United States
Environmental Protection
Agency

Solid Waste and
Emergency Response
(5307W)

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Expires: 12/31/2001

Survey of Surface Impoundments

Surface Impoundment Design and Operating Information

C

Complete one copy for each in-scope surface impoundment.

If you have questions, call the RCRA, Superfund and EPCRA Hotline:

1-800-424-9346

FIELD(ID)

C. SURFACE IMPOUNDMENT DESIGN AND OPERATING INFORMATION

This section addresses your in-scope surface impoundments' wastewater operations, impoundment history, liner specifications, sludge handling process, and wastewater and in-place sludge characterization data. Indicate the surface impoundment identification (name or number from Section B, Question B2) below and in the upper right hand corner of every page.

Please complete a separate copy of this section for each of the in-scope surface impoundments that you identified in Question B2, Column 5. We have provided one copy of this section for the number of impoundments you indicated on the screening questionnaire. **If you need additional copies, please make copies now.**

Surface Impoundment Number _____ (please fill in number or letter from Section B, Question B2, here and on all subsequent pages in Section C for this impoundment.)

Impoundment History and Future Plans

For the purpose of this questionnaire, "wastewater" means a waste liquid that contains less than 5 percent solids, by weight, and that results from manufacturing, processing, or use of a raw material, intermediate product, finished product, by-product, or waste product, or that results from cleaning or washing activities. "Sludge" means any solid, semi-solid, or liquid waste containing 5 percent solids, by weight, or greater that is generated in the course of treating or managing wastewater.

C1. When did this surface impoundment begin receiving wastewater and/or sludge? F **Mark if CBI**

1 G	before 1900	4 G	1950-1959	7 G	1980-1989
2 G	1900-1939	5 G	1960-1969	8 G	1990-present
3 G	1940-1949	6 G	1970-1979		

C2a. Has this surface impoundment permanently ceased receiving wastes since June 1, 1990?

1G Yes — Continue to Question C2b. 2G No — Skip to Question C3.

3G Don't Know/Other (please explain): _____

_____ (Skip to Question C3.)

C2b. State the month and year this impoundment permanently ceased receiving wastes: F **Mark if CBI**

Month: _____ Year: _____

C2c. Do you still produce wastewater and/or sludge? F **Mark if CBI**

1G Yes — Continue to Question C2d. 2G No — Skip to Question C5.

C2d. How do you manage the wastewater and/or sludge currently being produced that you formerly managed in this impoundment? F **Mark if CBI**
(Check all that apply)

1G Place it in a new impoundment built on-site
2G Place it in a different, already-existing impoundment on-site
3G Place it in a new tank on-site
4G Place it in an existing tank on-site
5G Send it off-site
6G Discharge it directly to surface water
7G Other (please specify): _____

Skip to Question C5. You must complete Question C5 and the remaining Section C questions for your closed impoundment to the best of your knowledge.

C3. Do you plan to stop using this surface impoundment permanently in the next: F **Mark if CBI**

1G 0-4 years?
2G 5-9 years?
3G 10-14 years?
4G 15-19 years?
5G 20-29 years?
6G 30-49 years?
7G more than 50 years?
8G no current plans to close — Skip to Question C5.

C4a. After you close this impoundment, do you anticipate still producing wastewater and/or sludge? **F Mark if CBI**

1G Yes — Continue to Question C4b. 2G No — Skip to Question C5.

3G Don't Know — Skip to Question C5.

C4b. After you close this impoundment, what do you plan to do with the wastewater and/or sludge that you now manage in this impoundment?
(Check all that apply) **F Mark if CBI**

1G Place it in a new impoundment built on-site

2G Place it in a different, already-existing impoundment on-site

3G Place it in a new tank on-site

4G Place it in an existing tank on-site

5G Send it off-site

6G Discharge it directly to surface water

7G Other (please specify): _____

_____

For the remaining questions in Section C, "reference time period" means the time period from June 1, 1990 to the present, or (if this surface impoundment has permanently ceased receiving wastes) the period from June 1, 1990 to the date the impoundment permanently ceased receiving wastes.

Impoundment Waste Sources and Regulatory Status

C5. Review your facility's operations that have contributed wastewater and/or sludge to this surface impoundment (during the reference time period), and determine the operations that have contributed the largest flows to this impoundment during that time period. For the five operations with the largest flows, describe each operation's output (for example, intermediate product or finished product produced in that operation, or the intermediate or final service performed): **F Mark if CBI**

NOTE: If you have fewer than five separate operations that contributed wastewater and/or sludge flow to this surface impoundment, describe each operation's output and enter "NA" in the remaining blanks.

1. _____
2. _____
3. _____
4. _____
5. _____

C6. During the reference time period, has this surface impoundment received any "decharacterized" waste? *("Decharacterized" means that at the point where it was generated, the waste was identified as hazardous based solely on one or more of the four characteristics of hazardous waste: ignitability, corrosivity, reactivity, or toxicity, but before it was placed into this surface impoundment it ceased to exhibit any of those characteristics.)* **F Mark if CBI**

1G Yes 2G No

3G Don't Know (please explain): _____

_____

_____

_____

C7a. During the reference time period, has this surface impoundment received any waste that is specifically exempt or excluded from regulation under your state's implementation of the federal Resource Conservation and Recovery Act (for example, waste from the combustion of coal or fuel oil)? *You may refer to Appendix 3, a reference table listing possible federal exemptions and exclusions, in making your determination for this impoundment. Some states do not allow some of the exemptions and exclusions on this listing, so some of the listed exclusions or exemptions may not be available at your facility.* **F Mark if CBI**

1G Yes — Continue to Question C7b. 2G No — Skip to Question C8a.

3G Don't Know (please explain): _____

_____

_____

_____ (Skip to Question C8.)

C7b. Exemptions and Exclusions

Column 1: If you answered "Yes" to Question C7a, list below all exemptions and/or exclusions (that is, the citation number(s)) that apply to this impoundment or to the wastes that have been managed in it. Please list using the specific regulatory or statutory citation listed in the left hand column of Appendix 3.

Column 2: For each exemption or exclusion you listed in Column 1, and for the reference time period, please provide a rough estimate of the proportion of the influent flow that was excluded or exempt:

TABLE C7b: EXEMPTIONS AND EXCLUSIONS

1	2 Portion of influent flow exempted or excluded						
Exemption or Exclusion	**0-5%**	**6-25%**	**26-50%**	**51-75%**	**76-95%**	**96-100%**	**Mark if CBI**
1.							F
2.							F
3.							F
4.							F
5.							F
6.							F

C8a. Do you have a state or local permit for any wastewater and/or sludge management, groundwater protection activities, and/or air emissions associated with this surface impoundment? F **Mark if CBI**

1G Yes — Continue to Question C8b. 2G No — Skip to Question C9a.

3G Don't Know (please explain): _____

_____

_____ (Skip to Question C9a.)

C8b. If you answered "Yes" to Question C8a, provide the name of the state or local government agency that issued the permit(s), and the permit number(s) (if any): F **Mark if CBI**

Agency Name(s): _____

Permit Number(s): _____

C9a. Is this impoundment a solid waste management unit (SWMU) that was evaluated during a RCRA Facility Assessment (RFA), or that was mentioned in an RFA or similar report? F **Mark if CBI**

1G Yes — Continue to Question C9b. 2G No — Skip to Question C10.

3G Don't Know — Skip to Question C10.

C9b. If you answered "Yes" to Question C9a, what is the date (year) of the RFA report? F **Mark if CBI**

_____

C9c. If you answered "Yes" to Question C9a, was this surface impoundment a solid waste management unit (SWMU) that was evaluated during a RCRA Facility Investigation (RFI) or similar investigation? F **Mark if CBI**

1G Yes — Continue to Question C9d. 2G No — Skip to Question C10.

3G Don't Know — Skip to Question C10.

C9d. If you answered "Yes" to Question C9c, what is the date (year) of the RFI report? F **Mark if CBI**

_____

Impoundment Design and Operation

C10. Plan and Elevation Views for this Surface Impoundment

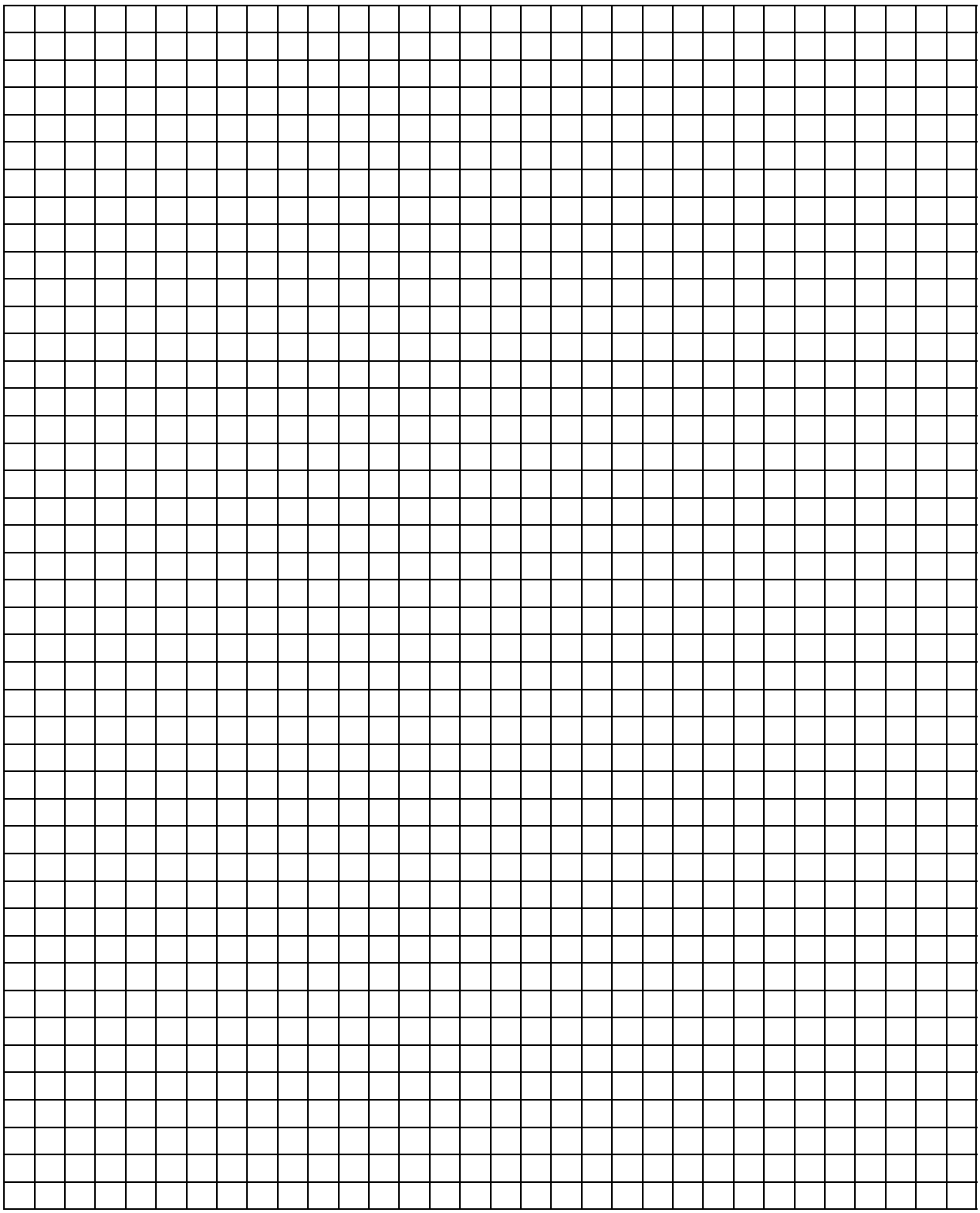
On the following pages (or as an attachment), please provide a plan (map) view and an evaluation (cross-sectional) view for this surface impoundment, to scale, and indicate the scale you used.

F Mark if CBI

In the plan view, indicate and label:

- *an arrow for orientation to the north;*
- *a line indicating the cross-section you used for the elevation view;*
- *the locations of all influent and effluent points for the surface impoundment, with sources and destinations of the water flow (for example, influent from pond 1 and pond 3, effluent to Deep River);*
- *the locations of major equipment (for example, covers, booms, pump stations, aerators);*
- *the locations of secondary containment structures (if any); and*
- *the locations of any monitoring wells that are within 500 feet of the impoundment's edge.*

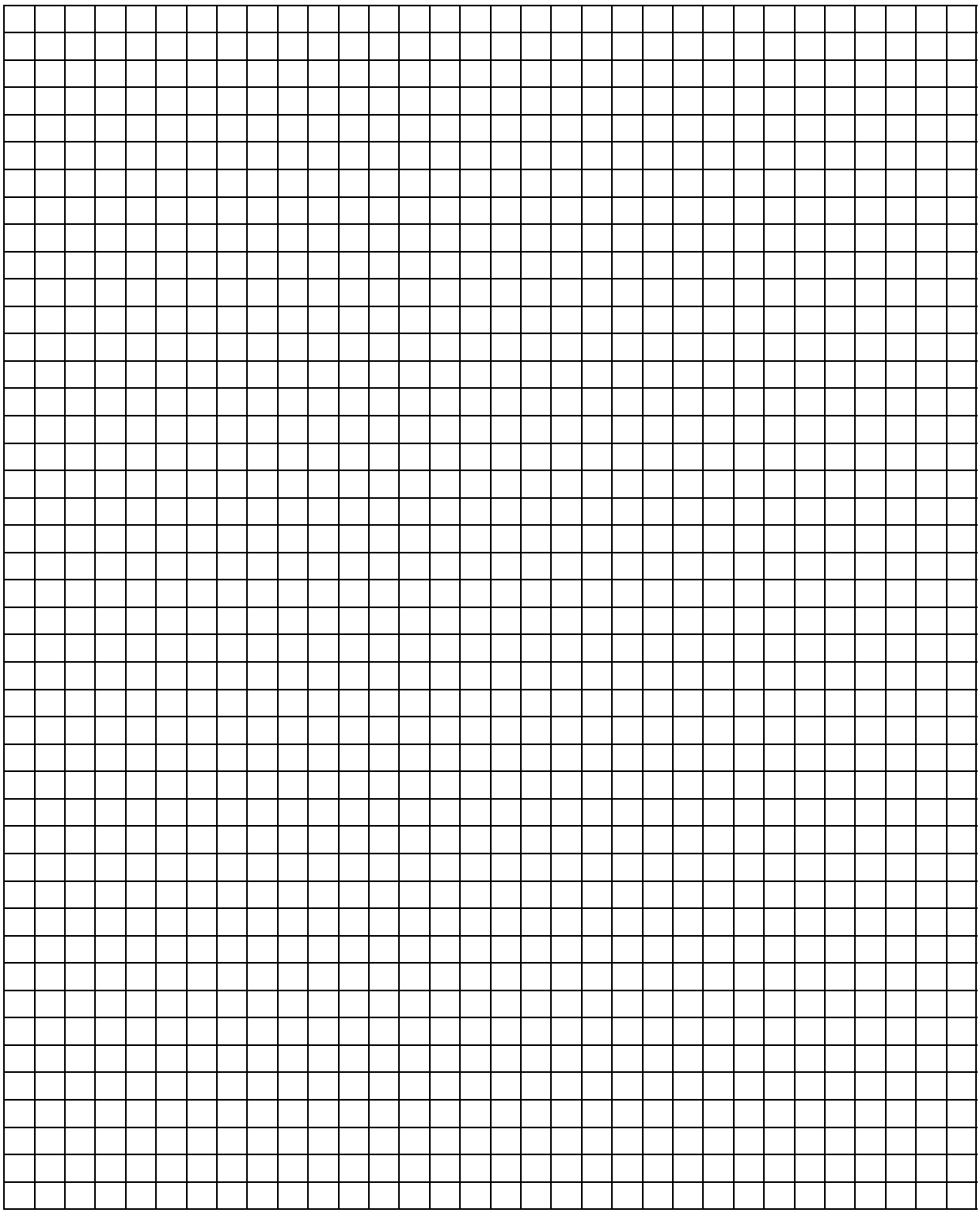
Plan View:



In drafting the elevation view, determine an appropriate cross-sectional place (for example, through the plane of the influent and effluent points). Indicate and label:

- *ground level (indicate elevation above mean sea level);*
- *the shape and height of any dikes or berms;*
- *secondary containment structures (if any);*
- *the average vertical distance of the water surface in the impoundment, relative to ground level, and a bracket to indicate the range of water surface vertical distances relative to ground level;*
- *a bracket to indicate the range of depth to groundwater;*
- *monitoring well(s) within 500 feet (if any), showing the screened interval. To conserve space on the diagram, you can depict the lengths of monitoring wells with a discontinuous line, as long as you indicate the vertical distance omitted by the discontinuity (that is, the break in the line); and*
- *leak detection and monitoring devices (if any), and their types.*

Elevation view:



Liner Characteristics

Refer to the elevation sketch you drew in Question C10. If this surface impoundment has a liner or liners, answer Questions C11 through C14. If this surface impoundment has no liners, skip to Question C15.

C11. Cross Section of Liner(s) F **Mark if CBI**

For the purpose of this questionnaire, "liner" means a continuous layer of natural or man-made materials, emplaced beneath and/or on the sides of a surface impoundment, that restricts the downward and/or lateral release of waste, waste constituents, or leachate from the surface impoundment. The liner does not include naturally occurring materials (such as a naturally occurring clay layer) that, although effective in controlling the release of leachate from the surface impoundment, were not emplaced intentionally for that purpose.

In the space below (or as an attachment), please provide a sketch of a cross section of the liner or liners for this surface impoundment. Please include the following on the sketch:

- *Each material or layer that has been placed to prevent, collect, or monitor releases from your surface impoundment. Remember that you already provided information on the characteristics of the soil, fill, and geologic materials beneath your impoundment in Table B9; do not include the same information here (for example, do not include a description of clay layers beneath your facility that, although effective in controlling releases from your impoundment, are naturally occurring or laterally extensive and thus have been described in Table B9).*
- *A general description of each liner material or layer (for example, compacted clay liner, high density polyethylene liner, gravel layer).*
- *A number to designate each material or layer that you sketched. Label the layer that is in contact with the wastewater and sludge/solids in the surface impoundment with the number "1." Number each layer below "1" sequentially. You will use these numbers in Question C12 to identify the physical properties of your liner materials.*

Cross Section:

C12. The table below asks for information on the composition of each layer or material that comprises your liner. Please fill out this table, starting with the liner material or layer that you designated "1" in Question C11. **F Mark if CBI**

Column 1: Please number the layer, starting with the layer or material that you designated "1" in Question C11, that is, the layer or material that is in contact with the wastewater and sludge/solids in the surface impoundment

Column 2: Provide a general description of the composition of the layer (for example, compacted clay, geotextile membrane, gravel).

Column 3: What is the thickness of the layer? (specify units)

Column 4: What is the hydraulic conductivity of the layer (specify units)?

TABLE C12: SURFACE IMPOUNDMENT LINER DATA

1	2	3		4		
		Layer Thickness		Hydraulic Conductivity		
Layer Number	General Description of Layer Material	value	units	value	units	Mark if CBI
1						F
2						F
3						F
4						F
5						F
6						F
7						F
8						F

C13. In what year did you install the existing liner (or, if one or more liners were installed on top of each other, in what year was each layer installed)? **F Mark if CBI**

(Enter year)

_____

_____

_____

C14a. Have any liner failures occurred during the life of the existing liner? F **Mark if CBI**

For the purpose of this questionnaire, a liner failure means the development of one or more physical disruptions in the liner's continuity (for example, cracks or tears), the presence of leachate underneath the liner, or the measured loss of contents through mass balance calculations.

1G Yes — Continue to Question C14b. 2G No — Skip to Question C14d.

3G Don't Know — Skip to Question C14d.

C14b. If you answered "Yes" to Question C14a, how was the liner failure detected? F **Mark if CBI**

(Check all that apply)

1G leak detection system (other than groundwater monitoring)

2G unusual seep

3G groundwater monitoring

4G Other (please describe): _____

_____

C14c. If you answered "Yes" to Question C14a, list each liner failure event that you are aware of since the existing liner was installed.

F **Mark If CBI**

Column 1: Provide your estimate of the month and year the liner failure event began.

Column 2: Provide the month and year the liner failure was discovered.

Column 3: Indicate the month and year the liner failure was resolved (that is, the liner's physical continuity was restored).

If you cannot specify calendar dates, please provide your best estimate of the year of occurrence.

TABLE C14c: LINER FAILURE EVENTS

1 Date Failure Began	2 Date Discovered	3 Date Resolved

C15. Water Quality Characteristics

*Please complete the table on page **C-16** with sampling and analysis data collected in the latest three complete calendar years this impoundment was in use. If you do not have sampling and analysis data, but can estimate values for the requested information, please provide estimates instead. For the purpose of this questionnaire, "influent" means the wastewater flow entering the surface impoundment. "Effluent" means the wastewater flow exiting the surface impoundment via an engineered structure that may be either a pipe or a channel, or the physical removal of sludge.*

You MUST complete all spaces in this table. If you did not measure a listed parameter at a particular sampling point and cannot provide an estimate, enter "DK" in the space provided for that parameter. If you did not measure any of the listed parameters at a particular sampling point and cannot provide any estimates, enter "DK" in the first space listed and draw a vertical line down through the remaining spaces.

Instructions for completing Table C15:

Column 1: *If you measured one or more of the listed parameters in the impoundment's influent, report the measured value(s) here. Report the mean value(s) if you measured two or more samples. Specify the units of each measured value.*

In the event this impoundment had more than one influent point, please report a weighted average value (based on flow), that reflects waste input via each influent point.

Column 2: *If you measured one or more of the listed parameters for the wastewater within this surface impoundment, report the measured value(s) here (report the mean value(s) if you measured two or more samples). Specify the units of the measured value(s).*

Column 3: *If you measured one or more of the listed parameters in the impoundment's effluent, report the measured value(s) here (report the mean value(s) if you measured two or more samples). Specify the units of the measured value(s).*

If there is no effluent from this impoundment, enter "NA" in the first space listed and draw a vertical line down through the remaining spaces.

In the event this impoundment had more than one effluent point, please report a weighted average value that reflects all effluent streams.

Column 4: *If you measured one or more of the listed parameters for the sludge within this surface impoundment, report the measured value(s) here (report the mean value(s) if you measured two or more samples). Specify the units of the measured value(s).*

If there is no sludge within this impoundment, enter "NA" in the first space listed and draw a vertical line down through the remaining spaces.

For explanations of acronyms, definitions of technical terms, and unit dimensions associated with these parameters, see the following page.

TABLE C15: WATER QUALITY CHARACTERISTICS									
	1 Impoundment Influent		2 Wastewater within Impoundment		3 Impoundment Effluent		4 Sludge within Impoundment		Mark if CBI
Parameter	Value	Units	Value	Units	Value	Units	Value	Units	
Temperature									F
pH									F
Oil and grease									F
Density									F
Viscosity									F
BOD (biochemical oxygen demand)									F
COD (chemical oxygen demand)									F
TOC (total organic carbon)									F
TOD (total oxygen demand)									F
Total solids									F
Total suspended solids									F
Cell yield coefficient									F
Biomass concentration									F
MLSS (mixed liquor suspended solids)									F
MLVSS (mixed liquor volatile suspended solids)									F

Definitions/unit dimensions/abbreviations:

pH:	the negative logarithm of the hydrogen ion concentration (unitless).
Density:	the mass of wastewater and/or sludge per unit volume (units: mass/volume).
Viscosity:	the measure of the wastewater's and/or sludge's's resistance to flow when acted upon by an external force (units: (force x time)/(length x length)).
BOD (biochemical oxygen demand):	a measure of the biodegradable organic content of the waste. Biochemical oxygen demand means the amount of oxygen used for respiration during the aerobic metabolism of an energy source by acclimated microorganisms (units: mass/volume).
COD (chemical oxygen demand):	a measure of the total organic content of the waste, both degradable and refractory. Chemical oxygen demand means the amount of oxygen required for maximum oxidation of the organic matter in a sample of the waste (units: mass/volume).
TOC (total organic carbon):	the amount of carbon in the organic matter in a sample (units: mass/volume).
TOD (total oxygen demand):	the amount of oxygen required to oxidize both the organic and inorganic matter in a sample under specific conditions (units: mass/volume).
Total solids:	the sum of dissolved (filterable) and suspended (nonfilterable) solids (units: mass/volume).
Total suspended solids:	the portion of a waste sample that does not pass through a glass fiber filter (units: mass/volume).
Cell yield coefficient:	mass of cells produced per unit of substrate removed (units: mass/mass).
Biomass concentration:	Biomass is a heterogeneous microbial population, such as an activated sludge. Biomass concentration is the dry weight of biomass per unit volume of reaction fluid (units: mass/volume).
MLSS (mixed liquor suspended solids):	the suspended (nonfilterable) solids concentration in the mixture of wastewater and suspended culture that is used in activated sludge processes (units: mass/volume).
MLVSS (mixed liquor volatile suspended solids):	the volatile suspended (nonfilterable) solids concentration in the mixture of wastewater and suspended culture that is used in activated sludge processes (units: mass/volume).

C16. Operating Quantities

For the purpose of this questionnaire, "wastewater" means liquid or semi-solid waste with less than 5 percent solids, by weight. "Sludge" means any solid, semi-solid, or liquid waste containing 5 percent solids, by weight, or greater that is generated in the course of treating or managing wastewater.

Instructions for completing Table C16:

The term "quantity" refers to the units of volume (for example, gallons), mass (for example, metric tons), or flow rate (for example, gallons per minute) that you use to measure the amount of wastewater and sludge within your impoundment, entering your impoundment, and exiting your impoundment. If you recirculate sludge into this impoundment, report the recirculated quantities in Column 2, Rows 3 through 5. If you periodically remove sludge from this impoundment, either manually or mechanically, report the removed quantities in Column 2, Rows 6 through 8.

Column 1: *Use this column to enter quantities and units for wastewater.*

Column 2: *Use this column to enter quantities and units for sludges.*

Row 1: *Typical operating storage quantity. Enter the quantity of wastewater (Column 1) and sludge (Column 2) held in this surface impoundment at a given point in time when you operate(d) it under typical conditions. You may specify a range of quantities that reflect "typical" conditions.*

Row 2: *Maximum operating storage quantity. Enter the quantity of wastewater (Column 1) and sludge (Column 2) that you could hold in this surface impoundment at a given point in time under the conditions that no overflow and no overtopping occur, although effluent may be discharged through the engineered effluent structure.*

Row 3: *Average daily influent quantity. Enter the mean daily quantity of wastewater (Column 1) and sludge (Column 2) placed into this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

Row 4: *Maximum daily influent quantity. Enter the maximum daily quantity of wastewater (Column 1) and sludge (Column 2) placed into this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

Row 5: *Minimum daily influent quantity. Enter the minimum daily quantity of wastewater (Column 1) and sludge (Column 2) placed into this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

Row 6: *Average daily effluent quantity. Enter the mean daily quantity of wastewater (Column 1) and sludge (Column 2) exiting this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

Row 7: *Maximum daily effluent quantity. Enter the maximum daily quantity of wastewater (Column 1) and sludge (Column 2) exiting this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

Row 8: *Minimum daily effluent quantity. Enter the minimum daily quantity of wastewater (Column 1) and sludge (Column 2) exiting this surface impoundment during the latest three complete calendar years it was in use. If you do not record daily quantities, use monthly quantities and divide by 30 or annual quantities and divide by 365.*

TABLE C16: OPERATING QUANTITIES

	1 Wastewater (with <5%$_{wt}$ solids)		2 Sludge (with ≥5%$_{wt}$ solids)		Mark if CBI
	Value	**Units**	**Value**	**Units**	
1. Typical operating quantity					F
2. Maximum operating quantity					F
3. Average influent quantity					F
4. Maximum influent quantity					F
5. Minimum influent quantity					F
6. Average effluent quantity					F
7. Maximum effluent quantity					F
8. Minimum effluent quantity					F

C17. What is the surface area of this impoundment under typical operating conditions (that is, surface area when fluid level is at the average level)? **F Mark if CBI**

_____ (units: _____)

C18. What function(s) does this surface impoundment perform? **F Mark if CBI**

Please note the following definitions:

***Disposal** means discharge, deposit, injection, or placing of a waste into or on any land or water so that the waste or its constituents may enter the environment, be emitted into the air or discharged into any waters, including groundwaters.*

***Storage** means the containment of waste, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal.*

***Treatment** means any method, technique, or process (including neutralization), designed to change the physical, chemical, or biological character or composition of the waste.*

(Check all that apply)

1G Storage prior to treatment
2G Storage after treatment
3G Storage (no treatment occurs in the waste-water's and/or sludge's management system)
4G Treatment
5G Disposal through seepage or infiltration (into the ground)
6G Disposal through evaporation
7G Other (please explain): _____

C19a. Which of the following model types best represents this impoundment's operation:

1G A plug flow reactor (a reactor in which the contents experience little or no mixing as they flow from influent to effluent) — Skip to Question C20
2G A continuous-flow stirred-tank reactor or complete-mix reactor (instantaneous dispersion throughout reactor volume)
3G Other (please describe): _____
4G Don't Know — Skip to Question C20.

C19b. Provide the number of mixers, delivered power, impeller diameter, and impeller speed:

For any values that you do not have available, enter "DK"

Number of mixers: _____
Average delivered power per mixer: _____ (units: _____)
Average mixer impeller diameter: _____ (units: _____)
Average mixer impeller speed: _____ (units: _____)

C20. If you answered "Treatment" as one of the functions in Question C18, which of the following treatment processes/unit operations occur in this impoundment? **F Mark if CBI**

(Check all that apply)

1 G Aeration (wastewater is exposed to air or air is introduced)
— Skip to Question C21a

2 G Flocculation (rapid mixing of coagulant chemicals followed by gentle agitation)

3 G Sedimentation (particle settling)

4 G Filtration (for example, filter bed of granular media)

5 G Coagulation (using chemicals to remove suspended matter)

6 G Disinfection (using chemicals to destroy pathogens)

7 G Precipitation (using chemicals to form insoluble precipitates)

8 G Ion exchange (ion exchange bed or column)

9 G Adsorption (bed or column of adsorbent material)

10 G Chemical oxidation (chemical reaction to increase oxidation state of contaminants)

11 G Nitrification (ammonia nitrogen converted to nitrite and nitrate)

12 G Denitrification (nitrite and nitrate converted to gaseous nitrogen)

13 G Carbonaceous biochemical oxygen demand (CBOD) removal

14 G Anaerobic biological treatment process

15 G Aerobic biological treatment process

16 G Facultative treatment process

17 G pH adjustment

18 G Temperature adjustment

19 G Other (please explain): _____

C21a. If you answered "aeration" in Question C20, indicate the type of aeration that occurs in this surface impoundment: F **Mark if CBI**

(Check all that apply)

Mechanical:

1 G Low-speed surface

2 G Low-speed with draft tube

3 G High-speed floating

4 G Rotor brush

(Answer Question C21b)

Diffused-air:

5 G Fine bubble porous diffuser

6 G Medium bubble porous diffuser

7 G Coarse bubble porous diffuser

8 G Static tube

9 G Jet

(Answer Questions C21c and C21d)

Waterfall:

10 G Spray

11 G Cascade

12 G Tray

Other:

13 G Turbine-sparger — Answer Question C21b

14 G (please specify): _____

C21b. If your answer to Question C21a included any aerator types in the "Mechanical" category, or "Turbine-sparger," provide the following information: F **Mark if CBI**

For any values that you do not have available, enter "DK."

Number of aerators: _____

Average delivered power per aerator: _____ (units: _____)

Average impeller diameter: _____ (units: _____)

Average impeller rotational speed: _____ (units: _____)

Oxygen saturation coefficient (β, or ratio of saturation concentration in waste to saturation concentration in water): _____

Oxygen transfer correction factor (α, or ratio of mass transfer coefficient of wastewater to mass transfer coefficient of tap water): _____

C21c. If your answer to Question C21a included any aerator types in the "Diffused-air" category, is the liquid surface quiescent or turbulent? **F Mark if CBI**

1G Quiescent 2G Turbulent 3G Don't Know

C21d. If your answer to Question C21a included any aerator types in the "Diffused-air" category, what is the diffused air rate, expressed as air (or oxygen) volume per unit time per volume of wastewater? **F Mark if CBI**

_____ air (units:_____/_____)/_____ wastewater (units:_____)
volume time volume

_____ oxygen (units:_____/_____)/_____ wastewater (units:_____)
volume time volume

Chemical Constituent Concentrations and Mass Quantities

The purpose of this section is to collect information on:

- Question C22: the type of sampling performed at this surface impoundment
- Question C23: the quantities of chemical constituents present in this surface impoundment
- Question C24: the quantities of chemical constituents present in this surface impoundment's influent and effluent, and constituents lost from this surface impoundment through leaching, volatilization, and treatment.

EPA requests information only for the chemical constituents in Appendix 2 - "List of Chemical Constituents of Interest."

*We realize that you may have information on constituent concentrations or mass only at certain points in your wastewater treatment system (and not other points). Questions C24 and C25 are formatted so that you can provide the information that you already have available, for those points in your wastewater treatment system that you have already sampled or for which you have estimated constituent concentrations or mass. You are **NOT** required to perform additional sampling or estimations, although EPA encourages you to perform sampling or estimations if the requested data are not available.*

If you have more than one sampling and analytical data point for a chemical constituent, please report one data point per row.

If it is easier to provide copies of existing sampling and analysis reports or summaries than to supply the information in the format we have requested here, then you may supply a copy of those reports or summaries instead.

Finally, you may know of reasons for variability in the data you report for your surface impoundment (for example, relating to production cycles, seasonal or climatic influences, or equipment cleaning). Please explain the reasons for variability along with your hard copy responses, or in a text format with your electronic responses.

C22. Surface Impoundment Sampling and Analysis

The tables on the following pages request information on the surface impoundment sampling and analysis performed at your facility. Please use these tables to describe the sampling and analysis conducted at this surface impoundment in the latest three complete calendar years it was in use. You are not required to conduct new sampling and analysis to answer this question.

Please complete a separate table for each of the following points at which you have performed sampling or estimations:

- *impoundment influent (Table C22a)*
- *wastewater within the impoundment (Table C22b)*
- *sludge within the impoundment (Table C22c)*
- *impoundment effluent (Table C22d)*
- *air above impoundment (Table C22e)*
- *leachate collected from the impoundment (Table C22f).*

If you have not performed any sampling or estimations at a particular point, enter "DK" in the space provided at the top of that table.

Instructions for completing Tables C22a – C22f:

Column 1: *List the chemical constituents from Appendix 2 that you have analyzed. If you analyzed for a group of constituents using a single analytical method (for example, volatile organics by Method 8240), you do not need to list each specific constituent in Column 1; instead, enter the appropriate group name, such as "volatile organics."*

Column 2: *Indicate the number of times per year you collected and analyzed samples for the constituent or group of constituents in Column 1. You can average the number of samples across the number of calendar years for which you are reporting results. Please count a composite sample as <u>one sample</u> and a sample/duplicate-sample pair as <u>one sample</u> as well.*

Column 3: *Identify the analytical method (for example, EPA method number, other standard method numbers, or analytical techniques) used to analyze the samples.*

TABLE C22a: IMPOUNDMENT INFLUENT			
If you did not sample this impoundment's influent, enter "DK" here_____ and go to Table C22b.			
1 **Constituent or group of constituents**	**2** **Number of samples per year**	**3** **Analytical method number or technique**	**Mark if CBI**
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F

TABLE C22b: WASTEWATER WITHIN IMPOUNDMENT	
	Mark if CBI

If there is/has been no wastewater within this impoundment, write "NA" here _____ and go to Table C22c. **If there is/has been wastewater within this impoundment but you did not sample the wastewater, enter "DK" here _____ and go to Table C22c.**			
1 **Constituent or group of constituents**	**2** **Number of samples per year**	**3** **Analytical method number or technique**	
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F

TABLE C22c: SLUDGE WITHIN IMPOUNDMENT			
If there is no sludge in this impoundment, write "NA" here _____ and go to Table C22d. **If there is sludge within this impoundment but you did not sample the sludge, enter "DK" here _____ and go to Table C22d.**			
1 **Constituent or group of constituents**	**2** **Number of samples per year**	**3** **Analytical method number of technique**	**Mark if CBI**
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F

TABLE C22d: IMPOUNDMENT EFFLUENT

If there is/has been no effluent from this impoundment, write "NA" here _____ and go to Table C22e.

If there is/has been effluent from this impoundment, but you did not sample the effluent from this impoundment, enter "DK" here _____ and go to Table C22e.

1 Constituent or group of constituents	2 Number of samples per year	3 Analytical method number or technique	Mark if CBI
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F

TABLE C22e: AIR ABOVE IMPOUNDMENT			
If you did not sample the air above this impoundment, enter "DK" here _____ and go to Table C22f.			
1 **Constituent or group of constituents**	**2** **Number of samples per year**	**3** **Analytical method number or technique**	**Mark if CBI**
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F

TABLE C22f: LEACHATE FROM IMPOUNDMENT			
If you have never observed/detected leachate from this impoundment, write "NA" here _____ and go to Question C23. **If you did not sample leachate from this impoundment, enter "DK" here _____ and go to Question C23.**			
1 **Constituent or group of constituents**	**2** **Number of samples per year**	**3** **Analytical method number or technique**	**Mark if CBI**
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F
			F

C23. Chemical Constituent Concentration or Mass Data — Impoundment Contents

This question requests information on the Appendix 2 chemical constituents' concentrations or mass while they are within this surface impoundment.

This question is set up as two tables: Table C23a for "wastewater within impoundment," and Table C23b for "sludge within impoundment." Note the definitions of wastewater and sludge in the Appendix 4 glossary.

You are not required to perform any new sampling/analysis, or any new estimates of mass loadings to answer this question. However, if no sampling data are available, EPA will be able to estimate risks better if you provide estimates of concentrations or mass loadings. Complete the tables with information you have available from the latest three complete calendar years this surface impoundment was in use. If you require additional space, photocopy the page(s) you need before making entries.

To save you time and effort in preparing your response, EPA has pre-loaded the tables below with chemical constituents that may be present in this surface impoundment. For pre-loaded constituent(s) that are not present in this surface impoundment, strike through the pre-loaded constituent name(s). If there are constituents present in this surface impoundment that are not pre-loaded onto the tables, add the names of those constituents to the tables and provide your available data for those constituents.

Instructions for completing Tables C23a and C23b:

Column 1: *Enter the name of each chemical constituent listed in Appendix 2 that you believe was present in this surface impoundment during the latest three complete calendar years this surface impoundment was in use.*

Column 2: *Place a "**/**" in this column if you know that this chemical was present in this surface impoundment during the latest three complete calendar years this surface impoundment was in use, but you do not know the chemical constituent's quantity.*

Column 3: *Enter the date that samples were collected for analysis of the constituent, or the averaging period that an estimate represents. If you have more than one sample result for a given constituent, average those results over the three complete calendar year period.*

Column 4:

- *Enter the concentration of the chemical constituent, if your information is expressed as concentration, or enter the mass of the chemical constituent, if your information is expressed as mass.*
- *Indicate the units in the subcolumn headed "units."*
- *If the entry is an estimate rather than analytical laboratory results, annotate the entry with an "E".*
- *If the entry is based on analytical laboratory results and measured flow data, rather than an estimate, annotate the entry with an "M."*
- *For metals:*
  - *Indicate if the results represent total metals concentrations or mass (unfiltered samples) by annotating the entry with a "T."*
  - *Indicate if the results represent dissolved metals concentrations or mass (filtered samples) by annotating the entry with a "D."*

Table C23a: Wastewater within impoundment

If you have more entries than are shown on this page, stop now to copy the necessary number of pages.

TABLE C23a: WASTEWATER WITHIN IMPOUNDMENT					
1	2	3	4		
Constituent Name	Place a "√" if Present, but Quantity Unknown	Sampling Date or Averaging Period	Chemical Concentration OR Mass		Mark if CBI
			Value	Units	
FIELD(CHEMICAL CONSTITUENTS)					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F

Table C23b: Sludge within impoundment

If there is no sludge within this impoundment, write "NA" here _____ and continue to Question C24.

If you have more entries than are shown on this page, stop now to copy the necessary number of pages.

TABLE C23b: SLUDGE WITHIN IMPOUNDMENT					
1	2	3	4		
	Place a "√" if Present, but Quantity Unknown	Sampling Date or Averaging Period	Chemical Concentration OR Mass		
Constituent Name			Value	Units	Mark if CBI
FIELD(CHEMICAL CONSTITUENTS)					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F

C24. Chemical constituent concentration or mass per unit time data

The tables on the following pages request the concentrations **OR** mass per unit time of the chemical constituents listed in Appendix 2, at the following points:

- wastewater influent (Table C24a)
- sludge influent (Table C24b)
- wastewater effluent (Table C24c)
- sludge effluent (Table C24d)
- air above the impoundment (Table C24e), and
- leachate from the impoundment (Table C24f).

To save you time and effort in preparing your response, EPA has pre-loaded the tables below with chemical constituents that may be present in the surface impoundment wastewater influent or surface impoundment wastewater effluent.

- *If we pre-loaded the names of constituent(s) that are not present at one or more of the points listed above, strike through the pre-loaded constituent name(s).*
- *If there are constituents present at one or more of the points listed above that are not pre-loaded onto the tables, add the names of those constituents to the tables and provide your available data for those constituents.*
- *If you require additional space, photocopy the page(s) you need before making entries.*

You are not required to perform any new sampling/analysis, or any new estimates of mass loadings to answer this question. However, if no sampling data are available, EPA will be able to estimate risks better if you provide estimates of concentrations or mass loadings. If you do not provide estimates of concentrations or mass loadings, EPA will use available public information to make assumptions about typical concentrations or mass loadings.

Instructions for completing Tables C24a – C24f:

Column 1: *Enter the name of the chemical constituent from Appendix 2 that you believe was present in this impoundment's influent wastewater, sludge influent, this impoundment's effluent (either wastewater or sludge), air emissions, or leachate, during the latest three complete calendar years this surface impoundment was in use.*

Column 2: *Place a "**/**" in this column if you know this chemical constituent is (or has been) present in this surface impoundment during the latest three complete calendar years this surface impoundment was in use, but you do not know its quantity. If you place a "**/**" in this column, you do not need to complete Columns 3 through 6.*

Column 3: *Enter the date that samples were collected for analysis of the constituent, or the averaging period that an estimate represents. If you have more than one sample result for a given constituent, average those results over the three complete calendar year period.*

Column 4:
- *Enter the concentration of the chemical constituent, if your information is expressed as concentration.*
- *Indicate the units in the subcolumn headed "units."*
- *If the entry is an estimate, rather than analytical laboratory results, annotate the entry with an "E."*
- *For metals:*
  - *Indicate if the results represent total metals concentrations (unfiltered samples) by annotating the entry with a "T."*
  - *Indicate if the results represent dissolved metals concentrations (filtered samples) by annotating the entry with a "D."*

Column 5:
- *Enter the mass per unit time of the chemical constituent, if your information is expressed as mass flux.*
- *Indicate the units in the subcolumn headed "units."*
- *If the entry is based on analytical laboratory results and measured flow data, rather than an estimate, annotate the entry with an "M."*
- *For metals:*
  - *For mass results that are based on sampling, indicate if the results represent total metals (unfiltered samples) by annotating the entry with a "T."*
  - *Indicate if the results represent dissolved metals (filtered samples) by annotating the entry with a "D."*

Note: You should fill out either Column 4 OR Column 5 for each chemical constituent, but not both columns.

Table C24a: Wastewater influent

If this impoundment has more than one influent point, please photocopy this table and complete it for each influent point. State the average flow rate (with units) at this influent point here:_____ (units:_____)

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C24a: WASTEWATER INFLUENT							
1	2	3	4		5		
			Chemical Concentration		Mass per Unit Time		
Constituent Name	Place a "√" if Present, but Quantity Unknown	Sampling Date or Averaging Period	Value	Units	Value	Units	Mark if CBI
FIELD(CHEMICAL CONSTITUENTS)							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F

Table C24b: Sludge influent

If you do not place sludge into this impoundment and solids do not settle from the wastewater and accumulate as sludge, write "NA" here _____ and continue to Table C24c.

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C24b: SLUDGE INFLUENT

1	2	3	4		5		
			Chemical Concentration		Mass per Unit Time		
Constituent Name	Place a "√" if Present, but Quantity Unknown	Sampling Date or Averaging Period	Value	Units	Value	Units	Mark if CBI
FIELD(CHEMICAL CONSTITUENTS)							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F

Table C24c: Wastewater effluent

If you do not have any wastewater effluent from this impoundment, write "NA" here _____, and continue to Table C24d.

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C24c: WASTEWATER EFFLUENT							
1	2	3	4		5		
			Chemical Concentration		Mass per Unit Time		
Constituent Name	Place a "√" if Present, but Quantity Unknown	Sampling Date or Averaging Period	Value	Units	Value	Units	Mark if CBI
FIELD(CHEMICAL CONSTITUENTS)							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F

Table C24d: Sludge influent

If you do not remove sludge from this impoundment, write "NA" here _____, and continue to Table C24e.

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C24d: SLUDGE INFLUENT							
1	2	3	4		5		
			Chemical Concentration		Mass per Unit Time		
Constituent Name	Place a "√" if Present, but Quantity Unknown	Sampling Date or Averaging Period	Value	Units	Value	Units	Mark if CBI
FIELD(CHEMICAL CONSTITUENTS)							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F

Table C24e: Air above this impoundment

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C24e: AIR ABOVE THIS IMPOUNDMENT							
1	2	3	4		5		
			Chemical Concentration		Mass per Unit Time		
Constituent Name	Place a "√" if Present, but Quantity Unknown	Sampling Date or Averaging Period	Value	Units	Value	Units	Mark if CBI
FIELD(CHEMICAL CONSTITUENTS)							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F

Table C24f: Leachate from this impoundment

If you are reporting more than 12 chemical constituents, stop now to copy the necessary number of pages.

TABLE C24f: LEACHATE FROM THIS IMPOUNDMENT							
1	2	3	4		5		
			Chemical Concentration		Mass per Unit Time		
Constituent Name	Place a "√" if Present, but Quantity Unknown	Sampling Date or Averaging Period	Value	Units	Value	Units	Mark if CBI
FIELD(CHEMICAL CONSTITUENTS)							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F
							F

C25. Please list the overtopping events (level of wastewater in this impoundment rose above the lowest point on the dike) and dike or berm failures that have occurred since the impoundment was put into service, the date(s) each event occurred, the cause(s) (if known), and your best estimate of the amount of waste released.

TABLE C25: OVERTOPPING EVENTS					
Event Type (overtopping/dike/berm failure)	Date(s)	Cause(s)	Amount of Waste Released		Mark if CBI
			Value	Units	
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F
					F

C26a. Review your Question C10 plan and elevation views of this surface impoundment. If monitoring wells are present, are the wells intended to detect a release of waste from this surface impoundment to groundwater? **F Mark if CBI**

1G Yes
3G Don't Know
2G No
4G No monitoring wells present

C26b. Have you detected a release of chemicals listed in Appendix 2 from this impoundment? **F Mark if CBI**

1G Yes — Continue to Question C26c.
2G No — Skip to Question C27.
3G Don't Know — Skip to Question C27.

C26c. If you answered "Yes" to Question C26b, did the magnitude of the release: *(Check all that apply)*

1G prompt a notification to your state environmental agency?
2G prompt assessment monitoring to determine the nature and extent of contamination?
3G prompt another action that is required under state law?

If you answered "Yes" to Question C2a, go to Question C27a. If you answered "No" or "Don't Know" to Question C2a, you have completed Section C for this surface impoundment. Please complete an additional copy of Section C for any other in-scope impoundments at this facility.

Closure Information and Description of the Impoundment Cap

C27a. Please describe the closure practices for this surface impoundment, using the table below:

Instructions for completing Table C27a:

Column 1: *Indicate (/) if this action took place.*

Column 2: *If you checked Column 1, indicate the date or time period over which the action took place (for example, month/year to month/year).*

Column 3: *Indicate (/) if this action did not take place.*

Column 4: *Indicate (/) if you don't know if the action took place.*

Row 1: *After this impoundment permanently ceased receiving waste, was it drained of liquids?*

Row 2: *After this impoundment permanently ceased receiving waste, were sludges removed?*

Row 3: *After this impoundment permanently ceased receiving waste, was any fill material placed in it?*

Row 4: *After this impoundment permanently ceased receiving waste, was any cover material placed on it?*

TABLE C27a: CLOSURE PRACTICES

	1 Yes	2 Date or Time Period	3 No	4 Don't Know	Mark if CBI
1. Wastewater removed?					F
2. Sludges removed?					F
3. Fill material placed?					F
4. Cover placed?					F

- If you answered "No" or "Don't Know" in both Row 3 and Row 4 in Table C27a, **you have completed Section C for this impoundment**. If you have not completed Section C for all of your in-scope surface impoundments, please complete an additional copy of Section C for any other in-scope impoundments.
- If you answered "Yes" in Row 3 in Table C27a, please answer Question C27b.
- If you answered "Yes" in Row 4 in Table C27a, please answer Questions C27b through C27e. (Note: You already may have responded to Question C27b if you answered "Yes" in Row 3 in Table C27a).

If you answered "No" to Question 4 in Table C27a, **you have completed Section C for this impoundment**. If you have not completed Section C for all of your in-scope surface impoundments, please complete an additional copy of Section C for any other in-scope impoundments.

C27b. If you answered "Yes" to Row 4 of Table C27a, please complete the following table for each distinct layer in the cover of your impoundment. If you do not know the requested information, enter "DK."

Column 1: Please number the cover layer, starting with the topmost layer.

Column 2: Please provide a brief description of the layer (for example, asphalt, sand, silt, clay, sandy-silt, etc.)

Column 3: What is the thickness of the cover layer? (specify units)

Column 4: What is the hydraulic conductivity of the cover layer? (specify units)

Column 5: What is the porosity (saturated water content) of the cover layer (vol/vol)?

Column 6: What is the percent organic carbon of the cover layer? (%)

TABLE C27b: COVER LAYER CHARACTERIZATION

1 Cover Layer No.	2 Brief Description	3 Thickness		4 Hydraulic conductivity		5 Porosity (vol/vol)	8 Percent Organic Carbon %	Mark if CBI
		Value	Units	Value	Units			
								F
								F
								F
								F
								F
								F
								F
								F

C27c. What is the average surface slope of the cover? _____% (*If you do not have an estimate of the average surface slope of the cover, provide the value for the following:*

$$\frac{[\text{(the maximum elevation of the cover) - (the minimum elevation at the edge of the cover)}] \times 100}{\text{the horizontal distance between the maximum elevation and the minimum elevation}}$$

Please be sure that you perform this calculation using the same units of distance [for example, all values are in feet].)

C27d. What percentage of the cover's surface area is vegetated? F **Mark if CBI**

(Check one)

1G 0 - 5 %
2G 6 - 25 %
3G 26 - 50%
4G 51 - 75%
5G 76 - 95%
6G 96 - 100%

C27e. If more than 5% of the cover's surface area is vegetated, describe the vegetation that is present: F **Mark if CBI**

(Check all that apply)

1G grass
2G low shrubs
3G trees
4G Other (please describe): _____

END OF SECTION C (for this impoundment)

If you have not completed Section C for all of your in-scope surface impoundments, please complete an additional copy of Section C for any other in-scope impoundments. If you have completed Section C for all of your in-scope surface impoundments, you have finished with this questionnaire. Thank you very much for your time, effort, and assistance.