Appendix 1. Lagoor	n Sludge Survey Form	Revised August 2008		State University
A. Farm Permit or DW	Q Identification Number	Richard Konger	NC	A&T State University COOPERATIVE
B. Lagoon Identification	1	11		EXTENSION
C. Person(s) Taking M	easurements		计 数据数	Empowering People · Providing Solutions
D. Date of Measureme	nt	#######		
E. Methods/Devices Us	sed for Measurement of:			
sonar b. Distance sonar	e from the lagoon liquid surface to e from the lagoon liquid surface to ss of the sludge layer if making a c		ler".	
(Draw a sketch of th	a (using dimensions at inside top of e lagoon on a separate sheet, list ilt different than designed, so m	dimensions, and calculate surface a	•	goon
b. If more(Using skethestimated n	an 1.33 acres: Use 8 points than 1.33 ac acres x ch and dimensions, develop a uniform	6 =, with maximum of grid that has the same number of intersember the intersection points on the lagoo	ections as the	
location of the pump	intake, take measurements of di	rvey Data Sheet" (Appendix 2). Also istance from liquid surface to top nust be at least 2.5 ft. when irrigat	of sludge	
	rvey, also measure the distance fro e lagoon gauge pole):	om the Maximum Liquid Level to the	Present Liq	uid0.0
	nce from the top of bank to the Max ement plan or other lagoon records			1.6
	nce from the Maximum Liquid to the ement plan or other lagoon records			0.0
L. Calculate the distan (Item K Minus Iten	ce from the present liquid surface n I, assuming the present liquid lev	level to the Minimum Liquid Level vel is below the Maximum Liquid Lev	el)	0.0
	udge Survey Data Sheet the distar	nce from the present liquid surface lets)	evel to the	8.7
	udge Survey Data Sheet the distan (average for all the measurement)	ice from the present liquid surface le points):	vel to the to	p4.1
O. Record from the Sli	udge Survey Data Sheet the avera	ge thickness of the sludge layer:		4.5
P. Calculate the thickn	ness of the existing Liquid Treatme	nt Zone (Item N minus Item L):		4.1
	r than Item P, proceed to the Wo or less than Item P, you do not h	orksheet for Sludge Volume and To ave to determine volumes.	reatment V	olume.
Completed by:	Eve H. Honeycutt Print Name /Signature		Da	ate: 12/19/2019

Appendix 2. Sludge Survey Data Sheet*

Revised August 2008

Lagoon Identification	·	1		
Completed by:	Eve H. Honeycutt		Date:	12/19/2019
	Print Name	Signature		

(A)	(B)				(C)		(C)-(B)		
Grid Point	Distance from liquid surface		Distance from liquid surface		Thickness of sludge layer		ge layer		
No.		op of sludg	1	to lag	oon bottom	(soil)			
	Ft.	& in.	Ft. (tenths)	Ft.	& in.	Ft. (tenths)	Ft.	& in.	Ft. (tenths)
1			4.4			9.1			4.7
2			4.5			9.1			4.6
3			3.3			9.1			5.8
4			4.5			9.1			4.6
5			4.6			9.1			4.5
6			4.7			9.1			4.4
7			4.3			9.1			4.8
8			3.5			9.1			5.6
9			4.2			9.1			4.9
10			4.2			9.1			4.9
11			3.7			9.1			5.4
12			4.5			9.1			4.6
13			4.6			9.1			4.5
14			4.7			9.1			4.4
15			4.8			9.1			4.3
16			4.7			9.1			4.4
17			4.4			9.1			4.7
18			3.9			9.1			5.2
19			4.9			9.1			4.2
20			4.6			9.1			4.5
21			5.0			9.0			
22			0.0			0.0			0.0
23			0.0			0.0			0.0
24			0.0			0.0			0.0
Number of p	oints with re	eadings	21.0	Х	Х	21.0	X	X	21.0
Average of points	X	Х	4.1428571	Х	Х	8.6666667	X	X	4.52380952
At pump intake			5.0	х	Х	Х	Х	×	Х

^{*}All Grid Points and corresponding sludge layer thicknesses must be shown on a sketch attached to this Sludge Survey Data Sheet.

The average thickness of the sludge layer and the thickness of the existing liquid (sludge-free) treatment zone are determined from the information on the Lagoon Sludge Survey Form (Items O and P, respectively). In this example, the average sludge layer thickness is 2.5 feet and the existing liquid treatment zone is 3.5 feet. If the lagoon has a designed sludge storage volume, see notes at end of the worksheet. The dimensions of the lagoon as measured and the side slope are needed for calculations of sludge volume and of total treatment volume. If the lagoon is a standard geometric shape, the sludge volume and the treatment volume in the lagoon can be estimated by using standard equations. For approximate volumes of rectangular lagoons with constant side slope, calculate length and width at the midpoint of the layer, and multiply by layer thickness to calculate layer volume, as shown in the example. For irregular shapes, convert the total surface area to a square or rectangular shape. For exact volumes for lagoons with constant side slope, the "Prismoidal Equations" may be used.

the desired and Thickness (T)	Example 2.5 ft.	Your Lagoon 4.5 ft.
Average sludge Layer Thickness (T)		
2. Depth of the lagoon from top of bank to bottom soil surface (D)	11ft.	ft.
3. Slope = Horizontal/ vertical side slope (S)	3	1.5
4. Length at the top of inside bank (L)	457ft.	1004.0ft.
5. Width at top inside slope (W)	ft.	147.0 ft.
6. Length at midpoint of sludge layer $L_m = L-2S(D-(T/2))$	398.5 ft.	<u>980.0</u> ft.
7. Width at midpoint of sludge layer W _m = W-2S(D-(T/2))	ft.	123.0 ft.
8. Volume of sludge (Vs) Vs=L _m W _m T	169,860ft ³	545,229 ft ³
9. Volume in gallons: Vs _g =V*7.5 gal./ft ³ .		4,089,215 gal.
10. Thickness of existing liquid tmt. zone (Y)	ft	ft
11. Thickness of total treatment zone (Z) Z= T+Y	ft	ft
12. Length at midpoint of total tmt. zone $L_z = L-2(S)(D-(Z/2))$	ft.	986.2 ft.
13. Width at midpoint of total tmt. Zone $W_z = W-2(S)(D-(Z/2))$	ft.	129.2 ft.
14. Volume of total treatment zone (Vz) $Vz = L_zW_zZ$	444,174 ft ³	1,104,281_ft ³
15. Ratio (R) of sludge layer volume to total Treatment Volume R = Vs/Vz	0.38	0.49

If the ratio R exceeds 0.50, than a sludge Plan of Action may be required. Check with DWQ for information on filing the Plan of Action.

Note: If the lagoon has a designed sludge storage volume (DSSV), subtract that volume from both the volume of sludge (Vs) (Item 8) and from the volume of total treatment zone (Vz) (Item 14), and take the ratio.

Then, R = (Vs-DSSV) / (Vz - DSSV)

Example: If DSSV = $85,000 \text{ ft}^3$, then R = (169,860 - 85,000) / (447,174 - 85,000) = 84,860 / 362,174 = 0.24.

16. Design sludge storage volume (DSSV)	85,000	
17. Ratio (R) of sludge layer volume to treatment volume adjusted for designed sludge storage volume	0.24	0.49

Appendix 1. Lagoon Sludge Survey Form	Revised August 2006	State Univ	ersity
A. Farm Permit or DWQ Identification Number	Richard Konger	A&T State	
B. Lagoon Identification	2	Annual State of the Party of th	INSION
C. Person(s) Taking Measurements	Eve Honeycutt	Empowerin	g People · Providing Solutions
D. Date of Measurement	#######		
E. Methods/Devices Used for Measurement of:			
 a. Distance from the lagoon liquid surface sonar boat b. Distance from the lagoon liquid surface calculated c. Thickness of the sludge layer if making n/a 	e to the bottom (soil) of the lagoon. g a direct measurement with "core so		
F. Lagoon Surface Area (using dimensions at inside to (Draw a sketch of the lagoon on a separate sheet, may have been built different than designed, so	list dimensions, and calculate surface	ce area. The lagoon	
G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 ac acre (Using sketch and dimensions, develop a unif estimated number of sampling points needed. recorded at each can be easily matched.)	orm grid that has the same number of ir	ntersections as the	
H. Conduct sludge survey and record data on "Sludge location of the pump intake, take measurements of layer and record it on the Data Sheet (last row); the	of distance from liquid surface to his must be at least 2.5 ft. when ir	rigating.	
I. At the time of the survey, also measure the distanc Level (measure at the lagoon gauge pole):	e from the Maximum Liquid Level to	the Present Liquid —	1.4
J. Determine the distance from the top of bank to the (use lagoon management plan or other lagoon rec	Maximum Liquid Level ords)	_	1.6
K. Determine the distance from the Maximum Liquid (use lagoon management plan or other lagoon rec	to the Minimum Liquid level: ords)	_	1.9
L. Calculate the distance from the present liquid surf (Item K Minus Item I, assuming the present liqui	ace level to the Minimum Liquid Level is below the Maximum Liquid	/el d Level)	0.5
M. Record from the Sludge Survey Data Sheet the d lagoon bottom (average for all the measurement	points)	_	7.0
N. Record from the Sludge Survey Data Sheet the d of the sludge layer (average for all the measurem	istance from the present liquid surfa nent points):	ice level to the top -	4.0
O. Record from the Sludge Survey Data Sheet the a	verage thickness of the sludge laye	r: _	3.0
P. Calculate the thickness of the existing Liquid Trea			3.5
Q. If Item O is greater than Item P, proceed to the If Item O is equal to or less than Item P, you do r	e Worksheet for Sludge Volume a not have to determine volumes.	nd Treatment Volume.	
Completed by: Eve H. Honeycutt Print Name /Signature		Date: _	12/19/2019

Appendix 2. Sludge Survey Data Sheet*

Revised August 2008

Lagoon Identification		1		
Completed by:	_ Eve H. Honeycutt		Date:	12/19/2019
	Print Name	Signature		

(A)		(B)		(C)		(C)-(B)			
Grid Point	Distance	e from liquio	surface	Distance from liquid surface Thickness of sludg		lge layer			
No.		top of slude		to lag	goon bottom	(soil)			
140. F	Ft.	& in.	Ft. (tenths)	Ft.	& in.	Ft. (tenths)	Ft.	& in.	Ft. (tenths)
1			3.2			7.0			3.8
2			3.5			7.0			3.5
3			3.2			7.0			3.8
4			3.4			7.0			3.6
5			3.8			7.0			3.2
6			4.3			7.0			2.7
7			4.4			7.0			2.6
8			4.6			7.0			2.4
9			4.6			7.0			2.4
10			4.5			7.0			2.5
11			4.6			7.0			2.4
12			4.2			7.0			2.8
13			0.0			0.0			0.0
14			0.0			0.0			0.0
15			0.0			0.0			0.0
16			0.0			0.0			0.0
17			0.0			0.0			0.0
18			0.0			0.0			0.0
19			0.0			0.0			0.0
20			0.0			0.0			0.0
21			0.0			0.0			0.0
22			0.0			0.0			0.0
23			0.0			0.0			0.0
24			0.0			0.0			0.0
Number of po	oints with re	eadings	12.0	Х	Х	12.0	Х	Х	12.0
Average of points	Х	X	4.025	Х	Х	7	X	X	2.975
At pump intake	<u> </u>		5.0	х	Х	Х	Х	х	х

^{*}All Grid Points and corresponding sludge layer thicknesses must be shown on a sketch attached to this Sludge Survey Data Sheet.

The average thickness of the sludge layer and the thickness of the existing liquid (sludge-free) treatment zone are determined from the information on the Lagoon Sludge Survey Form (Items O and P, respectively). In this example, the average sludge layer thickness is 2.5 feet and the existing liquid treatment zone is 3.5 feet. If the lagoon has a designed sludge storage volume, see notes at end of the worksheet. The dimensions of the lagoon as measured and the side slope are needed for calculations of sludge volume and of total treatment volume. If the lagoon is a standard geometric shape, the sludge volume and the treatment volume in the lagoon can be estimated by using standard equations. For approximate volumes of rectangular lagoons with constant side slope, calculate length and width at the midpoint of the layer, and multiply by layer thickness to calculate layer volume, as shown in the example. For irregular shapes, convert the total surface area to a square or rectangular shape. For exact volumes for lagoons with constant side slope, the "Prismoidal Equations" may be used.

	Example	Your Lagoon
Average sludge Layer Thickness (T)	ft.	3.0 ft.
2. Depth of the lagoon from top of bank to bottom soil surface (D)	ft.	10.0 ft.
3. Slope = Horizontal/ vertical side slope (S)	3	2.0
4. Length at the top of inside bank (L)	ft.	610.0 ft.
5. Width at top inside slope (W)	ft.	ft.
6. Length at midpoint of sludge layer $L_m = L-2S(D-(T/2))$	398.5 ft.	576.0 ft.
7. Width at midpoint of sludge layer W _m = W-2S(D-(T/2))	170.5ft.	ft.
8. Volume of sludge (Vs) Vs=L _m W _m T	ft ³	284,347 ft ³
9. Volume in gallons: Vs ₉ =V*7.5 gal./ft ³ .	1,273,950 gal.	2,132,604_gal.
10. Thickness of existing liquid tmt. zone (Y)	ft	ft
11. Thickness of total treatment zone (Z) Z= T+Y	ft	ft
12. Length at midpoint of total tmt. zone $L_z = L-2(S)(D-(Z/2))$	ft.	583.0ft.
13. Width at midpoint of total tmt. Zone $W_z = W-2(S)(D-(Z/2))$	ft.	ft.
14. Volume of total treatment zone (Vz) $Vz = L_z W_z Z$	444,174 ft ³	655,584 ft ³
15. Ratio (R) of sludge layer volume to total Treatment Volume R = Vs/Vz	0.38	0.43

If the ratio R exceeds 0.50, than a sludge Plan of Action may be required. Check with DWQ for information on filing the Plan of Action.

Note: If the lagoon has a designed sludge storage volume (DSSV), subtract that volume from both the volume of sludge (Vs) (Item 8) and from the volume of total treatment zone (Vz) (Item 14), and take the ratio.

Then, R = (Vs-DSSV) / (Vz - DSSV)

Example: If DSSV = $85,000 \text{ ft}^3$, then R = (169,860 - 85,000) / (447,174 - 85,000) = 84,860 / 362,174 = 0.24.

16. Design sludge storage volume (DSSV)	85,000	
17. Ratio (R) of sludge layer volume to treatment volume adjusted for designed sludge storage volume	0.24	0.43

D. Date of Measurement ######### E. Methods/Devices Used for Measurement of: a. Distance from the lagoon liquid surface to the top of the sludge layer. sonar boat b. Distance from the lagoon liquid surface to the bottom (soil) of the lagoon. calculated c. Thickness of the sludge layer if making a direct measurement with "core sampler". n/a F. Lagoon Surface Area (using dimensions at inside top of bank): (Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.)
3. Lagoon Identification 3. Eve Honeycutt ######### E. Methods/Devices Used for Measurement of: a. Distance from the lagoon liquid surface to the top of the sludge layer. sonar boat b. Distance from the lagoon liquid surface to the bottom (soil) of the lagoon. calculated c. Thickness of the sludge layer if making a direct measurement with "core sampler". n/a F. Lagoon Surface Area (using dimensions at inside top of bank): (Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.) G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 ac. acres x 6 =, with maximum of 24. (Using sketch and dimensions, develop a uniform grid that has the same number of intersections as the estimated number of sampling points needed. Number the intersection points on the lagoon grid so that data recorded at each can be easily matched.) H. Conduct sludge survey and record data on "Sludge Survey Data Sheet" (Appendix 2). Also, at the location of the pump intake, take measurements of distance from liquid surface to top of sludge layer and record it on the Data Sheet (last row); this must be at least 2.5 ft. when irrigating. I. At the time of the survey, also measure the distance from the Maximum Liquid Level to the Present Liquid Level (measure at the lagoon gauge pole): J. Determine the distance from the top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records) K. Determine the distance from the Maximum Liquid to the Minimum Liquid Level (use lagoon management plan or other lagoon records)
D. Date of Measurement ######### E. Methods/Devices Used for Measurement of: a. Distance from the lagoon liquid surface to the top of the sludge layer. sonar boat b. Distance from the lagoon liquid surface to the bottom (soil) of the lagoon. calculated c. Thickness of the sludge layer if making a direct measurement with "core sampler". n/a F. Lagoon Surface Area (using dimensions at inside top of bank): (Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.) G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 ac. acres x 6 = (Using sketch and dimensions, develop a uniform grid that has the same number of intersections as the estimated number of sampling points needed. Number the intersection points on the lagoon grid so that data recorded at each can be easily matched.) H. Conduct sludge survey and record data on "Sludge Survey Data Sheet" (Appendix 2). Also, at the location of the pump intake, take measurements of distance from liquid surface to top of sludge layer and record it on the Data Sheet (last row); this must be at least 2.5 ft. when irrigating. I. At the time of the survey, also measure the distance from the Maximum Liquid Level to the Present Liquid Level (measure at the lagoon gauge pole): J. Determine the distance from the top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records) K. Determine the distance from the Maximum Liquid to the Minimum Liquid Level (use lagoon management plan or other lagoon records)
D. Date of Measurement ######### E. Methods/Devices Used for Measurement of: a. Distance from the lagoon liquid surface to the top of the sludge layer. sonar boat b. Distance from the lagoon liquid surface to the bottom (soil) of the lagoon. calculated c. Thickness of the sludge layer if making a direct measurement with "core sampler". n/a F. Lagoon Surface Area (using dimensions at inside top of bank): 3.3 (acres) (Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.) G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 ac. acres × 6 = (Using sketch and dimensions, develop a uniform grid that has the same number of intersections as the estimated number of sampling points needed. Number the intersection points on the lagoon grid so that data recorded at each can be easily matched.) H. Conduct sludge survey and record data on "Sludge Survey Data Sheet" (Appendix 2). Also, at the location of the pump intake, take measurements of distance from liquid surface to top of sludge layer and record it on the Data Sheet (last row); this must be at least 2.5 ft. when irrigating. I. At the time of the survey, also measure the distance from the Maximum Liquid Level to the Present Liquid Level (measure at the lagoon gauge pole): J. Determine the distance from the top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records) K. Determine the distance from the Maximum Liquid to the Minimum Liquid Level -0.2
E. Methods/Devices Used for Measurement of: a. Distance from the lagoon liquid surface to the top of the sludge layer. sonar boat b. Distance from the lagoon liquid surface to the bottom (soil) of the lagoon. calculated c. Thickness of the sludge layer if making a direct measurement with "core sampler". n/a F. Lagoon Surface Area (using dimensions at inside top of bank): (Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.) G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 ac. acres × 6 =, with maximum of 24. (Using sketch and dimensions, develop a uniform grid that has the same number of intersections as the estimated number of sampling points needed. Number the intersection points on the lagoon grid so that data recorded at each can be easily matched.) H. Conduct sludge survey and record data on "Sludge Survey Data Sheet" (Appendix 2). Also, at the location of the pump intake, take measurements of distance from liquid surface to top of sludge layer and record it on the Data Sheet (last row); this must be at least 2.5 ft. when irrigating. I. At the time of the survey, also measure the distance from the Maximum Liquid Level to the Present Liquid Level (measure at the lagoon gauge pole): J. Determine the distance from the top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records) K. Determine the distance from the Maximum Liquid to the Minimum Liquid Level (use lagoon management plan or other lagoon records)
a. Distance from the lagoon liquid surface to the top of the sludge layer. sonar boat b. Distance from the lagoon liquid surface to the bottom (soil) of the lagoon. calculated c. Thickness of the sludge layer if making a direct measurement with "core sampler". n/a F. Lagoon Surface Area (using dimensions at inside top of bank): (Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.) G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 acres: Use 8 points (Using sketch and dimensions, develop a uniform grid that has the same number of intersections as the estimated number of sampling points needed. Number the intersection points on the lagoon grid so that data recorded at each can be easily matched.) H. Conduct sludge survey and record data on "Sludge Survey Data Sheet" (Appendix 2). Also, at the location of the pump intake, take measurements of distance from liquid surface to top of sludge layer and record it on the Data Sheet (last row); this must be at least 2.5 ft. when irrigating. I. At the time of the survey, also measure the distance from the Maximum Liquid Level to the Present Liquid Level (measure at the lagoon gauge pole): J. Determine the distance from the top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records) K. Determine the distance from the Maximum Liquid to the Minimum Liquid Level (use lagoon management plan or other lagoon records)
b. Distance from the lagoon liquid surface to the bottom (soil) of the lagoon. calculated c. Thickness of the sludge layer if making a direct measurement with "core sampler". n/a F. Lagoon Surface Area (using dimensions at inside top of bank): (Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.) G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 ac. acres x 6 =, with maximum of 24. (Using sketch and dimensions, develop a uniform grid that has the same number of intersections as the estimated number of sampling points needed. Number the intersection points on the lagoon grid so that data recorded at each can be easily matched.) H. Conduct sludge survey and record data on "Sludge Survey Data Sheet" (Appendix 2). Also, at the location of the pump intake, take measurements of distance from liquid surface to top of sludge layer and record it on the Data Sheet (last row); this must be at least 2.5 ft. when irrigating. I. At the time of the survey, also measure the distance from the Maximum Liquid Level to the Present Liquid Level (measure at the lagoon gauge pole): J. Determine the distance from the top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records) K. Determine the distance from the Maximum Liquid to the Minimum Liquid Level (use lagoon management plan or other lagoon records)
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F. Lagoon Surface Area (using dimensions at inside top of bank): (Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.) G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 ac.
(Draw a sketch of the lagoon on a separate sheet, list dimensions, and calculate surface area. The lagoon may have been built different than designed, so measurements should be made.) G. Estimate number of sampling points: a. Less than 1.33 acres: Use 8 points b. If more than 1.33 ac acres x 6 =, with maximum of 24. (Using sketch and dimensions, develop a uniform grid that has the same number of intersections as the estimated number of sampling points needed. Number the intersection points on the lagoon grid so that data recorded at each can be easily matched.) H. Conduct sludge survey and record data on "Sludge Survey Data Sheet" (Appendix 2). Also, at the location of the pump intake, take measurements of distance from liquid surface to top of sludge layer and record it on the Data Sheet (last row); this must be at least 2.5 ft. when irrigating. I. At the time of the survey, also measure the distance from the Maximum Liquid Level to the Present Liquid Level (measure at the lagoon gauge pole): J. Determine the distance from the top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records) K. Determine the distance from the Maximum Liquid to the Minimum Liquid Level (use lagoon management plan or other lagoon records)
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J. Determine the distance from the top of bank to the Maximum Liquid Level (use lagoon management plan or other lagoon records) K. Determine the distance from the Maximum Liquid to the Minimum Liquid level: (use lagoon management plan or other lagoon records) 1.9 (use lagoon management plan or other lagoon records)
K. Determine the distance from the Maximum Liquid to the Minimum Liquid level: (use lagoon management plan or other lagoon records) 1.9 -0.2
(Item A winds item i, assuming the processing the
M. Record from the Sludge Survey Data Sheet the distance from the present liquid surface level to the lagoon bottom (average for all the measurement points)
N. Record from the Sludge Survey Data Sheet the distance from the present liquid surface level to the top of the sludge layer (average for all the measurement points):
O. Record from the Sludge Survey Data Sheet the average thickness of the sludge layer: 3.2
P. Calculate the thickness of the existing Liquid Treatment Zone (Item N minus Item L):
Q. If Item O is greater than Item P, proceed to the Worksheet for Sludge Volume and Treatment Volume. If Item O is equal to or less than Item P, you do not have to determine volumes.
Completed by: Eve H. Honeycutt Date: 12/19/2019 Print Name /Signature

Lagoon Identification	ı	1		
Completed by:	Eve H. Honeycutt		_ Date:	12/19/2019
	Print Name	Signature		

(A)	(B) Distance from liquid surface to top of sludge			(C) Distance from liquid surface to lagoon bottom (soil)			(C)-(B) Thickness of sludge layer		
Grid Point									
No.									
	Ft.	& in.	Ft. (tenths)	Ft.	& in.	Ft. (tenths)	Ft.	& in.	Ft. (tenths)
1									0.0
2									0.0
3									0.0
4									0.0
5						1			0.0
6									0.0
7									0.0
8									0.0
9									0.0
10									0.0
11									0.0
12									0.0
13			0.0			0.0			0.0
14			0.0			0.0			0.0
15			0.0			0.0			0.0
16			0.0			0.0			0.0
17			0.0			0.0			0.0
18			0.0			0.0			0.0
19			0.0			0.0			0.0
20			0.0			0.0			0.0
21			0.0			0.0			0.0
22			0.0			0.0			0.0
23			0.0			0.0			0.0
24			0.0			0.0			0.0
Number of p	oints with re	eadings	sonar	Х	X	sonar	X	X	sonar
Average of points	X	X	4.2	Х	х	7.4	Х	X	3.2
At pump intake	· · · · · · · · · · · · · · · · · · ·		5.0	х	х	Х	Х	х	х

^{*}All Grid Points and corresponding sludge layer thicknesses must be shown on a sketch attached to this Sludge Survey Data Sheet.

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The average thickness of the sludge layer and the thickness of the existing liquid (sludge-free) treatment zone are determined from the information on the Lagoon Sludge Survey Form (Items O and P, respectively). In this example, the average sludge layer thickness is 2.5 feet and the existing liquid treatment zone is 3.5 feet. If the lagoon has a designed sludge storage volume, see notes at end of the worksheet. The dimensions of the lagoon as measured and the side slope are needed for calculations of sludge volume and of total treatment volume. If the lagoon is a standard geometric shape, the sludge volume and the treatment volume in the lagoon can be estimated by using standard equations. For approximate volumes of rectangular lagoons with constant side slope, calculate length and width at the midpoint of the layer, and multiply by layer thickness to calculate layer volume, as shown in the example. For irregular shapes, convert the total surface area to a square or rectangular shape. For exact volumes for lagoons with constant side slope, the "Prismoidal Equations" may be used.

	Example	Your Lagoon
Average sludge Layer Thickness (T)	ft.	3.2 ft.
2. Depth of the lagoon from top of bank to bottom soil surface (D)	ft.	11.1 ft.
3. Slope = Horizontal/ vertical side slope (S)	3	2.0
4. Length at the top of inside bank (L)	457ft.	420.0 ft.
5. Width at top inside slope (W)	ft.	350.0 ft.
6. Length at midpoint of sludge layer $L_m = L-2S(D-(T/2))$	398.5 ft.	382.1 ft.
7. Width at midpoint of sludge layer W _m = W-2S(D-(T/2))	170.5 ft.	312.1 ft.
8. Volume of sludge (Vs) Vs=L _m W _m T	169,860 ft ³	381,566 ft ³
9. Volume in gallons: Vs _g =V*7.5 gal./ft ³ .	1,273,950 gal.	2,861,749 gal.
10. Thickness of existing liquid tmt. zone (Y)	ft	ft
11. Thickness of total treatment zone (Z) Z= T+Y	6ft	ft
12. Length at midpoint of total tmt. zone $L_z = L-2(S)(D-(Z/2))$	409 ft.	ft.
13. Width at midpoint of total tmt. Zone $W_z = W-2(S)(D-(Z/2))$	ft.	320.8 ft.
14. Volume of total treatment zone (Vz) $Vz = L_z W_z Z$	444,174 ft ³	950,510 ft ³
15. Ratio (R) of sludge layer volume to total Treatment Volume R = Vs/Vz	0.38	0.40

If the ratio R exceeds 0.50, than a sludge Plan of Action may be required. Check with DWQ for information on filing the Plan of Action.

Note: If the lagoon has a designed sludge storage volume (DSSV), subtract that volume from both the volume of sludge (Vs) (Item 8) and from the volume of total treatment zone (Vz) (Item 14), and take the ratio.

Then, R = (Vs-DSSV) / (Vz - DSSV)Example: If DSSV = 85,000 ft³, then R = (169,860 - 85,000) / (447,174 - 85,000) = 84,860 / 362,174 = 0.24.

16. Design sludge storage volume (DSSV)	85,000	
17. Ratio (R) of sludge layer volume to treatment volume adjusted for designed sludge storage volume	0.24	0.40