plume of contamination, in order to determine if the remedial action is operating effectively.

2. <u>Monitor well drilling operations</u> should not use drilling muds, foams or additives without prior Illinois EPA approval. Use of such materials may affect groundwater chemistry and affect future groundwater sampling and analysis events.

3. Monitor well construction, development and maintenance:

a. Monitor well casing:

1) Casing must be clean, free of rust, grease, oil or contaminants and constructed of materials that will have the least interference in detecting groundwater contaminants. If volatile organic sampling is required, the well casing which is in contact with groundwater and screen in the saturated zone must be made from stainless steel, type 316 or 304, or similarly inert material. However, PVC may be used for investigation purposes but data from these wells may not be utilized to determine "clean closure". If volatile organic sampling is not required, PVC casing is acceptable, if is certified by the National Sanitation Foundation (NSF). In addition, PVC may be used for investigation purposes but may not utilized.

2) Casing must have a minimum inside diameter of two inches and maximum of four inches.

3) All joints must be flush threaded and watertight. Joints shall be wrapped with Teflon tape. No adhesives solvents or grease shall be used.

4) The well casing must be straight and free of any obstruction and permit the collection of representative groundwater samples.

5) All wells must be vented so that the pressure in the casing is equal to atmospheric pressure. Wells completed flush to surface must be watertight. The water level should be allowed to equilibrate prior to measuring.

b. Monitor well screens:

1) The well screen must meet all of the above criteria for well casing.

2) The well must be screened at appropriate intervals to monitor the permeable ones encountered following the requirements of Item 1. Well Location and Screening, above. The well screen must be of a manufactured type and not less than 5 feet, or more than 10 feet, in length.

3) The slot size must be compatible with the grain size of the annular Filter pack to prevent silting in by the surrounding material.

4) Screens must be continuous slot wire wound or machine cut. Field slotted screens are unacceptable.

5) The bottom of the screen must be located within 6 inches of the borehole bottom.

c. Annular Fill Material:

1) The filter pack around the screen should filter out sediments and be 2 1/2 -3 times larger than the 50% grain size of the zone being monitored.

2) A clean, well rounded and uniform (mainly one grain size) filter pack is preferred; however, in sand and gravel deposits where cave-ins occur, the natural sand and gravel is acceptable, if unavoidable.

3) To ensure that the sealing material does not interfere with the screen, the filter pack shall, at a minimum, extend two feet above the top of the well screen.

4) The sealing material above the filter pack must prevent the migration of fluids from the surface and between subsurface sediments. The sealing material must be installed from the bottom of the annular opening upward in one continuous operation using a "tremie tube" or "tremie pipe". Expanding cement grout with 1% bentonite, by weight, added to the appropriate amount of water before being added to the cement or 5% bentonite, by volume, added to the cement before mixing with water should be used. No quick setting cements that contain additives will be allowed. Any bentonite used must also be free of additives.

5) At the surface, a concrete cap shall generally be installed. To prevent frost-heave damage, the cap shall extend below the frost zone and slope away from the well casing on the surface so that rain water will be diverted away from the well casing and bore hole.

d. Monitor well protection and identification:

1) That portion of the well casing above the ground surface must be protected to minimize damage or tampering through setting in the annular seal below the frost zone. These precautions should include a locking cap, and in high traffic areas, three bumper guards within two to four feet of the concrete cap.

2) Wells must be identified by a monitor point number, using an Illinois EPA approved designation.

3) The location of the well(s) in relation to the waste management area must be must be located on a topographic map (scale 1"=200' or larger). This must include county, site name, township, range and section.

e. Monitor well development:

After the monitor well has been constructed and allowed to sit for 24 hours (this allows the cement grout to set properly before development), the well must be adequately developed to minimize turbidity within the well and increase flow into the well. To be effective, development procedures require reversal or surges in flow to avoid bridging by particles, which is common when flow is continuous in one direction. This action can be created by using surge blocks, bailers or pumps.

f. Monitor well replacement

A monitoring well may be replaced if it is damaged, if it does not consistently produce a sample, or if there are problems attributed to well construction. It must not be replaced when: (1) contamination has been indicated; (2) the well is intended to be a piezometer; and, (3) a replacement well has not been established prior to decommissioning of the original well.

The facility should get the Illinois EPA's concurrence in the form of a closure plan modification prior to making this change. However, the facility may be given up front approval to make the replacement, if the replaced well meets a certain number of requirements, and the facility provides a certain amount of information:

1) The replacement well shall be installed within ten (10) feet of the existing well.

2) This well shall monitor the same hydrogeologic or saturated zone as the existing well provided that the existing well screen was properly located and screened at an elevation to comply with the objectives of the approved monitoring program.

3) This well shall be constructed in accordance with the above procedures.

4) The old well must be plugged following the procedures for well plugging in the next section. The well should not be plugged until the new well is on-line and monitoring data has been obtained and verified, unless the well is extremely damaged and would create a potential route for groundwater contamination.

5) The facility must not miss any quarter of sampling due to the installation of the replacement well.

6) As-built diagrams (Attachment B) and boring logs should be submitted to the Compliance Monitoring Section within 30 days following the installation of the well.

7) The facility must indicate the quarter for which the new sampling will be initiated.

8) The well must be renumbered using the "R" designation in place of the alphabetic character. For example, GlOl becomes RlOl. A third replacement well takes on the "A"..."B," "C" designation. For example , RlOl becomes AlOl, A202 becomes B202, etc.

9) The facility must use this new number on the chemical analysis form.

10) A statement that the facility has followed the above procedures regarding the replacement well must be included in the next permit modification request.

g. Monitor well plugging and abandonment procedures are as follows:

1) Monitoring wells and borings, which are no longer being used, must be properly plugged/sealed and abandoned so that groundwater is protected from surface contamination and from degradation by other stratigraphic sediments and so that yields and hydrostatic heads of aquifers are conserved. Guidance for the plugging of monitoring wells, based upon geologic materials and well construction, is provided at www.epa.state.il.us/land/forms/#groundwaterpermits.

2) Soil borings and test wells are to be plugged using the procedures for monitoring wells if they penetrate a water bearing sediment. Those that do not contain water can be filled from the surface, as long as methods are used which ensure that pure cement slurry will reach the bottom of the hole. There may also be abandoned drinking water wells on-site that must be plugged because they can serve as routes for contamination.

3) When a well has been damaged, such as when the casing has been broken off at or below the surface, it should be bailed to remove any material that entered it before plugging is initiated. All open drill holes must be covered to prevent injury to people or animals. Also, the depth of the well should be checked to detect the presence of any obstructions that may interfere with sealing. The operator is to restore the areas around drill holes to their original condition.

4) Wells are sometimes lost, as a result of being buried or when risers are broken off. If this occurs, an attempt must be made to locate them so they can be properly plugged. If metal construction materials were used, they may be found using metal detection equipment. Otherwise, it will be necessary to consult drilling records, facility site plans or people who were involved in the construction and operation of the well, such as the driller, sampler or regulatory Illinois EPA inspector.

5) Accurate records of plugging and abandonment procedures should be maintained for possible future reference and to document proper closure. For example, the static water level should be measured before plugging begins. The quantity of sealing materials (neat cement slurry) used and any changes made in well construction need to be recorded in detail. The Illinois EPA must be informed when plugging is complete.

h. Monitor well reports:

1) Boring logs must be completed for all monitor wells. Also, all test boring should be continuously sampled, and have the elevations surveyed and reported in MSL to the nearest 0.01 ft. Well completion (as-built) diagrams which have been surveyed by a registered surveyor must be submitted to the Illinois EPA on the form provided at: www.epa.state.il.us/land/forms/#groundwater-permits.

2) A scaled drawing showing monitor well and test boring locations should be submitted to the Illinois EPA. The drawing should also illustrate buildings, roads, the site's property boundaries, areas permitted for waste disposal and currently filled areas. In addition, a Cartesian coordinate grid for the site should be established, shown on the map, and all test boring and monitor wells should have coordinates surveyed and reported (i.e., establish a grid system). This drawing and the associated work which must be carried out to obtain the necessary information for the drawing should be completed by an Illinois registered land surveyor.

i. Other reporting requirements:

All necessary permits, licenses, and reporting regarding well construction, operation and plugging must be in according with the requirements of the Illinois EPA and the Illinois Department of Public Health.

4. Sampling and Analysis Procedures:

a. Sampling and Analysis Plan

A sampling and analysis plan must be developed in order to properly obtain and analyze samples from the installed groundwater monitoring system. This plan should be submitted and approved prior to sampling of the groundwater monitoring system. This plan must followed, maintained and updated by the facility. The plan must include procedures and techniques for:

1) Sample collection;, including:

(a) Measurement of Static Water Level,

(b) Detection of Immiscible Layers,

(c) Well Evacuation,

(d) Sample Withdrawal, and

(e) In-situ or Field Analysis.

2) Sample preservation and shipment, including:

(a) Sample containers,

(b) Sample Preservation, and

(c) Special Handling Considerations.

3) Chain of Custody, including:

(a) Sample Labels,

(b) Sample Seals,

(c) Field Logbook,

(d) Chain-of-Custody,

(e) Sample Analysis Request Sheets, and

(f) Laboratory Logbook.

4) Analytical Procedures.

5) Quality Assurance/Quality Control Procedures for field program and laboratory program.

6) Procedures for Statistical Analysis.

The following documents may be reviewed for more specific guidance: "RCRA GROUND-WATER MONITORING: DRAFT TECHNICAL GUIDANCE", EPA/530-R-93-001, November 1992; "Procedures Manual For Groundwater Monitoring At Solid Waste Disposal Facilities", EPA-530/SW-6ll, August 1977; "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1979; and, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, (SW-846) Third Edition Final Update III, Revision 4" dated December 1996, EPA/OSW and all finalized updates.

b. Groundwater Monitoring Parameters

Groundwater samples obtained from the monitoring system should be analyzed for those parameters which may be present in the groundwater. The parameters to be monitored shall be based on a review of the wastes managed in the unit undergoing closure. Illinois EPA will establish clean-up objectives for the parameters which may be present. However, if it is not possible to identify the possible parameters following the review of the wastes stored in the unit, an analysis for the constituents identified in 35 Ill. Adm. Code 724 Appendix I may be necessary to identify which parameters to analyze and establish clean-up objectives.

ATTACHMENT D-4

Guidance for Demonstrating Groundwater is Class II Groundwater

Introduction

The Illinois Pollution Control Board adopted the Groundwater Quality Standards at 35 Ill. Adm. Code 620, in November 1991. Included in this rulemaking are criteria for classifying groundwaters for purposes of determining the appropriate level of protection (i.e. determining the appropriate quality standards which the groundwater should meet). This document has been developed to provide guidance to facilities regarding the type of information which should be provided to the Illinois EPA to demonstrate that groundwater beneath a facility is subject to the Class II Groundwater Quality Standards. The class of a groundwater is independent of its actual quality, except for certain Class IV groundwater.

Definition of Class II Groundwater

Groundwater is classified in 35 Ill. Adm. Code 620 as a Class II, general resource, groundwater when it:

1. Does not meet the provisions of 35 Ill. Adm. Code 620.210 (Class I groundwater), 35 Ill. Adm. Code 620.230 (Class III) or 35 Ill. Adm. Code 620.240 (Class IV). (Determining whether the groundwater is Class III or Class IV is relatively straight forward, as is the requirement to determine if the groundwater has previously been classified as Class II groundwater by the Board). Determining that a groundwater is not a Class I groundwater is somewhat complex and is further discussed in the following section.

2. Has been found by the Board to be a Class II groundwater, pursuant to the petition procedures set forth in 35 Ill. Adm. Code 620.260; (If a continuous zone containing groundwater begins within 10 feet of the ground surface and extends greater than ten feet below the ground surface it will not be considered a Class II groundwater if an additional criteria is met under 35 Ill. Adm. Code 620.210, in this case it would be considered Class I groundwater. Although it may be possible, it is unrealistic to try and designate two distinct classes of groundwater within the same saturated hydrogeologic unit. But, if a facility can demonstrate that by cleaning the groundwater within ten feet of the surface to Class II specifications will not degrade the groundwater greater than 10 feet below the Illinois EPA may approve both Class I standards, the Illinois EPA may approve both Class I and II standards in accordance with the location of the groundwater); or

3. Is located less than ten feet below the ground surface (See also discussion in Item 2 above).

Demonstrating a Groundwater is a Class II Groundwater

Initially, the following should be reviewed to determine the appropriate classification of groundwater of a site: (1) published data concerning regional and local geologic and hydrogeologic conditions (i.e. geologic surveys, former site investigations, etc.); (2) the locations of all potable water wells located within one mile of the site with the logs and/or dates of well completion attached; and (3) available on site boring logs which characterize the geology from ground surface to the first saturated unit or, if a perched zone is present, the first saturated unit below the perched zone. A review of this information may clearly indicate that the groundwater of concern is a Class I, III or IV groundwater and thus would not be Class II groundwater.

If it appears as though, based on the general information gathered as discussed above, the groundwater of concern may only be a Class II groundwater then additional efforts must be carried to demonstrate conclusively that the groundwater is indeed Class II groundwater. The information which should thus be compiled and submitted to the Illinois EPA to demonstrate that a given groundwater is Class II groundwater includes the following (NOTE: If the information identified below has previously been submitted to the Illinois EPA, then one need only reference the document name, date it was submitted, and page(s) of the document on which the information is located):

1. Background information regarding the facility’s operations;

2. A scaled drawing showing the location of the facility;

3. The discussion of the reason why it is necessary to classify the groundwater of concern at the facility;
4. A description of any remedial actions being carried out at the facility;
5. The results of the review of existing general information regarding the geology/hydrogeology of the facility and surrounding area as discussed above.
6. A description of the on-site geology and hydrogeology, including a description of the groundwater which is being classified and the geologic formation in which the groundwater is located. This description should be developed in accordance with the guidance set forth in the TEGD.
7. Information indicating that the groundwater of concern is not a Class III groundwater (see 35 Ill. Adm. Code 620.230) or a Class IV groundwater.
8. Information, as appropriate, indicating that the groundwater has already been determined to be Class II groundwater by the Illinois Pollution Control Board as allowed by 35 Ill. Adm. Code 620.260.
9. Information indicating that the groundwater is less than 10' below the groundwater surface. (If a continuous zone containing groundwater begins within 10 feet of the ground surface and extends greater than ten feet below the ground surface it will not be considered a Class II groundwater if an additional criteria is met under 35 Ill. Adm. Code 620.210, in this case it would be considered Class I groundwater. Although it may be possible, it is unrealistic to try and designate two distinct classes of groundwater within the same saturated hydrogeologic unit. But, if a facility can demonstrate that by cleaning the groundwater within ten feet of the surface to Class II specifications will not degrade the groundwater greater than 10 feet below the Illinois EPA may approve both Class I standards, the Illinois EPA may approve both Class I and II standards in accordance with the location of the groundwater); or
10. Information demonstrating that the groundwater is not Class I groundwater as defined in 35 Ill. Adm. Code 620.210. This demonstration can be made by addressing the following (note that to be a Class II groundwater, a demonstration must be made that the groundwater does not meet any of the five criteria for Class I groundwater described below):

    a. Groundwater <u>located within the minimum setback of a well which serves as a potable water supply and to the bottom of such well</u> Class I groundwater. The minimum setback zone of a well extends from the land surface to the bottom of the well as determined by the screen depth. This establishes a three-dimensional zone of protection around the well. Section 14.1 of the Environmental Protection Act establishes minimum setbacks of less than 200 feet for a private water supply well or less than 400 feet for a public water supply well unless the specified minimum setbacks have been expanded under the Wellhead Protection Program and the Illinois Groundwater Protection Act. Thus information must be provided demonstrating that the groundwater of concern does not meet this criterion for Class I groundwater.

       This issue can be addressed by submitting a scaled map delineating the site and all potable water wells located within a one mile radius from the unit/s of concern. The Illinois State Water Survey and/or the Division of Public Water Supplies of the Illinois EPA should be contacted, as well as other appropriate state and federal entities, to obtain this information. A copy of the state or federal agencies response to an information inquiry should be included with the information submitted by the facility. Also, a visual inspection of the area within 200 feet of the unit/s of concern should be conducted when possible to detect unlogged private wells.

    b. Groundwater in formations beneath in a facility which consist of unconsolidated sand, gravel or sand and gravel which is 5 feet or more in thickness and that contains 12 percent or less in fines (i.e. fines which pass through a No. 200 sieve tested according to ASTM Standard Practice D2488-84, incorporated by reference at Section 620.125) is Class I groundwater. Thus, if a facility desires to have groundwater beneath its facility to be classified as a Class II groundwater, it must submit information that the groundwater <u>does not meet</u> this criterion for Class I groundwater.

This criterion is specific to the type formations listed. If a zone of saturation fails this Class I criterion, Class I may still apply pursuant to (d) or (e) below. This criterion may be satisfied by the submission of, at a minimum, one site specific, continuously sampled boring log which clearly identifies the saturated interval from which a representative sample was obtained. Sieve test analysis should be conducted on several samples from each saturated interval which is at least five feet in thickness and composed of sand sized grains or greater. In addition, the facility should submit the sieve data sheet, plot and a scaled map which identifies the location of each boring.

c. Groundwater in sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness is Class I groundwater. Thus, to demonstrate a groundwater is Class II groundwater, information must be provided to demonstrate that the groundwater in question does not meet this criterion for Class I groundwater.

This demonstration may be made by the submission of, at a minimum, on e site specific, continuously sampled boring log with a description of the geologic material present. This boring log should extend from the ground surface to a depth which is 10 feet to the uppermost water-bearing unit subject to Class I standards or bedrock, whichever is shallower. The boring(s) should be continuously samples and located on a scaled site map. A representative sample, as used previously, is a sample obtained from each distinctive saturated unit within the boring. Also, a literature search of regional and local geologic conditions should be conducted with the results submitted to the Illinois EPA.

d. Groundwater in a geologic material which is capable of a sustained groundwater yield, from up to a 12 inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less is Class I groundwater. Thus, a demonstration that a given groundwater is Class II groundwater must contain a demonstration that the groundwater in question does not meet this criterion for Class I groundwater.

The pump test should consider some minimum pumping rate during the test. The following criteria should be used:

1) If all areas within 200 feet of the site have access to a water main to provide drinking water from a public water supply system, then a minimum pumping rate of 4 gallons per minute should be used when performing this test.

2) If all areas within 200 feet of the site do not have access to a water main to provide drinking water from a public water supply system, then a minimum pumping rate of 0.5 gallons per minute should be used when performing the test.

This demonstration can be made by the submission of continuously sampled boring logs which demonstrate aquifer thickness. In addition, as-built well construction diagrams should also be submitted to the Illinois EPA for review. Furthermore, a pump test or equivalent must be conducted to determine the yield of the geologic material. methodology, assumptions and any calculations performed should also be submitted to meet this requirement. If the aquifer geometry and transmissivity have been obtained through a site-specific field investigations, an analytical solution may be used to estimate well yield. The facility must demonstrate the appropriateness of an analytical solution to estimate well yield versus an actual field test. Well yield should be determined for either confined or unconfined.

e. Groundwater in a geologic which has a hydraulic conductivity of 1 x 10-4 cm/sec or greater is Class I groundwater. Thus, a demonstration that a given groundwater is Class II groundwater must contain a demonstration that the groundwater in question does not meet this criterion for Class I groundwater.

This demonstration can be made by performing field and/or lab tests such as a permeameter, slug test and/or pump test. An appropriate method of evaluation should be chosen based on the type of wells, the length of time over which data may need to be collected and, if known, the characteristics of the targeted aquifer. Such test methods and the suggested information to be submitted to the Illinois EPA include (note that any of the three method can be used):

1) **Permeameter**. If this method is chosen, samples of unconsolidated materials should be left in the field-sampling tubes which then becomes the permeameter sample chamber. Proceeding in this manner should allow as little disruption to the sample as possible. Unconsolidated samples should not be repacked into the sample chamber. An outline of the laboratory test method used and a description of the steps followed including any calculations should be submitted to the Illinois EPA for review.

2) **Slug tests**. The information to be submitted to the Illinois EPA should include a description of the slug test method utilized and a discussion of the procedures following during the tests, including any calculations performed.

A significant drawback to performing a slug test is that it is heavily dependent on a high-quality intake. If a well point is clogged or corroded, measured values may be inaccurate. Also, if a well is developed by surging or backwashing prior to testing, the measured values may reflect increased conductivities in the artificially induced gravel pack around the intake (Freeze and Cherry, 1979). If slug tests are chosen, a sufficient number of tests should be run to ensure that representative measures of hydraulic conductivities have been obtained and that lateral variations at various depths are documented (TEGD, 1986).

3) **Pump tests**. Preliminary or short-term drawdown tests should be performed initially to assess the appropriate pumping rate for the constant-rate tests. Several methods and/or equations may be used in evaluating data generated from pump tests such as Theis, Hantush-Jacob, Hvorslev and/or Theim equations. The method(s) of evaluation selected should be provided to the Illinois EPA with justification for their use, explanations of any assumptions made and examples of all calculations performed along with a description of the physical tests performed including the type of pump used.

Two problems that should be considered are (1) storage of potentially contaminated water pumped from the well system and (2) potential effects of groundwater pumping on existing waste plumes (TEGD, 1986). Any groundwater pumped from wells in an area where there is a potential for contamination during either a yield test or hydraulic conductivity test should be containerized and tested to determine whether its contents would be a special waste. This will aid the facility in determining whether any special permits are needed for disposing of the groundwater properly. Caution should be used when performing groundwater yield tests for extended periods of time, so that any contaminant plume present or suspected is not significantly altered.

NOTE REGARDING PERMEABILITY TESTING: It may be beneficial to use laboratory evaluation methods to further support results of field tests; however, field methods provide the best definition of the hydraulic conductivity in most cases (TEGD, 1986). The most appropriate method to determine hydraulic conductivity for most sites will be the pump test provided proper evaluation of the data obtained from the test utilized. Pump tests provide in-situ measurements that are averaged over a large aquifer volume and are preferred since they are able to characterize a greater portion of the subsurface compared to the other aquifer tests. Slug tests provide in-situ values representative of a small volume of porous media in the immediate vicinity of a piezometer tip, providing point values only, and may be more appropriate in very low-permeability materials in which conductivity is too small to conduct a pump test.

REFERENCES: USEPA, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD), OSWER - 9950.1

Freeze and Cherry, Groundwater, 1979, Prentice-Hall, Inc., Englewood Cliffs, NJ

ATTACHMENT D-5
Groundwater Remediation Systems

This attachment has been developed to identify the information which should be provided to the Illinois EPA for review and approval regarding proposed groundwater remediation systems associated with RCRA closure activities. It should be noted that the proposed groundwater remediation system should be approved by the Illinois EPA before a facility begins installation of the system.

The information which is submitted to the Illinois EPA regarding a proposed groundwater remediation should be presented in the form of design reports. To ensure that the Illinois EPA has sufficient information to evaluate the proposed remediation system, these reports should contain at a minimum, the following information, (Note: if the identified information has previously been submitted to the Illinois EPA, that information may be referenced):

1. The information acquired during the Phase II groundwater monitoring (described in Attachment D, Item II.2 and Attachment D-2) should be used to describe the groundwater contamination. The description should identify (1) the vertical and horizontal extent of contamination to the clean-up objective concentration; (2) contaminant concentration throughout the plume; and, (3) groundwater flow rate and direction.

2. A detailed characterization of the geology and hydrogeology of the area where the remediation is to take place. The information acquired during Phase II Characterization of the Geology (described in Attachment D-2, Item 2) should be used for this characterization.

3. Design plans and specifications for all components of the proposed remediation system, including supporting design calculations. This should include the information described in the document entitled <u>Information Which Should be Provided in Support of Remediation Systems at Facilities Undergoing RCRA Closure</u> (Attachment C).

4. A Groundwater Management Zone (GMZ) established to meet the requirements of 35 Ill. Adm. Code 620.250 for undertaking adequate corrective action in those areas which contain contamination, may utilize the guidance provided at www.epa.state.il.us/land/regulatoryprograms/permits-and-management/establishing-groundwater-management-zone.html. To meet the requirements of the cited rule, hydraulic control shall be maintained within the GMZ and contaminant concentrations reduced continually.

5. A detailed description of the procedures which will be implemented to withdraw a sufficient quantity of water to adequately capture groundwater horizontal and vertical flow within the GMZ. This description shall include:

   a. The rate at which water will be withdrawn from each well; and,

   b. Procedures for the operation and maintenance of withdrawal wells.

6. A demonstration that the proposed withdrawal system will adequately control groundwater flow within the GMZ by determining horizontal and vertical gradients.

7. A detailed description of the procedures which will be utilized to verify that the remediation/recovery system is controlling groundwater flow. These procedures should include:

   a. Daily monitoring and recording of the amount of groundwater withdrawn from each withdrawal well; and,

   b. Periodically monitoring the piezometric head at various locations in the saturated unit.

8. A detailed description of the procedures which will be utilized to (1) monitor the groundwater quality in the area of concern, and (2) ensure that the remediation system is performing adequately.

9. A detailed description of what will be done with the water which is withdrawn from the saturated unit.

a. If some type of on-site treatment will be used, then design plans and specifications of the system must be provided in the engineering report identified in Item 3 above. It must be noted that the treatment system must meet the applicable requirements of 35 Ill. Adm. Code 700-739, as well as applicable 35 Ill. Adm. Code, Subtitle B (Air Pollution) and 35 Ill. Adm. Code Subtitle C (Water Pollution). If possible treatment systems should take advantage of the permit exclusions in 35 Ill. Adm. Code 703.123 and 722.134. Otherwise, treatment systems may also need RCRA permits. Of special concern is the fact that the treatment tanks should generally meet the requirements of 35 Ill. Adm. Code 725, Subpart J. Copies of permit applications submitted to the Bureau of Air or the Bureau of Water for the system must also be provided.

b. If this groundwater is sent off-site to a commercial facility, it must be managed as a special waste.

10. A detailed description of the procedures which will be utilized to verify that the cleanup objectives have been achieved in the groundwater.

11. A reporting schedule for routinely submitting data to the Illinois EPA.

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IEPA RCRA CLOSURE PLAN GUIDANCE

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ATTACHMENT E

RCRA Interim Status Closure and Post-Closure
Care Plans General Forms

RCRA INTERIM STATUS CLOSURE AND POST-CLOSURE CARE PLANS GENERAL FORM

LPC-PA18

This form must accompany any rcra interim-status closure and/or post-closure care plans or modification request submitted to the division of land pollution control. The original and two copies of all documents submitted must be provided.

Facility Identification (Information about the facility where the units are located which are addressed in this closure plan submittal)

Name: ______________________ County: ______________________

Street Address: ______________________ Site # (IEPA): ______________________

City: ______________________ Site # (USEPA): ______________________

Owner Information

Name: ______________________

Mailing Address:

____

____

____

Contact Name: ______________________

Contact Title: ______________________

Phone #: ______________________

Operator Information

Name: ______________________

Mailing Address:

____

____

____

Contact Name: ______________________

Contact Title: ______________________

Phone #: ______________________

Type of Submission (check applicable item and provide requested information, as applicable)

- ☐ Original (New) Closure Plan
- ☐ Original (New) Post-Closure Plan
- ☐ Response to Disapproval letter
- ☐ Modification Request
- ☐ Additional Information for ____ / ____ / _____ Submittal (Log No. ______________ if known)

Log No. of Most Recent Agency Approval/Disapproval Letter ______________________

Date of Most Recent Agency Approval/Disapproval Letter ______________________

Does this submittal contain groundwater information: ☐ Yes ☐ No

(if yes, please include one additional copy of submittal)

Description of Submittal: (briefly describe what is being submitted)

____

____

____

List of Documents Submitted (identify all documents in this submittal, including the cover letter)

____

____

____

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

IL 532-2106
LPC 464 Rev. 02/03

Units Undergoing Closure (please identify what type of units are addressed in the plan, their capacities and whether they are on the RCRA Part A for the facility)

Unit	Unit Code	Number of Units Closing	Capacity	On Part A (Y/N)
Storage:				
Container (barrel, drum, etc.)	S01	________	________	________
Tank	S02	________	________	________
Waste Pile	S03	________	________	________
Surface Impoundment	S04	________	________	________
Treatment:				
Tank	T01	________	________	________
Surface Impoundment	T02	________	________	________
Incinerator	T03	________	________	________
Other (other)	T04	________	________	________
Disposal				
Landfill	D80	________	________	________
Land Application	D81	________	________	________
Surface Impoundment	D83	________	________	________

CERTIFICATION AND SIGNATURE (Must be completed for all submittals. Certification and signature requirements are set forth in 35 Ill. Adm. Code 702.126. Any submittal involving engineering plans, specifications and calculations as defined in the Illinois Professional Engineering Practice Act (225 ILCS 325) and 68 Ill. Adm. Code 1380 must be signed and certified by an Illinois licensed professional engineer.)

All closure plans, post-closure plans and modifications must be signed by the person representing the owner/ operator designated below or by a duly authorized representative of that person:

1. If the owner/operator is a Corporation - By a principal executive officer of at least the level of vice-president.
2. If the owner/operator is a Partnership or Sole Proprietorship - By a general partner or the proprietor, respectively.
3. If the owner/operator is a Government - By either a principal executive officer or a ranking elected official.

A person is a duly authorized representative only if:

1. the authorization is made in writing by a person described above; and
2. is submitted with this application (a copy of a previously submitted authorization can be used).

CERTIFICATION STATEMENT - I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner Signature: ______________________________ Date: ____________

Title: ______________________________

Operator Signature: ______________________________ Date: ____________

Title: ______________________________

Engineer Signature: ______________________________ Date: ____________

Engineer Name: ______________________________

Address: ______________________________ Engineer Seal:

____

Phone: ______________________________

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IEPA RCRA CLOSURE PLAN GUIDANCE

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ATTACHMENT F

RCRA Interim Status Closure Certification Statement

RCRA Interim Status Closure Certification Statement

To meet the requirements of 35 Ill. Adm. Code 725.215, this statement is to be completed by a responsible officer of the owner/operator (as defined in 35 Ill. Adm. Code 702.126) and an independent licensed professional engineer upon completion of interim status closure of a hazardous waste management unit.

Facility Name: ____________________

Illinois EPA Identification Number: ____________________

USEPA Identification Number: ____________________

Illinois EPA Closure Log No.: ____________________

Name of Unit(s) Being Closed: ____________________

The hazardous waste management unit(s) identified above has/have been closed in accordance with the specifications in a plan approved with conditions and modifications by Illinois EPA. A report demonstrating closure was carried out in accordance with the approved plan is attached.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

____________________	__________	____________________
Signature of Owner/Operator Responsible Officer Responsible Officer	Date	Name and Title of Owner/Operator

____________________	__________	____________________
Signature of Licensed P.E.	Date	Name of Licensed P.E. and Ill. License No.

Mailing Address of P.E.:

____

____

____

Licensed P.E.'s Seal:

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IEPA RCRA CLOSURE PLAN GUIDANCE

July 2003

ATTACHMENT G

Guidance for Preparing Certain RCRA
Closure Documentation Reports

Attachment G
Guidance For Preparing
Certain RCRA Closure Documentation Reports

1.0 Introduction

Upon completion of required RCRA closure activities at a facility, the owner/operator and the overseeing independent licensed professional engineer must submit certification to the Illinois EPA that closure of the hazardous waste management unit(s) was/were carried out in accordance with the approved closure plan. A report must also be developed and submitted with the closure certification which: (1) documents the closure activities performed and (2) demonstrates the closure activities were carried out in accordance with the approved plan. This guidance document provides basic guidance in the preparation of such a closure documentation report for closures which do not include any groundwater investigation or remediation.

2.0 Recommended Contents of a Closure Documentation Report

A RCRA closure documentation report for a closure project which did not include any groundwater investigation or remediation should contain the information discussed in this section. The order the information is presented in this section is one possible way to format the report, however this format may be altered in order to more clearly develop a report which demonstrates that a unit has been closed in accordance with the approved plan. In general, a closure documentation report should be a stand-alone report which: (1) provides a concise and accurate description of the unit being closed; and (2) documents/demonstrates that the activities carried out to complete closure of the unit met the requirements of the approved plan.

2.1 Introduction to the Closure Documentation Report

A general discussion of the content and goals of the report should be provided in the introductory portion of the closure documentation report. The introduction should also discuss, in general, the facility of interest and the hazardous waste management unit(s) undergoing closure.

2.2 Facility/Closure Background

A brief summary of the location and operations of the facility should be provided in the report.
At a minimum this section should include:

1. The address of the facility and the township/range/section in which the facility is located.
2. A site location map.
3. A scaled drawing of the facility in which the location of all relevant structures are identified, including hazardous waste management units undergoing closure.
4. The name and EPA process code of each unit that has been closed.
5. A description of each unit being closed including:
    a. A detailed drawing of the unit and its spatial relationship to surrounding structures and associated equipment/units;
    b. The dimensions, capacity and construction materials of the unit;
    c. Dates of operation and how it was typically operated; and
    d. Photographs of the unit identifying the date the photograph was taken and the orientation of the photograph depicted on a scaled drawing.
6. A brief overview of the completed closure activities.
7. A chronological summary of various Illinois EPA actions on the closure plan for the unit(s) and closure plan modification requests.

2.3 Information Regarding Removal of Waste from the Unit

A description of the methods and procedures used to remove all residual wastes remaining in the unit at the time of closure plan approval should be provided, including:

1. Characterization of all wastes, including the waste name and principal components, referencing the appropriate EPA Hazardous Waste Codes for those wastes removed and transported off-site for treatment and/or disposal;
2. The total volume of each waste type removed from each unit;
3. The final destination and disposition (i.e., landfill, incinerator, treatment, etc.) of the waste;
4. Copies of the manifest for each shipment of waste. Any discrepancies between the volumes of hazardous waste remaining in the unit at the time of final approval (or final receipt) and volumes of hazardous wastes listed in the manifests should be discussed here.

2.4 Information Regarding the Procedures used to Decontaminate all Structures and Equipment

A description of the methods and procedures used to decontaminate all structures and equipment contaminated with hazardous wastes through waste management unit operations or closure activities should be provided, including:

1. A description of the structures and equipment which were decontaminated;
2. A description of the procedures and equipment used to decontaminate the structures and equipment identified in Item 1 above;
3. Identification of the volume of wastes generated through decontamination activities. The term "wastes" includes waste residues, decontamination wash and rinse waters, contaminated disposable equipment, etc.;
4. A description of the waste characterization of the wastes generated through decontamination activities, including the designated EPA Hazardous Waste Code; and
5. The methods and procedures of management of wastes generated through decontamination activities. The following items should be addressed:
    a. the final destination and disposition (i.e., landfill, treatment, incineration, etc.) of the waste; and
    b. copies of the waste manifests for each shipment of waste off-site.

2.5 Information Regarding any Required Integrity Evaluation

If an integrity evaluation is required, then information regarding this evaluation must be provided in the closure documentation report. At a minimum, the following should be provided:

1. A description of the procedures used to conduct the evaluation, including reference to the actual method used;
2. The results of the inspection,
3. Scaled drawings showing the location of all cracks and construction joints observed during the investigation,
4. Conclusions reached regarding cracks/construction joints observed,
5. Justification for the conclusions reached (e.g., information must be provided which indicates that any construction joints in the areas of concern are indeed watertight), and
6. Photographs to support the conclusions reached.

2.6 Establishment of Remediation Objectives

Sufficient information should be provided demonstrating that soil remediation objectives for the project were developed in accordance with 35 Ill. Adm. Code 742 (Tiered Approach to Corrective Action Objectives - TACO). This information should include:

1. An identification of the soil remediation objectives for the project and a demonstration that they meet the requirements of TACO;
2. All calculations and information in support of developing the ROs;

3. A detailed description of any required engineering barrier, including documentation that it has been properly installed and meets all the applicable TACO requirements;
4. Documentation that any required institutional controls are in place and meet all the requirements of TACO.

Additional guidance regarding the development of this portion of the closure documentation report can be found in the Illinois EPA document entitled TACO Requirements for Soil Remediation Objectives Associated with RCRA Remediation Projects.

2.7 Information Regarding All Sampling and Analysis Efforts

A description of the methods, procedures, and results of all soil sampling/analysis efforts should be provided in the closure documentation report, including the following information:

1. Identification of the reason for the sampling/analysis effort and the goals of the effort;
2. A summary in tabular form of all analytical data, including all quality assurance/quality control data;
3. The location from which all soil samples were collected including the sample depth interval with respect to ground surface;
4. A scaled drawing showing the location from which all soil samples were collected;
5. A description of the sampling procedures, sample preservation procedures and chain of custody procedures;
6. Identification of the analytical test method used and detection limits achieved, including sample preparation, sample dilution (if necessary) and analytical interferences;
7. Copies of the final laboratory report sheets, including final sheets reporting all quality assurance/quality control data and chain of custody reports;
8. A summary of all procedures used for quality assurance/quality control, including the results of these procedures; and
9. A discussion of the data as it is related to the overall goal of the sampling/analysis effort.

2.8 Information Regarding Soil Remediation Efforts

The closure documentation report should contain the following information regarding any soil remediation effort conducted as part of the RCRA closure process:

1. A description of any soil excavation removal effort conducted to comply with the requirements of the approved closure plan and closure standards, including
   a. A description of excavation/soil removal procedures including equipment used;
   b. A description and scaled drawings of the horizontal and vertical extent of the excavation;
   c. Identification of the volume of soil and other material removed;
   d. A description of how excavated material was managed, including sampling and analytical efforts to classify the material for disposal (specific references can be made to information related to waste management activities presented in accordance with Section 2.3 above).
   e. Soil sampling/analysis results demonstrating that the established remediation objectives were achieved during the effort.
   f. Photographs documenting excavation activities.
2. If the remediation effort included more than just soil removal/off-site disposal, then the following information should be provided regarding the effort:
   a. A description of the extent and distribution of the contamination remediated, prior to actually implementing the remedy (including scaled drawings);
   b. A detailed description of the remediation technique, including scaled drawings showing the layout of the system;

c. A detailed description of all equipment used;

d. A detailed description of the operation of the system;

e. Soil sampling/analysis results demonstrating that the established remediation objectives were achieved during the effort.

f. Photographs documenting the remedial efforts;

g. Documentation the effort was carried out in accordance with the approved plan.

2.9 Final Conclusions Regarding the Closure Activities

A summary and evaluation of the information provided in Sections 2.2 through 2.8 above should be presented. This summary/evaluation should identify how and why the information provided above sufficiently demonstrates that the unit was closed in accordance with the approved plan.

2.10 Closure Cost Expenditures

A summary of cost incurred for each of the tasks involved in the closure project and for the overall project should be provided within the closure documentation report.

2.11 Color Photo Documentation

Color photo documentation of closure activities performed should be included in the documentation report. Photos should depict all relevant closure activities in chronological order and indicate activities and conditions at the waste management unit(s) before, during and after closure activities had been completed.

2.12 Report Certification

The closure documentation report must be accompanied by a certification which is signed by both the owner/operator and by any independent Illinois licensed professional engineer. This certification must meet the certification requirements of 35 Ill. Adm. Code 702.126. This certification document must include (1) original signatures of the owner/operator and the overseeing independent licensed professional engineer; (2) date of signatures; and (3) stamp of the certifying engineer. A copy of an acceptable certification form is provided as Attachment G.

3.0 Closure Certification Report Submission

The original with all attachments and certifications and two copies of the closure documentation report with all certifications should be mailed to the following address:

Illinois Environmental Protection Agency
Division of Land Pollution Control
Permit Section
2520 West Iles Avenue
Post Office Box 19276
Springfield, Illinois 62794-9276

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