Post Closure Care (PCC) Termination Plans: Principles and Needs

SWANA & KDHE SWM Conference & Operator Training Course – Nov. 8, 2012

Carl E. Burkhead
Bureau of Waste Management

Kansas
Department of Health
and Environment

Purpose of Presentation:

To assist Subtitle D landfill owners/operators in the preparation of a PCC termination plan using the Allen County Landfill (ACL) as a pilot landfill.

A stable landfill is one that can be closed safely in perpetuity! This conclusion can be based on trend analysis for the following options:

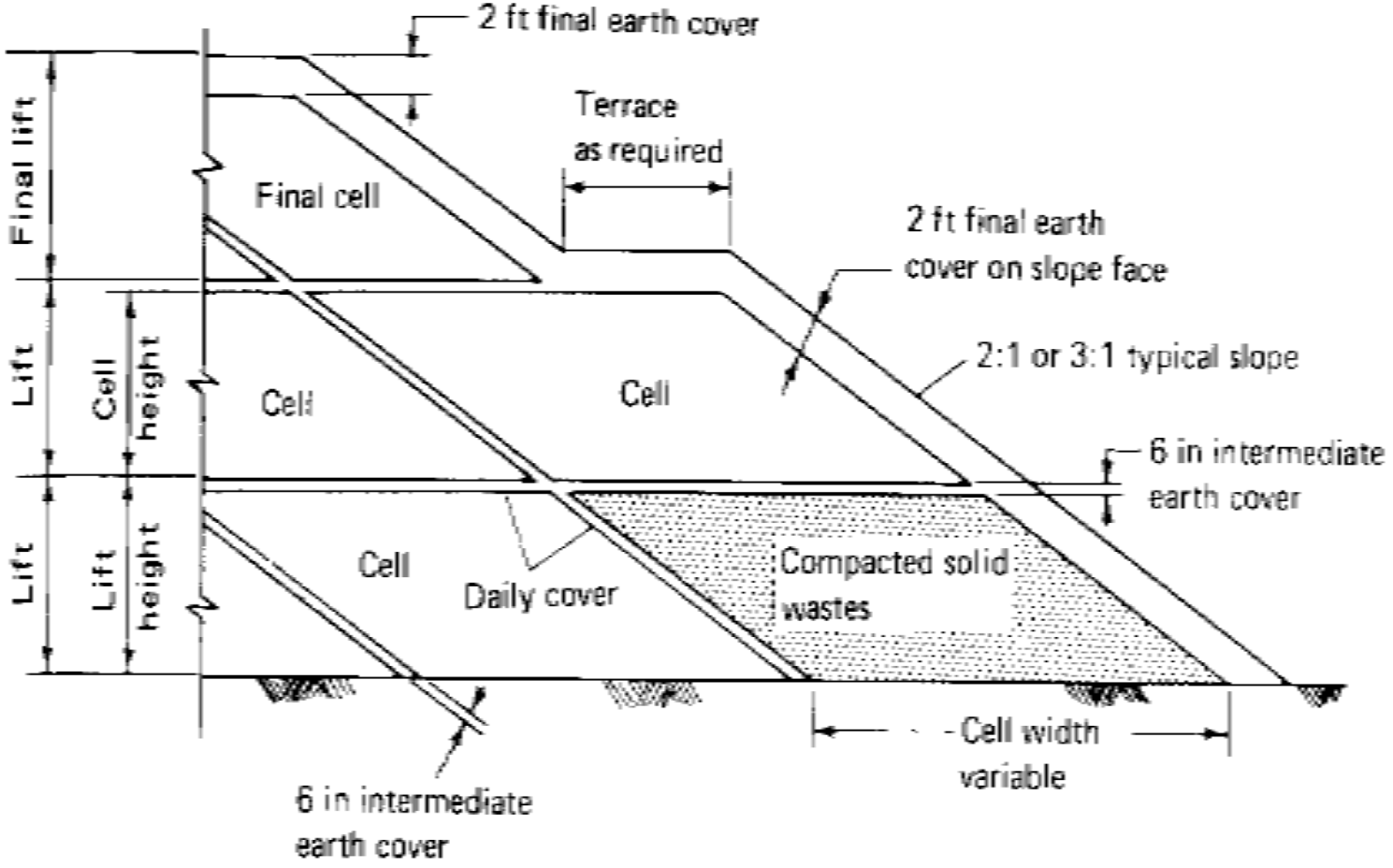
1. The stability of the stored MSW.

2. The stability of the emissions from the MSWLF, i.e., the leachate and landfill gases (LFG).

3. A combination of Items 1 and 2.

Stability means the character of these regimes do not change with time; hence, the closed landfill does not pose a potential problem in terms of human health and environment. Also, the closed site has a useful future purpose.

Option 1 - Evaluating the MSW itself; imagine sampling this regime:



Disadvantages of assessing MSW stability via Option 1:

1. Difficulty in getting a representative sample to judge the MSW character.
2. Difficulty in measuring MSW stability parameters with a collected sample.
3. Need to take samples three dimensionally in the different phases of the landfill.
4. Correlating the phase results as a whole.
5. The need for repeated sampling and analysis for establishing trends.

Option 2 is the most viable because:

1. Both emissions (leachate and LFG) are easier to sample and compare over time.
2. Both emissions better represent the whole of the MSWLF.
3. Emission character is easier to measure and is related to existing environmental requirements, e.g., the Clean Water Act and the Clean Air Act regulations.
4. There are existing studies where this type of trend analysis or methodology has been demonstrated.

CONCLUSION: Use Option 2 to validate the PCC termination date.

Before getting into the heart of the presentation, I want to state that:

"A successful PCC termination plan must be based on a predetermined monitoring plan designed to provide the data necessary for implementing the methodology used to determine a PCC termination date."

The remainder of the presentation will demonstrate the principles and the partial results of this premise for the ACL.

A Predetermined Monitoring Plan should also consider the Conservation of Mass principle (besides trend analysis) where:

Input = Output + Accumulation

Tables 1 to 3 define the first two parts of the equation so that the last part can be estimated for the ACL (First, see Figures 1a to 1d).

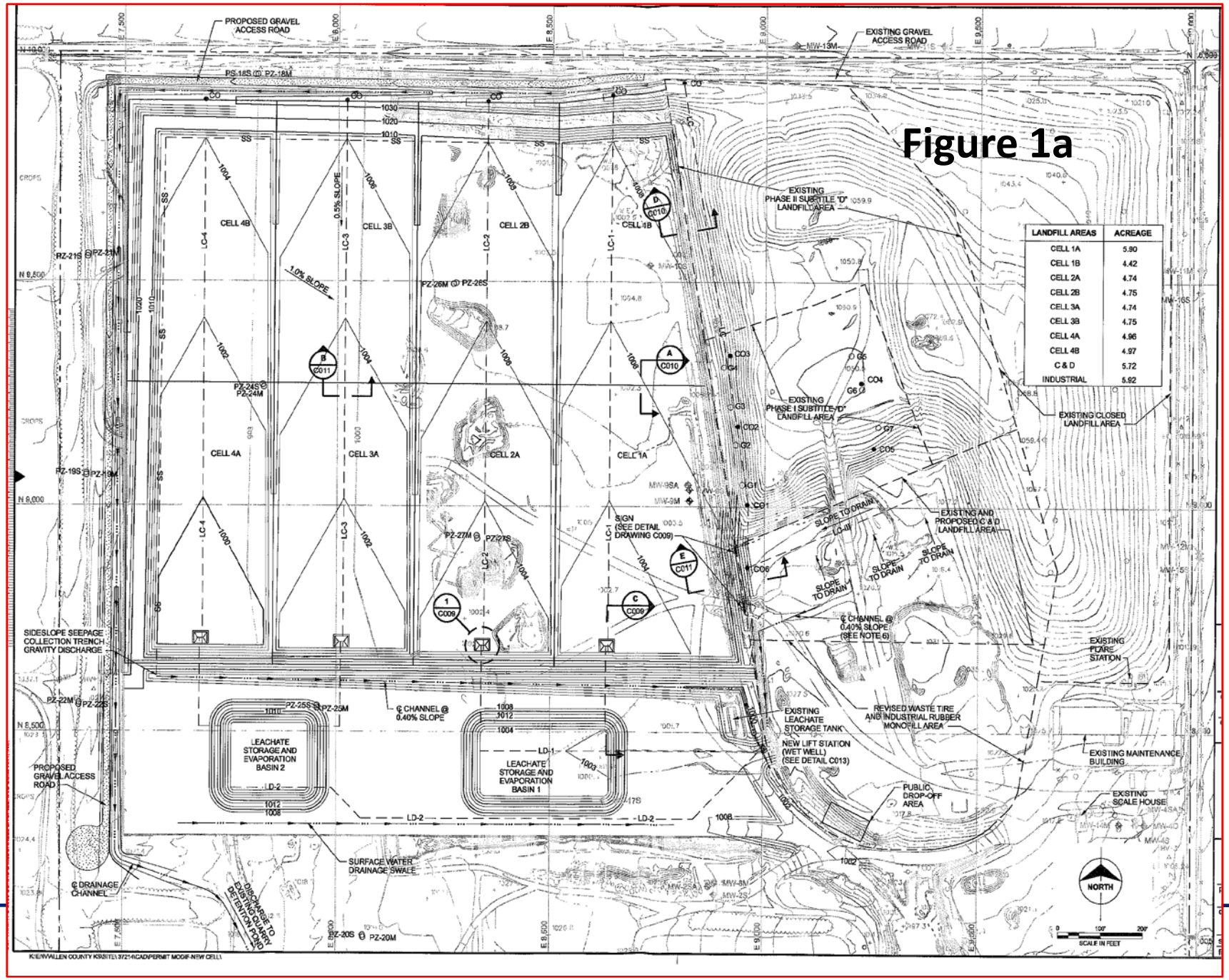


Figure 1a
PROPOSED GRAVEL ACCESS ROAD
EXISTING GRAVEL ACCESS ROAD
EXISTING PHASE II SUBTITLE 'D' LANDFILL AREA
EXISTING PHASE I SUBTITLE 'D' LANDFILL AREA
EXISTING CLOSED LANDFILL AREA
EXISTING AND PROPOSED C & D LANDFILL AREA
CELL 4B
CELL 3B
CELL 2B
CELL 1B
CELL 4A
CELL 3A
CELL 2A
CELL 1A
1.0% SLOPE
0.5% SLOPE
SLOPE TO DRAIN
SIDESLOPE SEEPAGE COLLECTION TRENCH GRAVITY DISCHARGE
LEACHATE STORAGE AND EVAPORATION BASIN 2
LEACHATE STORAGE AND EVAPORATION BASIN 1
EXISTING LEACHATE STORAGE TANK
NEW LIFT STATION (WET WELL) (SEE DETAIL C013)
REVISED WASTE TIRE AND INDUSTRIAL RUBBER MONOFILL AREA
EXISTING FLARE STATION
EXISTING MAINTENANCE BUILDING
EXISTING SCALE HOUSE
PUBLIC DROP-OFF AREA
PROPOSED GRAVEL ACCESS ROAD
SURFACE WATER DRAINAGE SWALE
℄ DRAINAGE CHANNEL
℄ CHANNEL @ 0.40% SLOPE
℄ CHANNEL @ 0.40% SLOPE (SEE NOTE 6)
SIGN (SEE DETAIL DRAWING C009)
DISCHARGE TO EXISTING ARRY DETENTION POND
NORTH
SCALE IN FEET
LANDFILL AREAS | ACREAGE
CELL 1A | 5.90
CELL 1B | 4.42
CELL 2A | 4.74
CELL 2B | 4.75
CELL 3A | 4.74
CELL 3B | 4.75
CELL 4A | 4.96
CELL 4B | 4.97
C & D | 5.72
INDUSTRIAL | 5.92

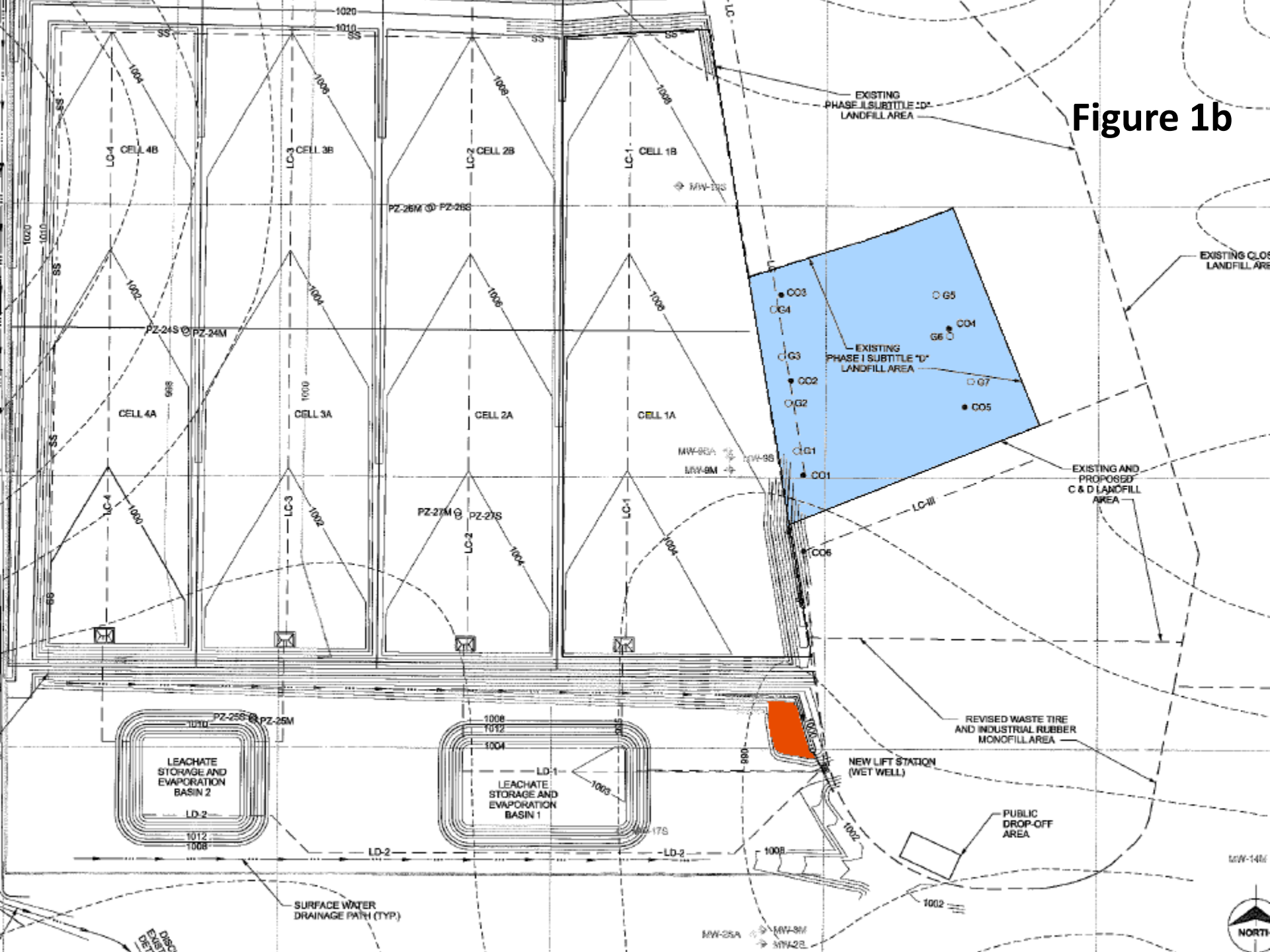


Figure 1b
EXISTING PHASE II SUBTITLE "D" LANDFILL AREA
EXISTING PHASE I SUBTITLE "D" LANDFILL AREA
EXISTING AND PROPOSED C & D LANDFILL AREA
REVISED WASTE TIRE AND INDUSTRIAL RUBBER MONOFILL AREA
NEW LIFT STATION (WET WELL)
PUBLIC DROP-OFF AREA
LEACHATE STORAGE AND EVAPORATION BASIN 2
LEACHATE STORAGE AND EVAPORATION BASIN 1
SURFACE WATER DRAINAGE PATH (TYP.)
CELL 4B
CELL 3B
CELL 2B
CELL 1B
CELL 4A
CELL 3A
CELL 2A
CELL 1A
LC-4
LC-3
LC-2
LC-1
LC-III
LD-1
LD-2
CO1
CO2
CO3
CO4
CO5
CO6
G1
G2
G3
G4
G5
G6
G7
PZ-26M
PZ-26S
PZ-24S
PZ-24M
PZ-27M
PZ-27S
PZ-25S
PZ-25M
MW-9S
MW-9M
MW-9SA
MW-17S
MW-25A
MW-9I
MW-28
MW-14I
NORTH

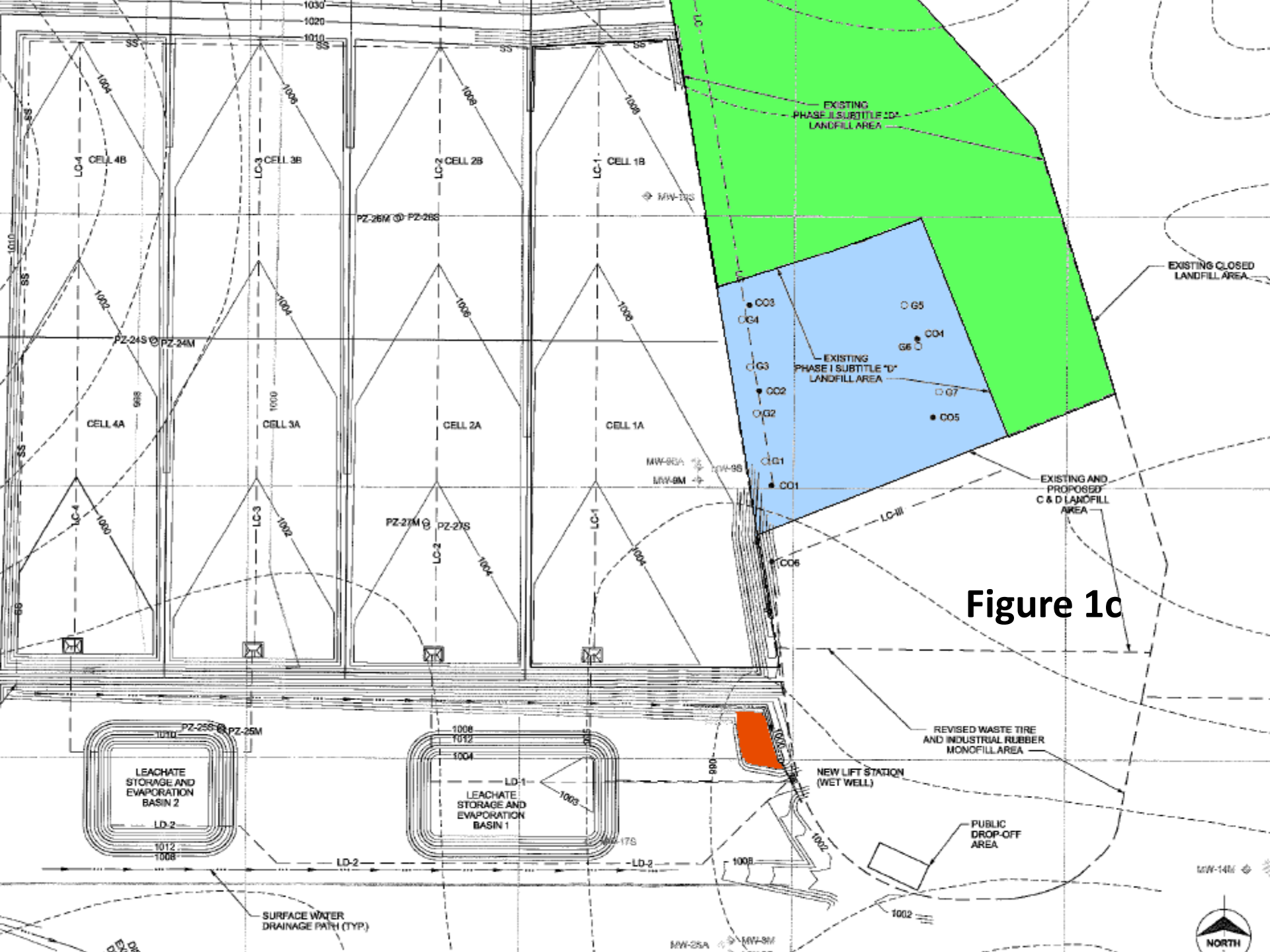

EXISTING PHASE II SUBTITLE "D" LANDFILL AREA
EXISTING CLOSED LANDFILL AREA
EXISTING PHASE I SUBTITLE "D" LANDFILL AREA
EXISTING AND PROPOSED C & D LANDFILL AREA
REVISED WASTE TIRE AND INDUSTRIAL RUBBER MONOFILL AREA
NEW LIFT STATION (WET WELL)
PUBLIC DROP-OFF AREA
LEACHATE STORAGE AND EVAPORATION BASIN 1
LEACHATE STORAGE AND EVAPORATION BASIN 2
SURFACE WATER DRAINAGE PATH (TYP.)
CELL 1A
CELL 1B
CELL 2A
CELL 2B
CELL 3A
CELL 3B
CELL 4A
CELL 4B
LC-1
LC-2
LC-3
LC-4
LC-III
LD-1
LD-2
CO1
CO2
CO3
CO4
CO5
CO6
CO7
G1
G2
G3
G4
G5
G6
MW-1RS
MW-8M
MW-8S
MW-8SA
MW-14M
MW-17S
MW-25A
PZ-24S
PZ-24M
PZ-25S
PZ-25M
PZ-26M
PZ-26S
PZ-27M
PZ-27S
NORTH

Figure 1c

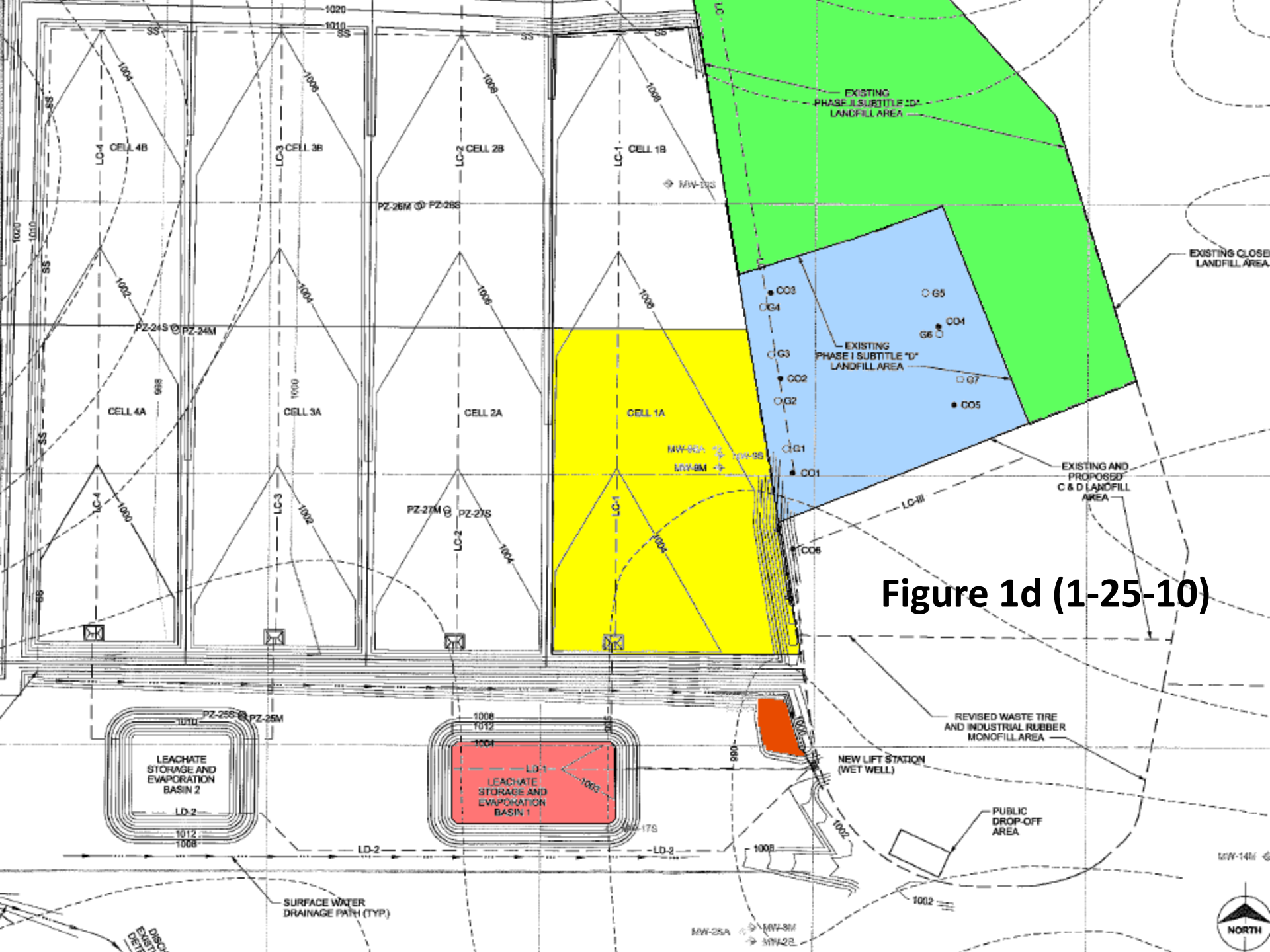


Figure 1d (1-25-10)

Values	Accounting Or Monitoring	Measurement Frequency	Data Summary
MSW et al Inputs	Tonnage	Daily	Monthly
Liquid Inputs	RD&D Liquids (gallons)	As applied	Quarterly
	Leachate Recirculation (tonnage or volume)	As applied	Quarterly
	Other Liquids (e.g., Toe Drainage)	As applied	Quarterly
Climatic: Inputs	Precipitation (inches as rain or snow)	As occurs	Quarterly
Ambient	Temperataure (^{o}F)	Daily (highs & lows)	Monthly
On-Site or Local Weather Station	Various Data Available	Depends on Station Daily & Monthly (Chanute)	Daily or Internet

Table 2 – Ideal Output Leachate Values (ACL in green)

Values	Phases	Frequency	Data Summary
Quantity	Individual	Monthly	Quarterly
	Combined	Monthly	Quarterly
Quality	Individual	Quarterly	Quarterly
	Combined	Quarterly & Annual	Quarterly
Temperature	Individual	Monthly	Quarterly
	Combined	Monthly	Quarterly
Storage: Tank(s)	Individual	Weekly	Annual
	Combined	Periodic?	?
Lagoon(s)	Individual	Weekly	Annual
	Combined	Periodic	?
On-site Treatment	Individual	Daily	Monthly
	Combined	As Treated	Monthly
Off-site Disposal*	Individual	Daily	Monthly
	Combined	As Hauled	Monthly

* May include POTW quantity and quality, regular or periodic, check data.

Table 3 – Ideal Output LFG Values

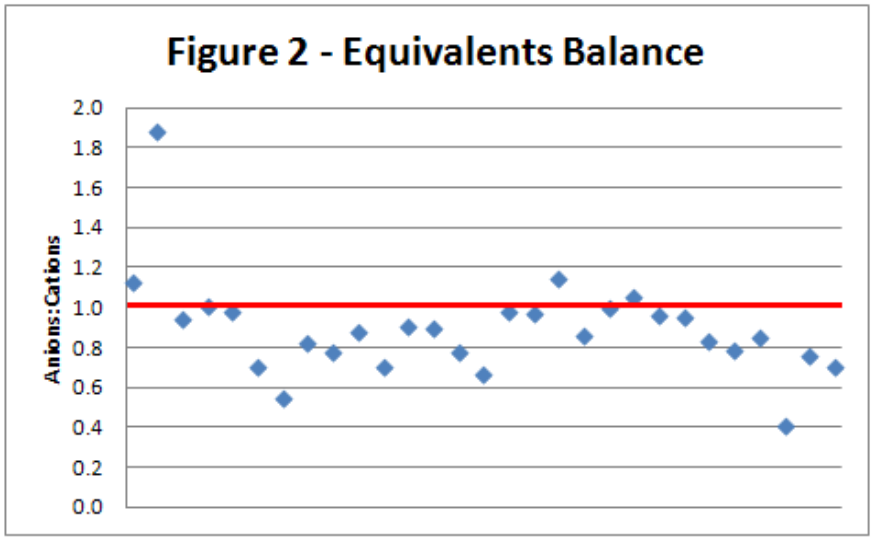
Values	Phases	Frequency	Data Summary
Quantity	Individual Combined	Monthly Quarterly	Quarterly Quarterly
Quality	Individual Combined	Monthly Quarterly	Quarterly Quarterly
Temperature	Individual Combined	Monthly Quarterly	Quarterly Quarterly
On-site Usage	Individual	Daily	Monthly
Flare	Combined	As used	Monthly
Off-site Usage*	Combined	As discharged	Monthly
Off-site CAA Migrations*	Individual Combined	Daily or Periodic Daily or Periodic	Quarterly Quarterly

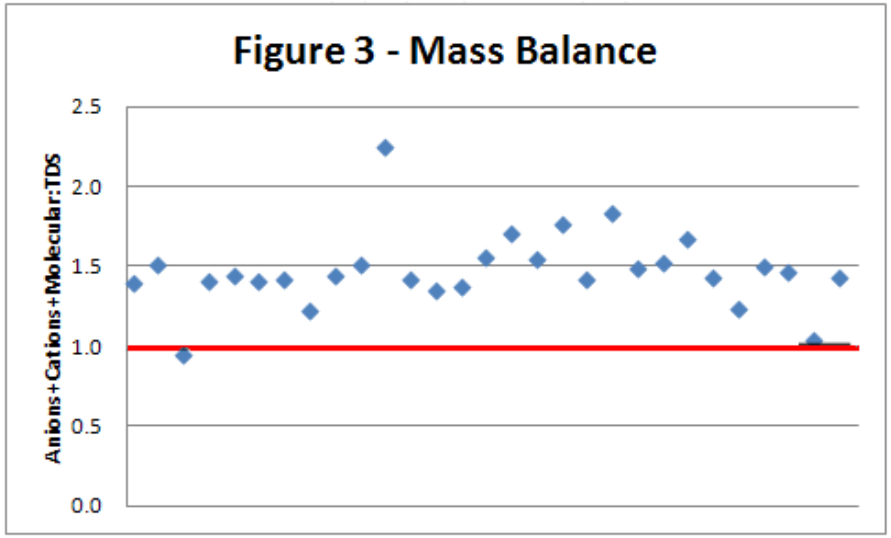
* May include users and/or government quantity and quality data.

Ways to use the collected data. To:

1. Check lab results' validity in terms of charge and mass.
2. Determine emission trends for key stability parameters. PCC Goal
3. Establish useful correlations.
4. Use the Conservation of Mass principle to make:
   a. Water Balance
   b. Non-Water Balance:
      MSW vs. TDS + TSS + Gases
5. Meet discharge requirements. PCC Goal

1. The ACL leachate quality data were used to check lab results validity:





2. To check for trends of key stability parameters:

Figure 4 - ACL Surrogate Organics (mg/L)

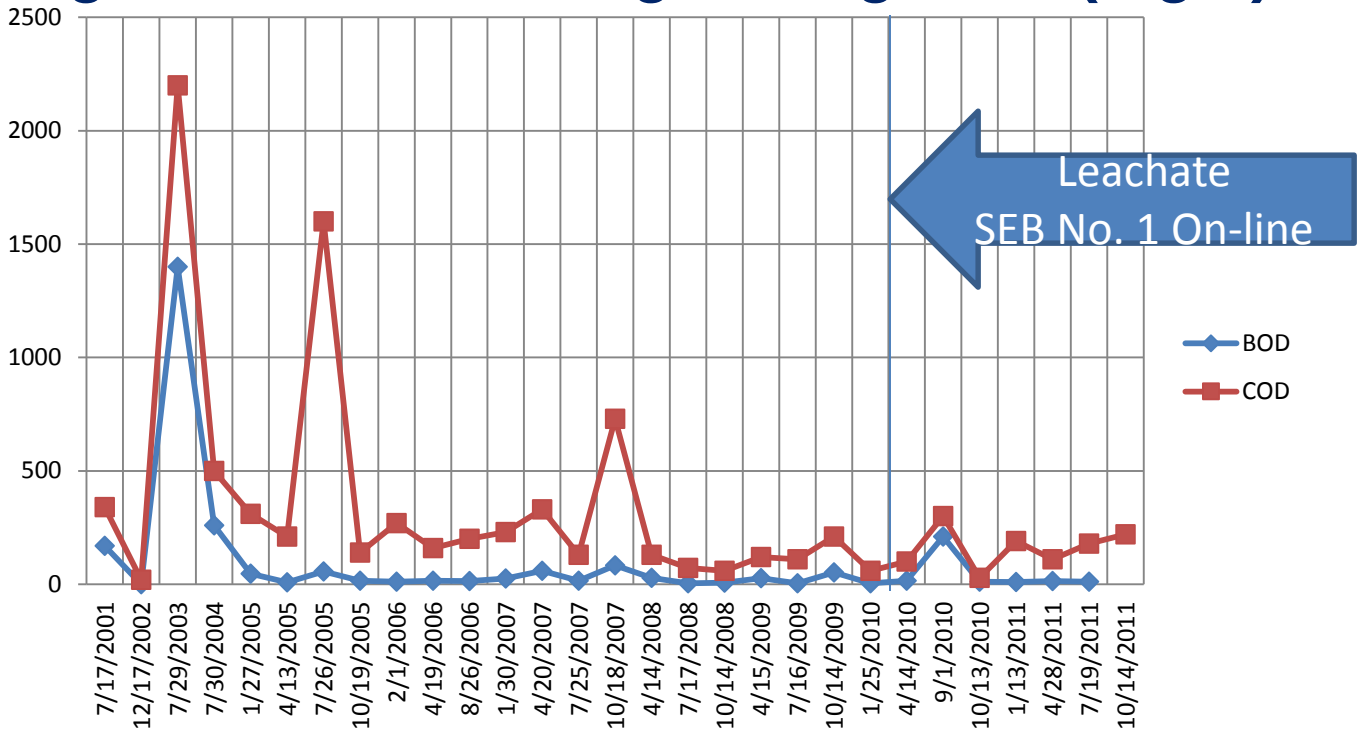


Figure 5 - TSS (mg/L)

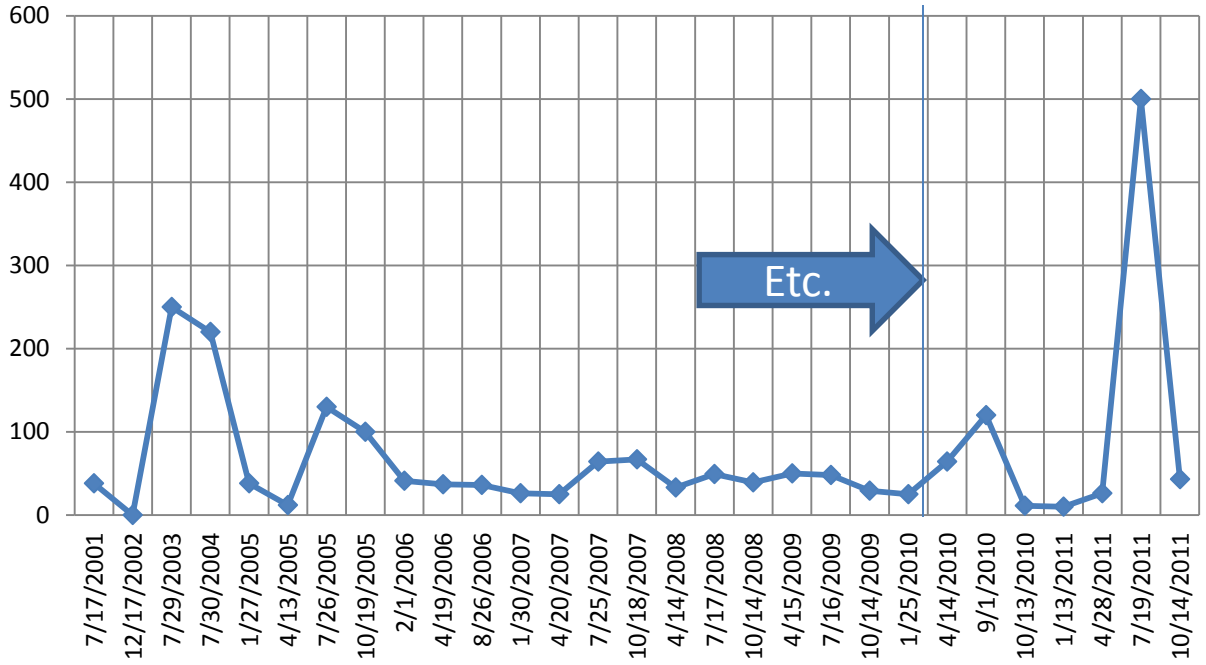


Figure 6 - Ammonia (mg/L)

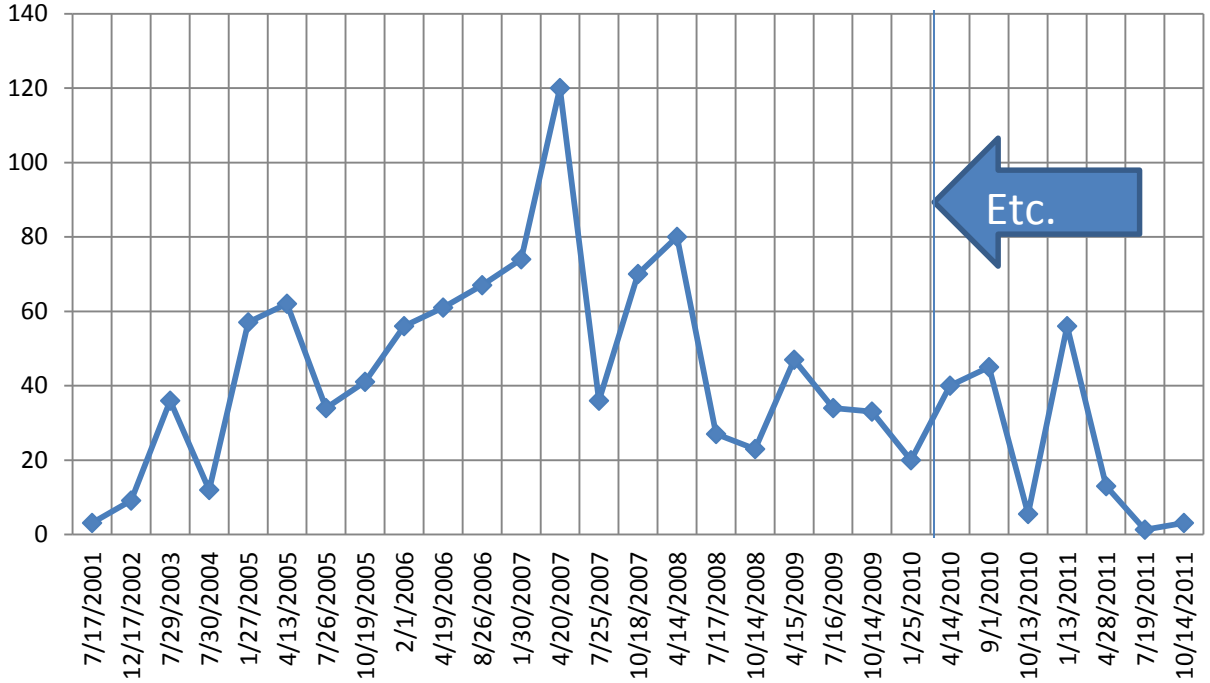


Figure 7 - pH

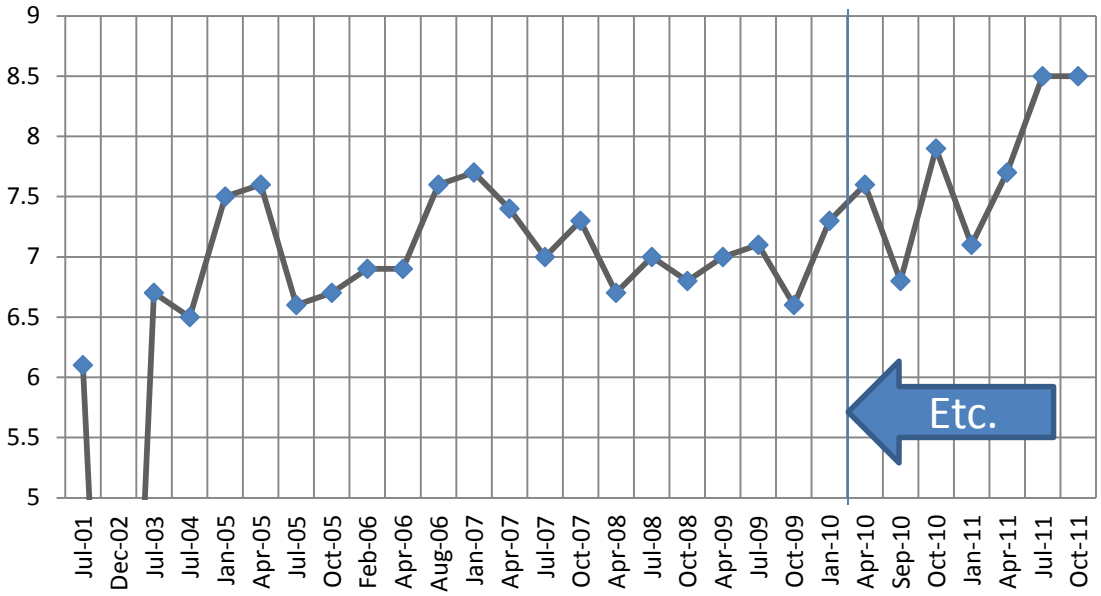
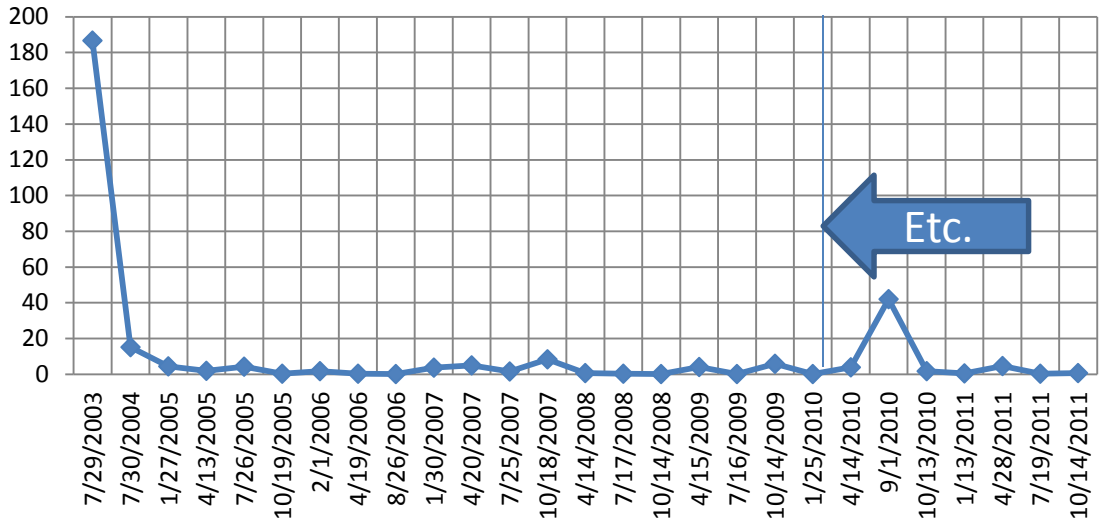
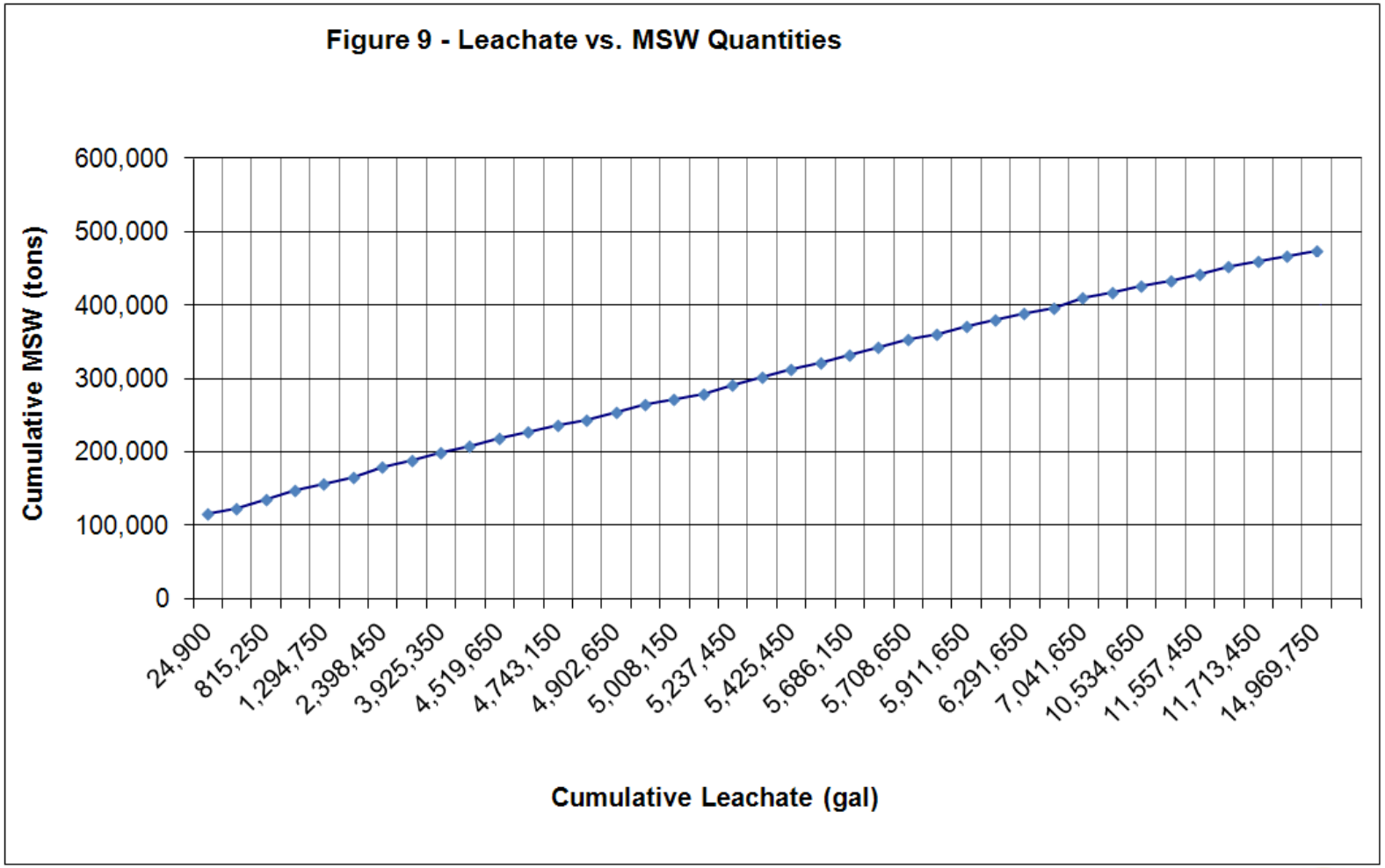

9
8.5
8
7.5
7
6.5
6
5.5
5
Jul-01
Dec-02
Jul-03
Jul-04
Jan-05
Apr-05
Jul-05
Oct-05
Feb-06
Apr-06
Aug-06
Jan-07
Apr-07
Jul-07
Oct-07
Apr-08
Jul-08
Oct-08
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Sep-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Etc.

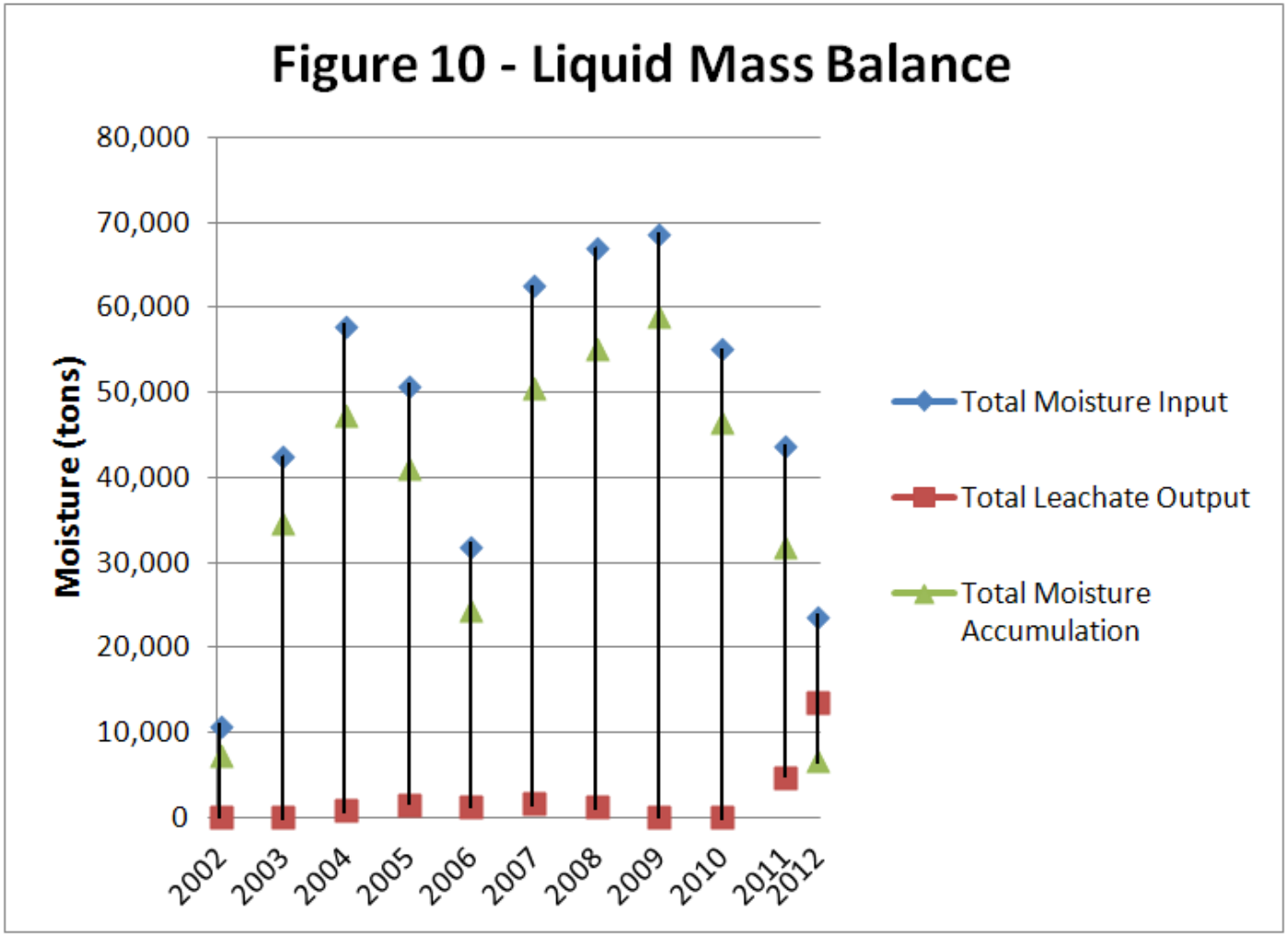
Figure 8 - BOD5 Mass Flow (lb/day)



3. To establish useful correlations:



4. To make a water balance:



5. To meet discharge requirements:

Table 4 - MSWLF Effluent Limitations vs. ACL Leachate Data

Regulated parameter	Maximum daily[1]	ACL Leachate [1, 3]	Maximum monthly avg.[1]	ACL avg. Leachate [1,3]
BOD_5	140	5 to 51	37	16.8
TSS	88	10 to 120	27	45.7
Ammonia (as N)	10	5.5 to 56	4.9	23.4
α-Terpineol	0.033	NA	0.016	NA
Benzoic acid	0.12	NA	0.071	NA
p -Cresol	0.025	NA	0.014	NA
Phenol	0.026	NA	0.015	NA
Zinc	0.20	NA	0.11	NA
pH	([2])	6.8 to 8.5	([2])	7.7

[1]Milligrams per liter (mg/L, ppm)
[2]Within the range 6 to 9.
[3]Based on last two years (2010 to 2011) of ACL data.

Contact Information for copy of PPP and/or paper with same title:

Dr. Carl E. Burkhead

cburkhead@kdheks.gov

785-296-6898

Or, just give me your business card.

www.kdheks.gov

Our Mission: To protect and improve the health and environment of all Kansans.