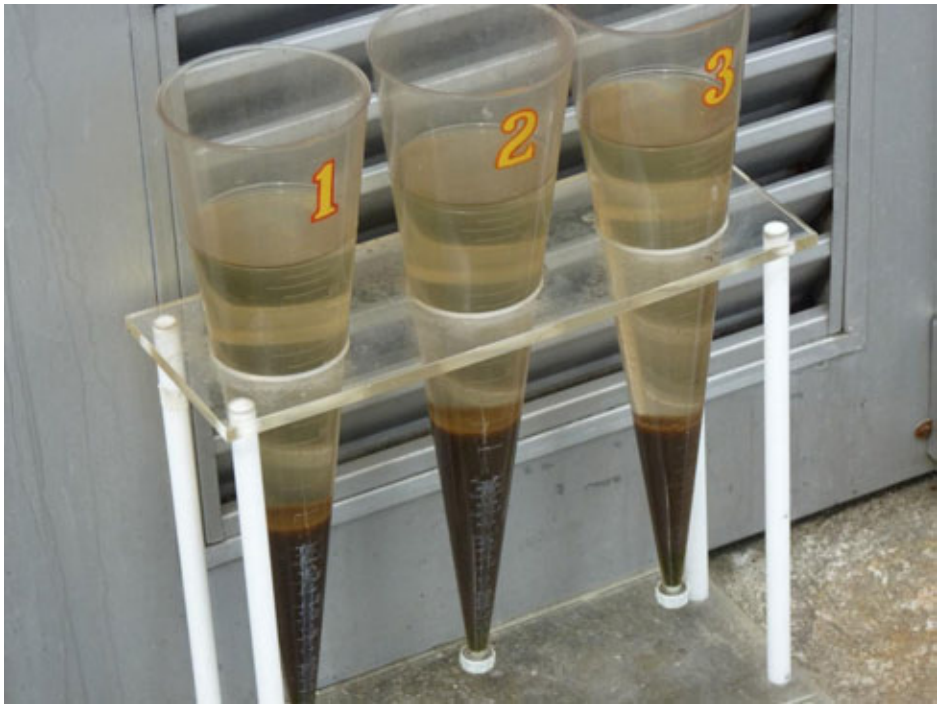
Fecal Sludge Waste Characterization Study for Indonesia



For CSE Learning Event
April 4, 5 2016

Waste Characterization Study – *why do it?*

- The information is used to:
  - Select appropriate technologies
  - Size treatment equipment

- Assumed values may result in significant under-sizing or oversizing facilities

Desludging practices in Indonesia

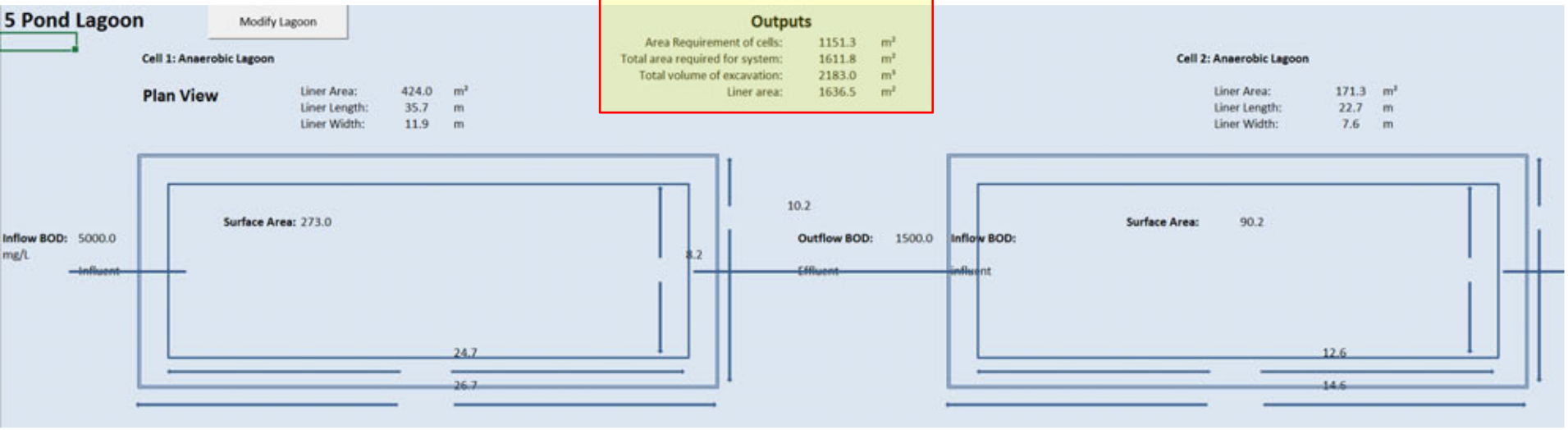
Characterization of septage (US EPA)

Parameter	Concentration (mg/L)		
	Average	Minimum	Maximum
Total solids	34,106	1,132	130,475
Total volatile solids	23,100	353	71,402
Total suspended solids	12,862	310	93,378
Volatile suspended solids	9,027	95	51,500
Biochemical oxygen demand	6,480	440	78,600
Chemical oxygen demand	31,900	1,500	703,000
Total Kjeldahl nitrogen	588	66	1,060
Ammonia nitrogen	97	3	116
Total phosphorus	210	20	760
Alkalinity	970	522	4,190
Grease	5,600	208	23,368
pH	—	1.5	12.6

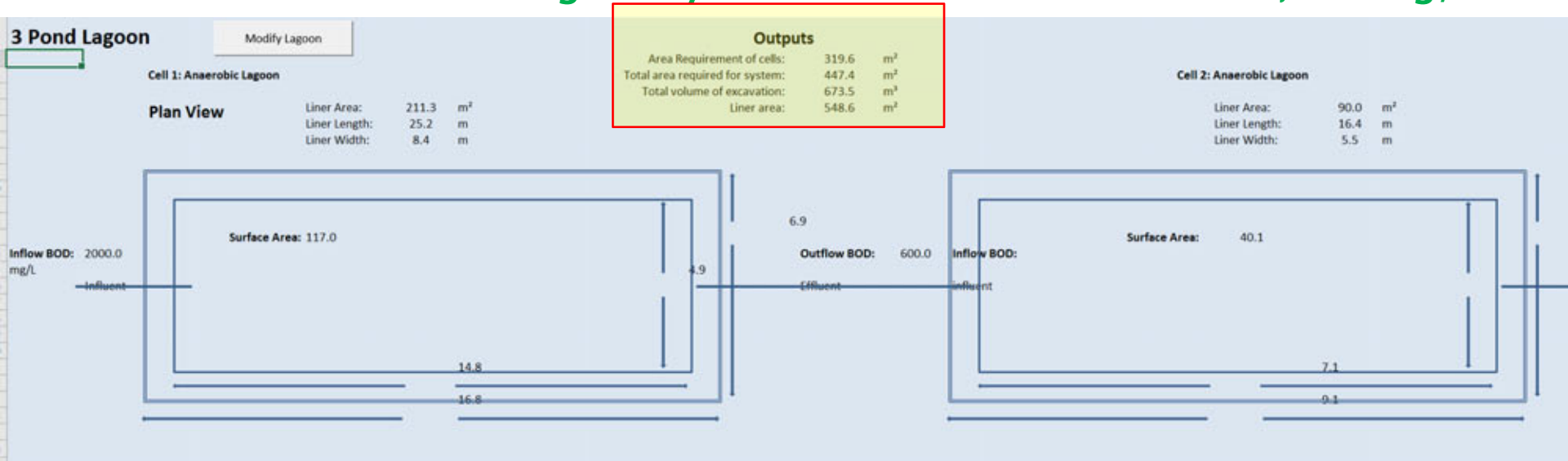
BOD – huge variability. Does it really matter?

Facility sizing

FS treatment Lagoon system: Flow 50 m^3 at BOD = 5,000 mg/l



FS treatment Lagoon system: Flow 50 m^3 at BOD = 2,000 mg/l



Facility sizing

FS treatment Lagoon system: Flow 50 m^3 at BOD = 5,000 mg/l

Outputs		
Area Requirement of cells:	1151.3	m^2
Total area required for system:	1611.8	m^2
Total volume of excavation:	2183.0	m^3
Liner area:	1636.5	m^2

FS treatment Lagoon system: Flow 50 m^3 at BOD = 2,000 mg/l

Outputs		
Area Requirement of cells:	319.6	m^2
Total area required for system:	447.4	m^2
Total volume of excavation:	673.5	m^3
Liner area:	548.6	m^2

Objective – *develop a standardized procedures for cities to follow to obtain real data*

1. Preparing a **sampling plan**
2. Collecting **representative** samples
3. Handling and **preserving** samples properly
4. **Document** the sampling activities
5. Conducting proper analysis and **QA / QC**

Sampling plan

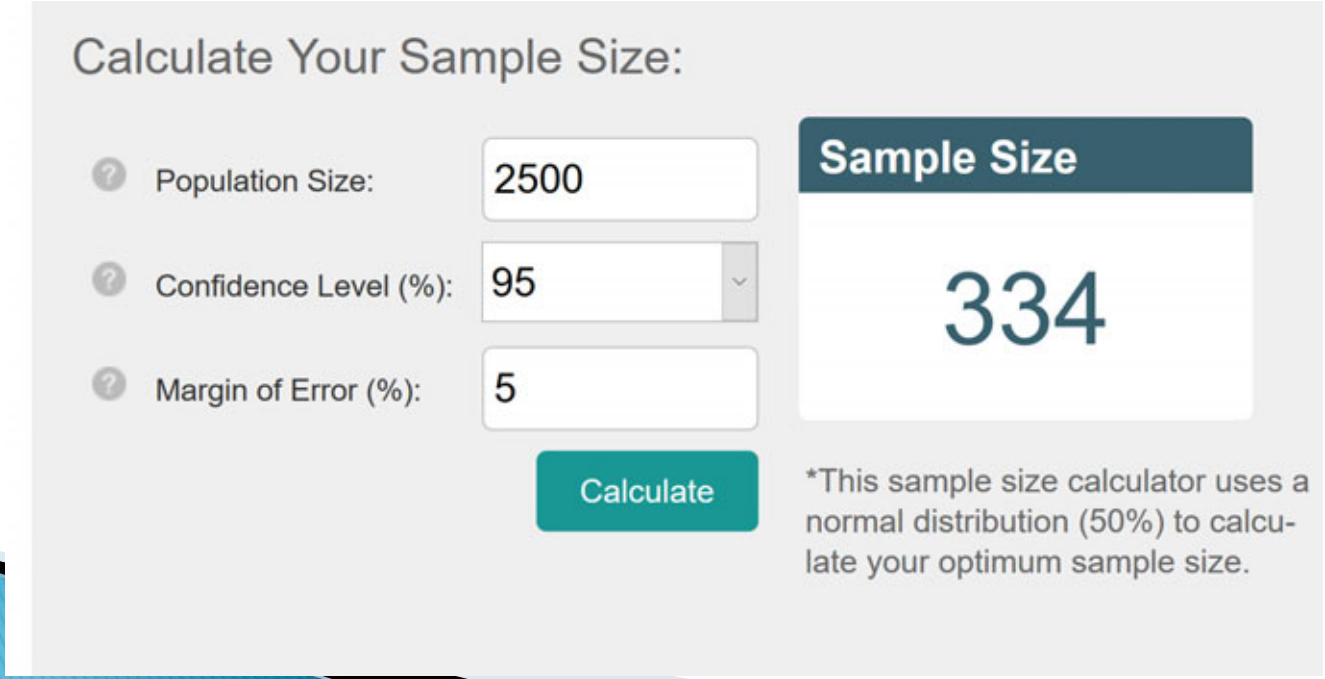
- **How many** samples will be collected?
- What will be **tested** for?
- Which **sampling procedure** will be used?
- **Who** will conduct the sampling?
- Where will the samples be **analyzed**
- How will the samples be **transported** to the lab

How will the work be done safely and represent as closely as possible the actual waste characteristics?

How many samples

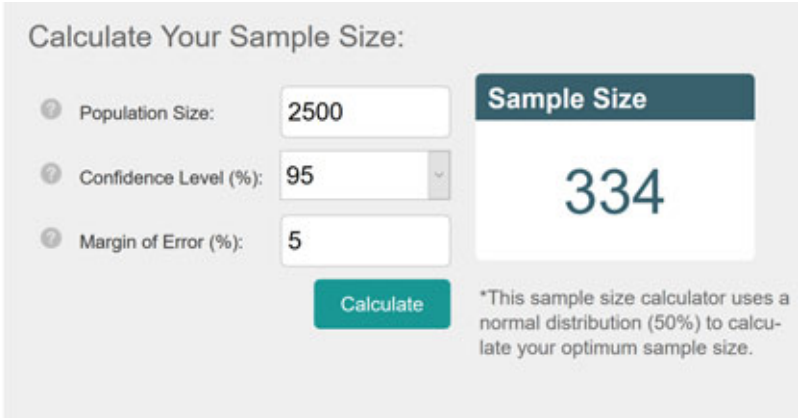
Confidence level: How often the true result lies within the percentages expressed in the Margin of Error

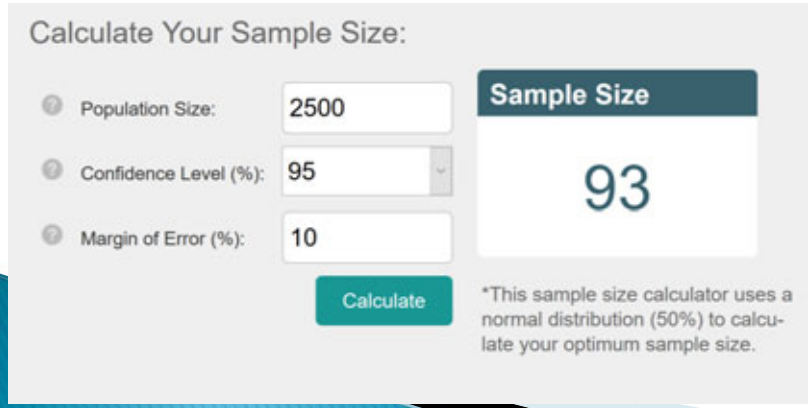
Margin of Error: likelihood that the result from a sample is close to the number one would get if the whole population had been queried



How many samples

- Margin of error
- Confidence level
- Budget





For Indonesian Study:

- Sample in different seasons
- Start now to feed data into design process;
- In each season
  - 3 days of sampling and 20 samples each day
  - One week later another 3 days of samples with 20 samples each day
  - We can see how consistent they were and see what more is needed

Sampling method

- **Grab sample**
- **Composite**
- **Flow weighted composite**

- Use the site glass on the truck to time the samples
- Use hygienic sampling practices

For Indonesia program:

- Each sample will be a composite of 3 equal portions
  - Some from start (what has settled)
  - Some from end
  - Some from in between
- Then mix equal amounts prior filling the bottles and sending to lab)

What to test for

Primary constituents

- BOD
- TSS
  - % volatile solids
  - Indication of sand
- COD
- NH3-N
- Fats, Oil and Grease (FOG)
- Sludge Volume Index (SVI)
- pH
- alkalinity

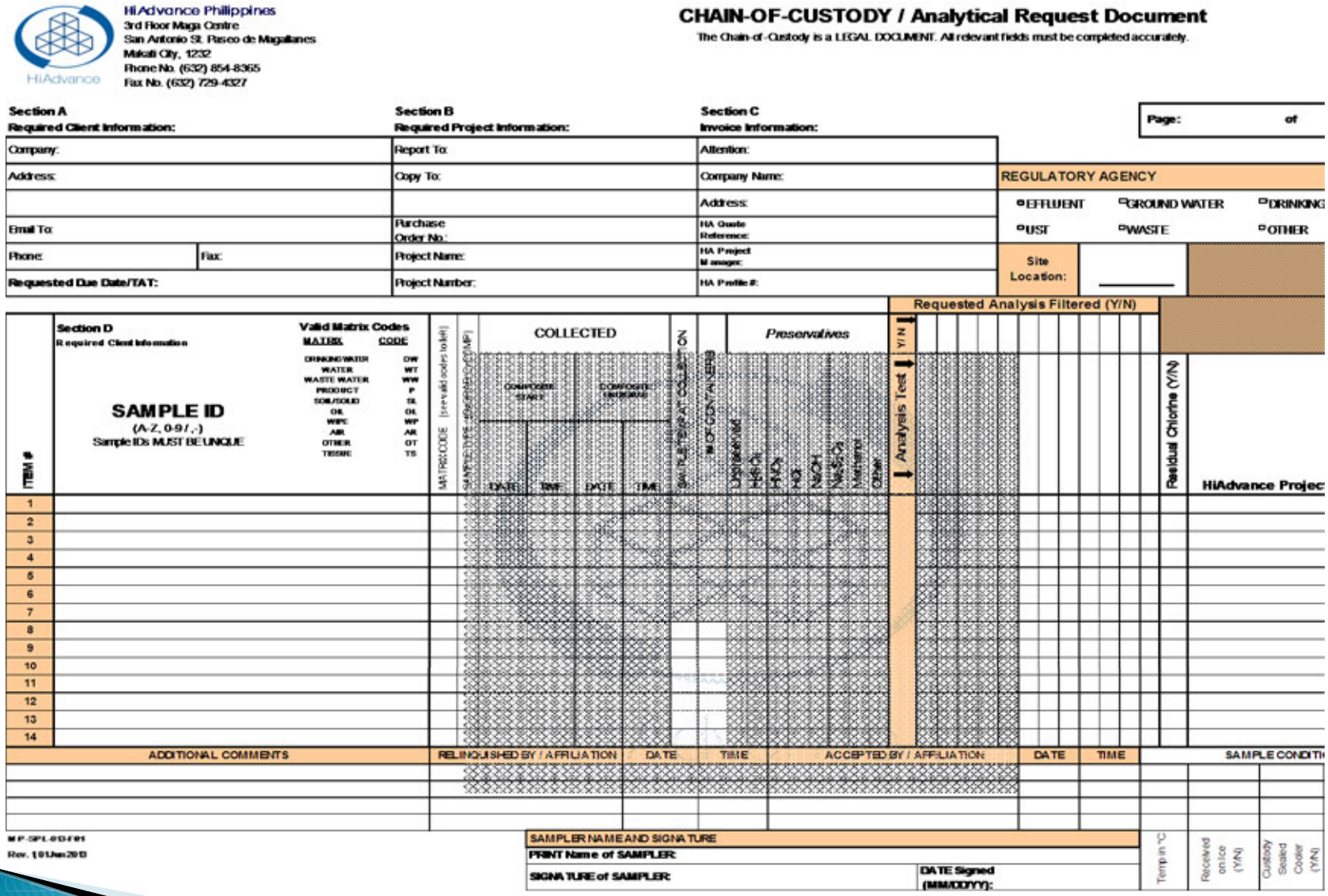
Secondary Importance

- TP
- TN
  - TKN
  - NO3

These are all useful in designing FS treatment systems. Work with lab early on to obtain sample bottles, volume of sample needed and field preservation method

These become more important for large systems using activated sludge or SBR processes

Recordkeeping



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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:	Section C Invoice Information:	Page: of
Company:		Report To:	Attention:	
Address:		Copy To:	Company Name:	REGULATORY AGENCY
			Address:	☐ EFFLUENT ☐ GROUND WATER ☐ DRINKING
Email To:		Purchase Order No.:	HA Quote Reference:	☐ UST ☐ WASTE ☐ OTHER
Phone:	Fax:	Project Name:	HA Project Manager:	Site Location:
Requested Due Date/TAT:		Project Number:	HA Profile #:	

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / , -)
Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (DW, GW, WW, SW, SO, NP)	COLLECTED: COMPOSITE START DATE	COLLECTED: COMPOSITE START TIME	COLLECTED: COMPOSITE END DATE	COLLECTED: COMPOSITE END TIME	SAMPLE TEMPERATURE AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	HNO3	H2SO4	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N)	Analysis Test	Residual Chlorine (Y/N)	HiAdvance Project
1																					
2																					
3																					
4																					
5																					
6																					
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8																					
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10																					
11																					
12																					
13																					
14																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITI

MP-SPL-03-F01
Rev. 1 01Jun2013

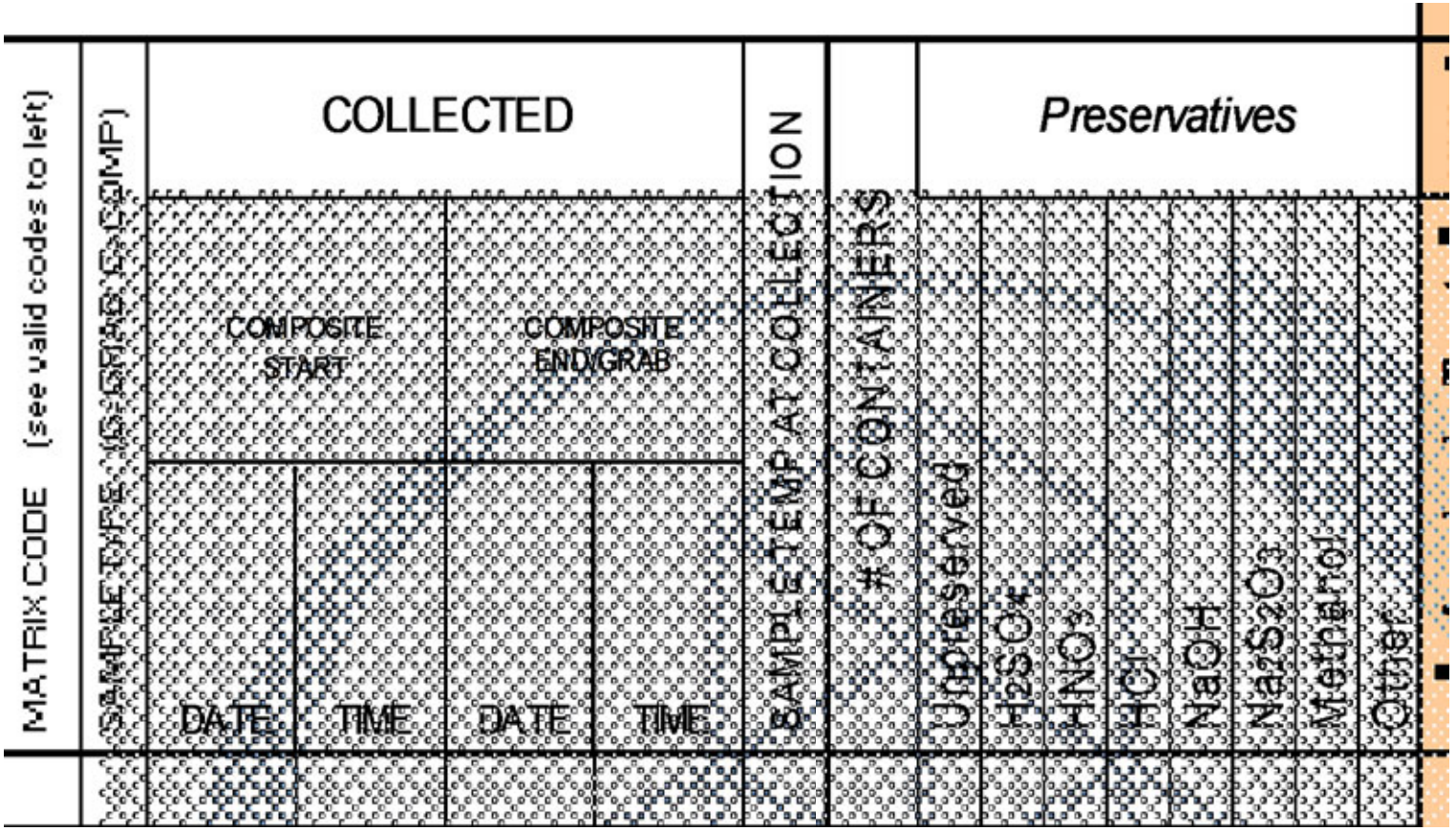
SAMPLER NAME AND SIGNATURE		Temp in °C	Received on ice (Y/N)	Custody Sealed Cooler (Y/N)
PRINT Name of SAMPLER:				
SIGNATURE of SAMPLER:	DATE Signed (MM/DD/YY):			

Recordkeeping

Section A Required Client Information:		Section B Required Project Information:	Section C Invoice Information:
Company:		Report To:	Attention:
Address:		Copy To:	Company Name:
			Address:
Email To:		Purchase Order No.:	HA Quote Reference:
Phone:	Fax:	Project Name:	HA Project Manager:

Contact, reporting and billing information

Recordkeeping



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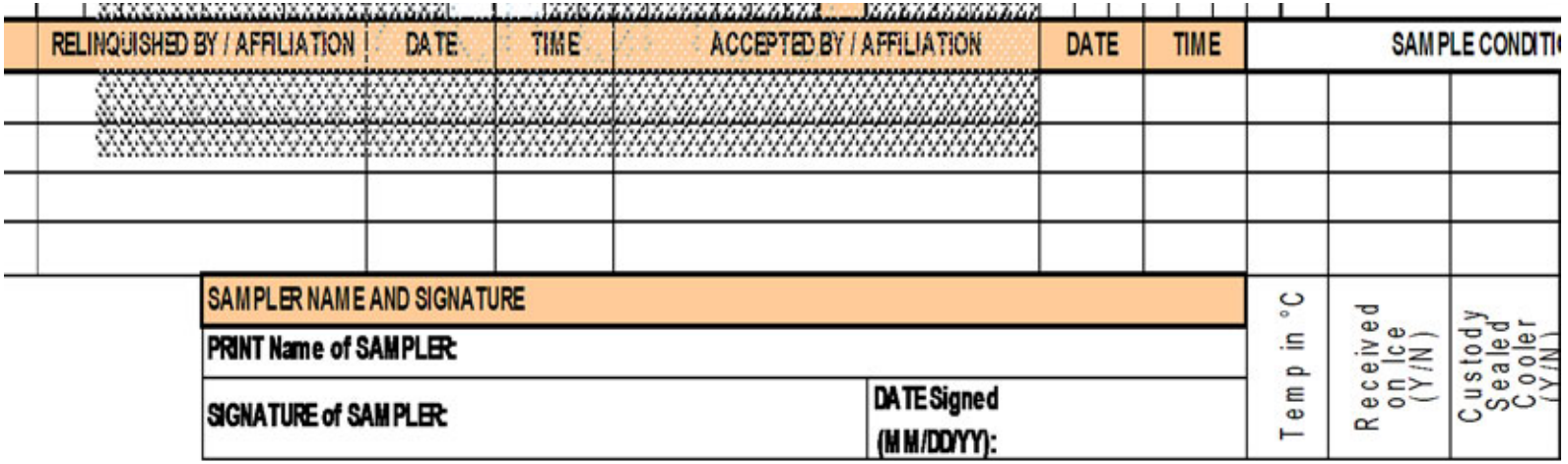

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITI

SAMPLER NAME AND SIGNATURE		Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)
PRINT Name of SAMPLER:				
SIGNATURE of SAMPLER:	DATE Signed (MM/DD/YY):			

Custody chain – who has the sample and when

QA/QC Indonesia project

- Use of **standard operating procedures** for sample collection and analysis;
- Use of **chain-of-custody** and sample-identification procedures;
- Instrument **standardization, calibration**, and verification;
- Sampling technician and analyst **training**;
- Assurance of appropriate **preservation, handling**, and decontamination; and
- Use of QC samples such as field and trip **blanks, duplicates**, and equipment rinses.

Sampling plan

Sampling Plan Check List	Y	N
There is a written sampling plan		
The number of samples, the analytical tests, and the sampling locations have been identified in the plan.		
The laboratory that will do the analysis has been contacted, procedures have been reviewed, and services have been scheduled.		
All sampling bottles, sample preservatives, labels, ice chests, and Chain of Custody forms have been received.		
The person(s) who will conduct the sampling has been trained in proper procedures.		
Health and safety training, as well as the required personal protective equipment, has been provided.		
Access to the sampling locations is open and unrestricted.		
Transport of the samples to the laboratory has been arranged and will be done within the required hold times.		
The laboratory is licensed to conduct the required work and that they have a QA/QC plan.		

Other points to consider

- How might the characteristics of the fecal sludge change over time as **procedures improve**?
- Should there be some effort to correlate samples from **different collection operators** (public and private) as desludging practices may vary?
- How about trying to identify differences in sludge quality collected by **different desludging equipment**?

Thank you!

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