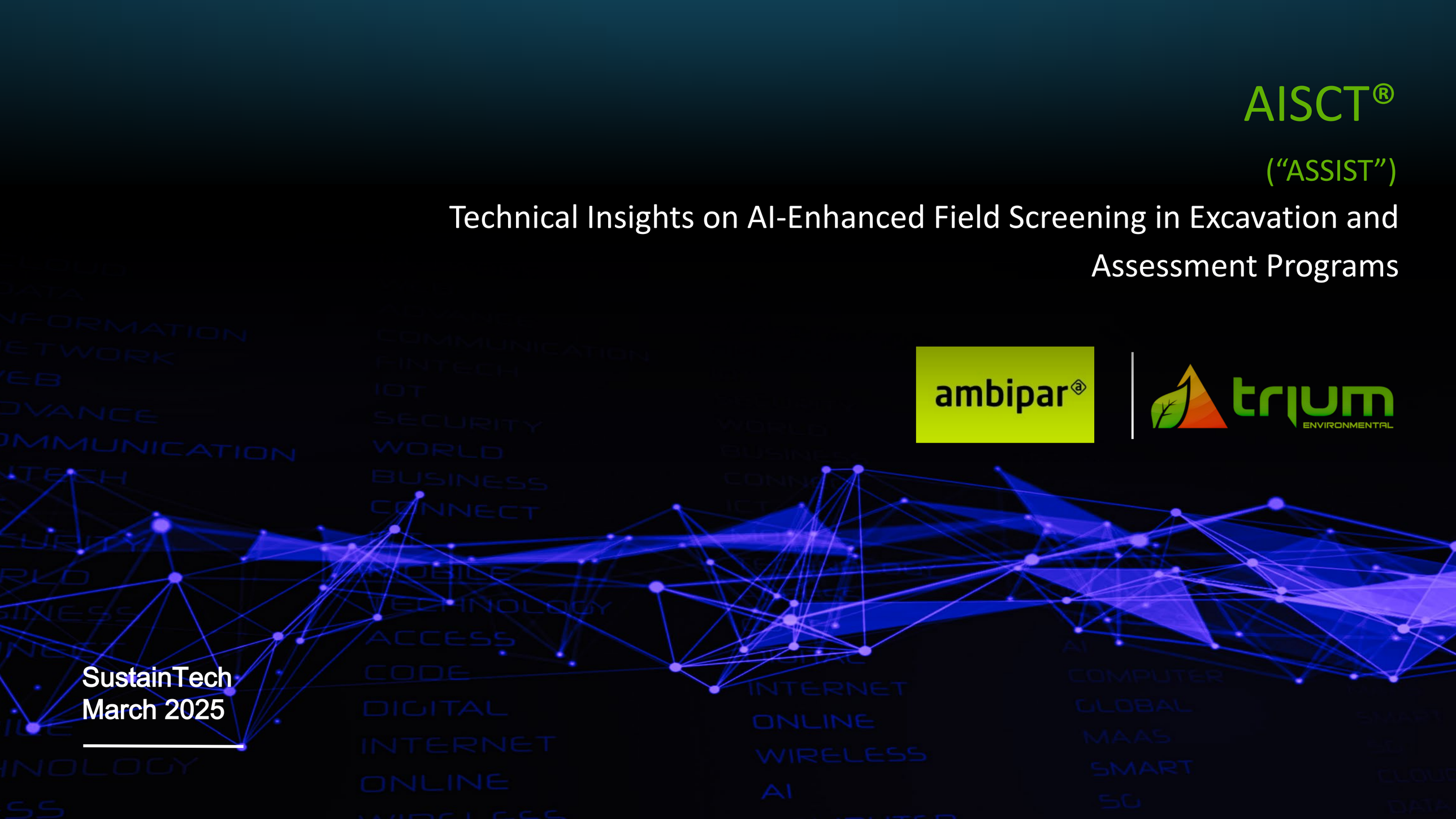
AISCT®

(“ASSIST”)

Technical Insights on AI-Enhanced Field Screening in Excavation and Assessment Programs



SustainTech
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PRESENTATION OUTLINE

- What is the challenge with Field Screening?
- Project Background
- Application of AISCT in Assessment Program
- Application of AISCT in Remediation Program
- AISCT – a Consultant's Perspective

CURRENT FIELD SCREENING PRACTICE

Petroleum Hydrocarbons

A Photoionization Detector (PID) or Flame Ionization Detector (FID) is a type of gas detector used to measure volatile organic compounds (VOCs) and some inorganic compounds in the air.

Limitations :

- Sensitive to Humidity/Soil Type
- Interferences
- Maintenance: The UV lamp and sensor can become contaminated quickly, requiring regular cleaning and calibration
- Limited Selectivity: may not distinguish between VOCs

Prone to Error:

- Preparation
- Calibration/Over Limit
- Collection - Temperature
- Contaminant - User Etc.

EASE OF USE = EASE OF MISUSE

Challenges of Measuring Chloride

01 • EC and other indicator parameters biased by other ions and salt makeup.

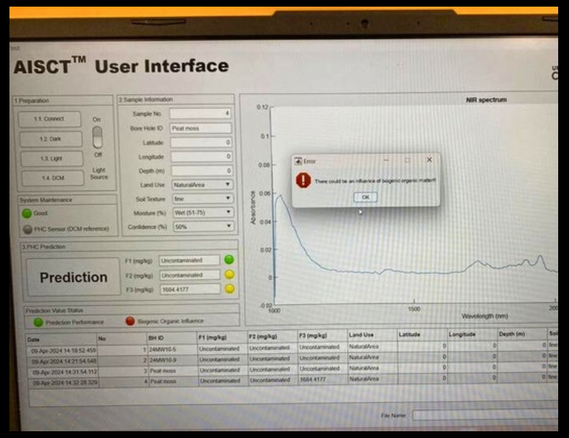
02 • Few technologies for ion specific analysis.

03 • Lacking accuracy and precision

04 • Importance of consistency and reliability among users.

05 • Low standardization of methodology.

AISCT Setup and Operations



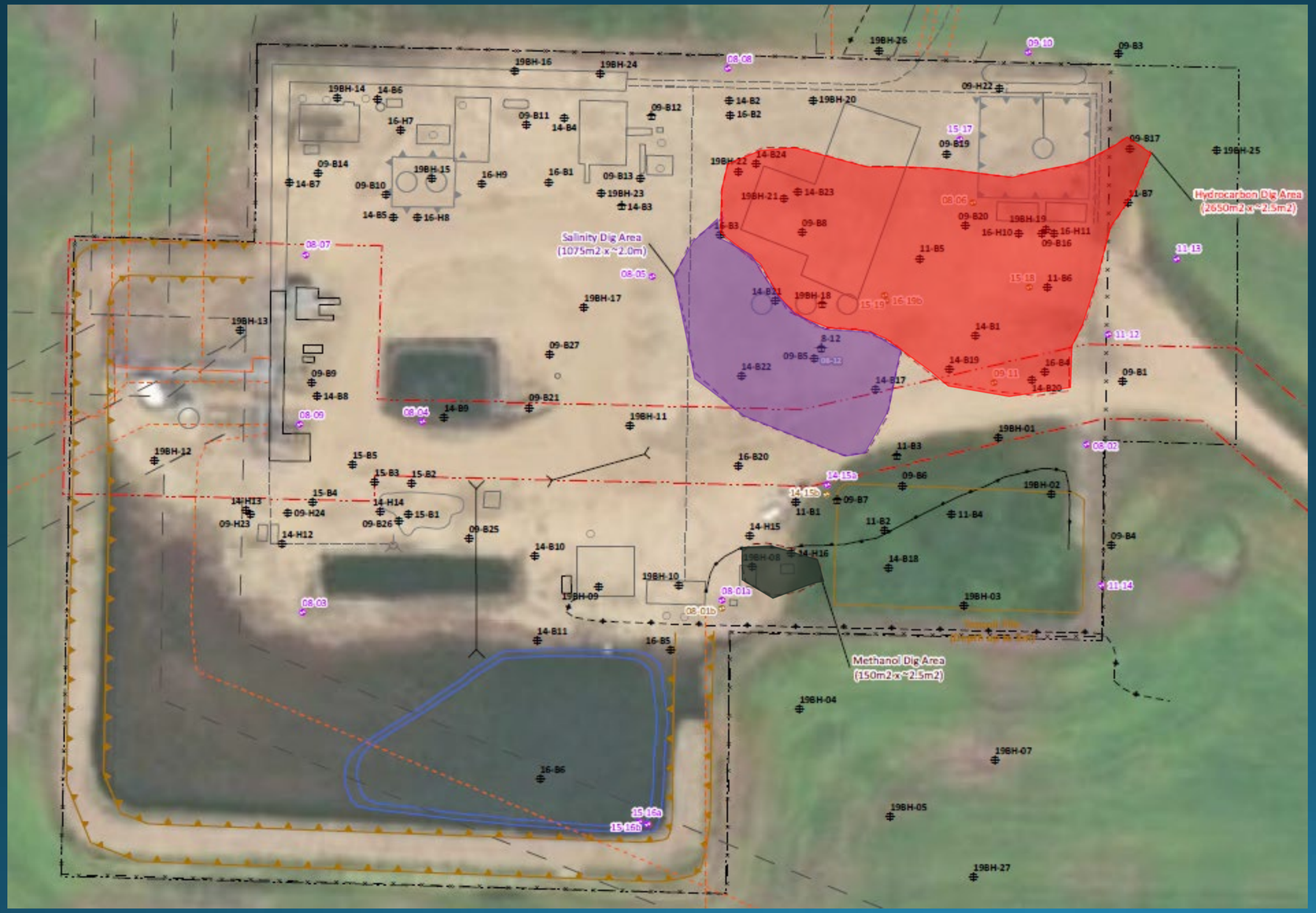
PROJECT BACKGROUND

- Gas well drilled in late 1950s and it was abandoned in 1990s
- Sweet gas production started in 1970s
- Sour gas production started in 1990
  - Regulated under EPEA Approval
- Gas plant decommissioned in 2019

PROJECT BACKGROUND

- Soil and groundwater data available since early 2000s
- 2023 RAP for methanol, salinity and PHC impacts
  - Approved by AER
- Public bid to execute Phase 1 of the remediation project

PROJECT BACKGROUND



Phase 1:

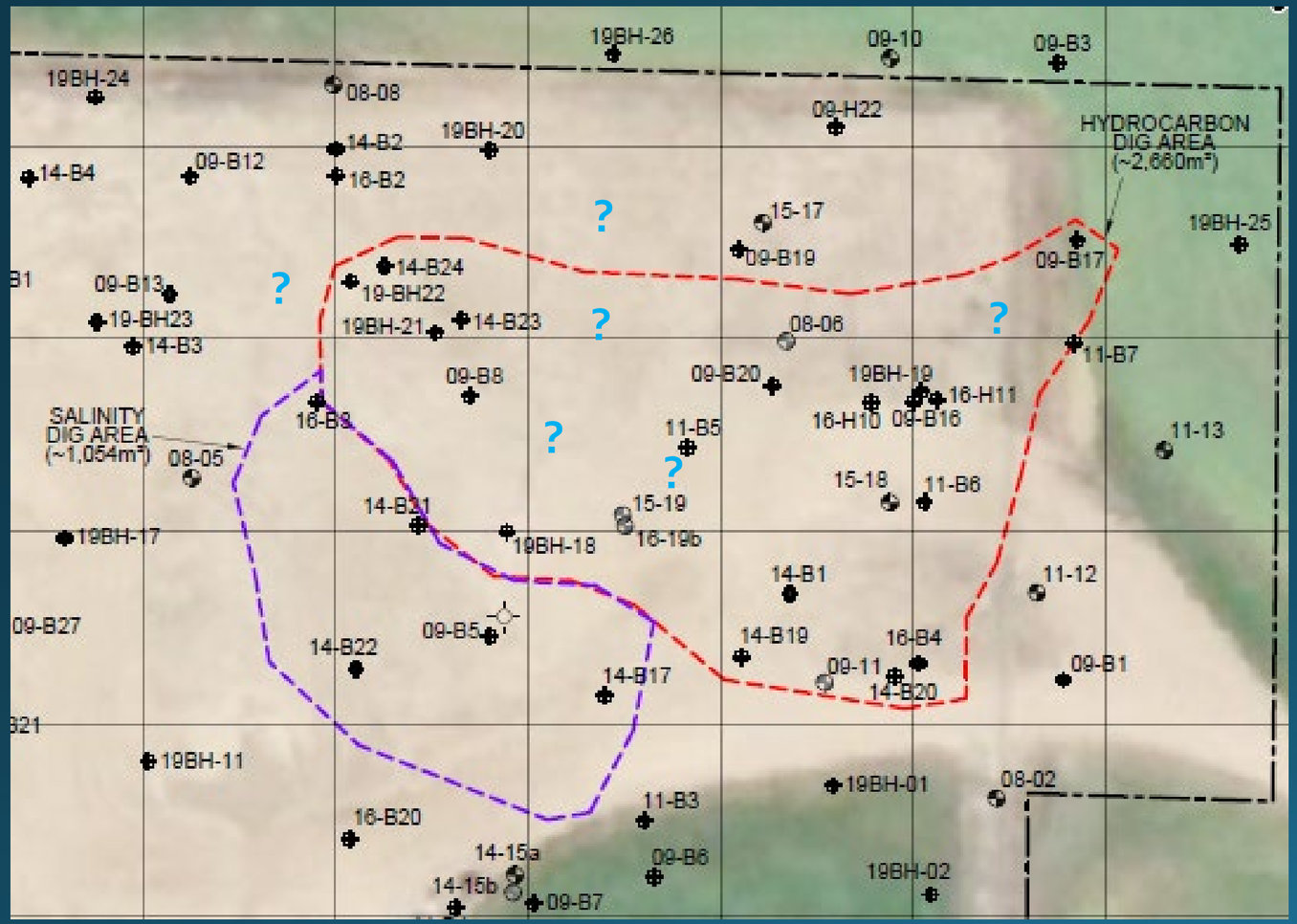
PHC Impacts – Area of 2,650 m² to 2.5 m depth

Methanol Impacts – Area of 150 m² to 2.5 m depth

Phase 2:

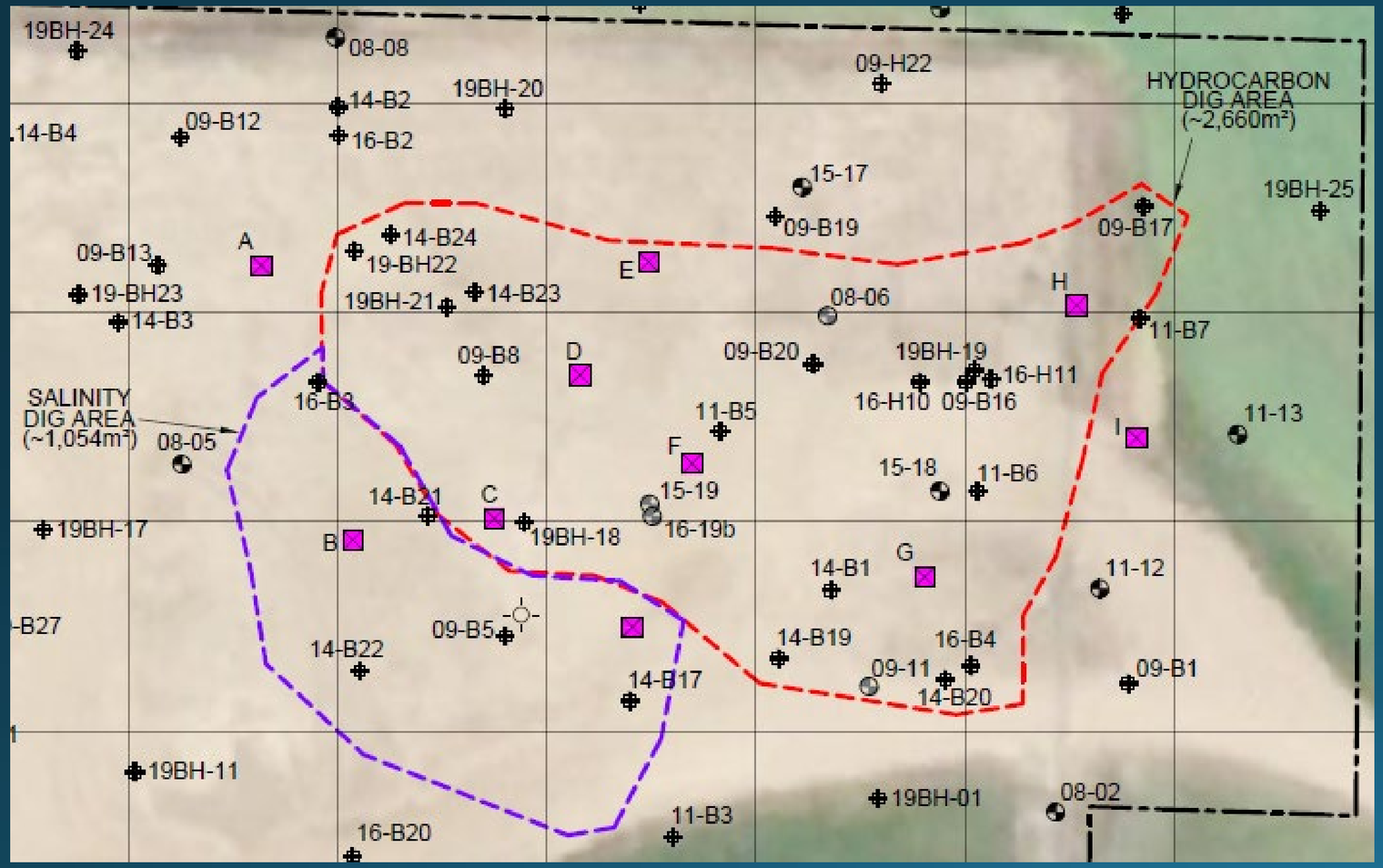
Salinity Impacts – Area of 1,075 m²

ASSESSMENT PHASE



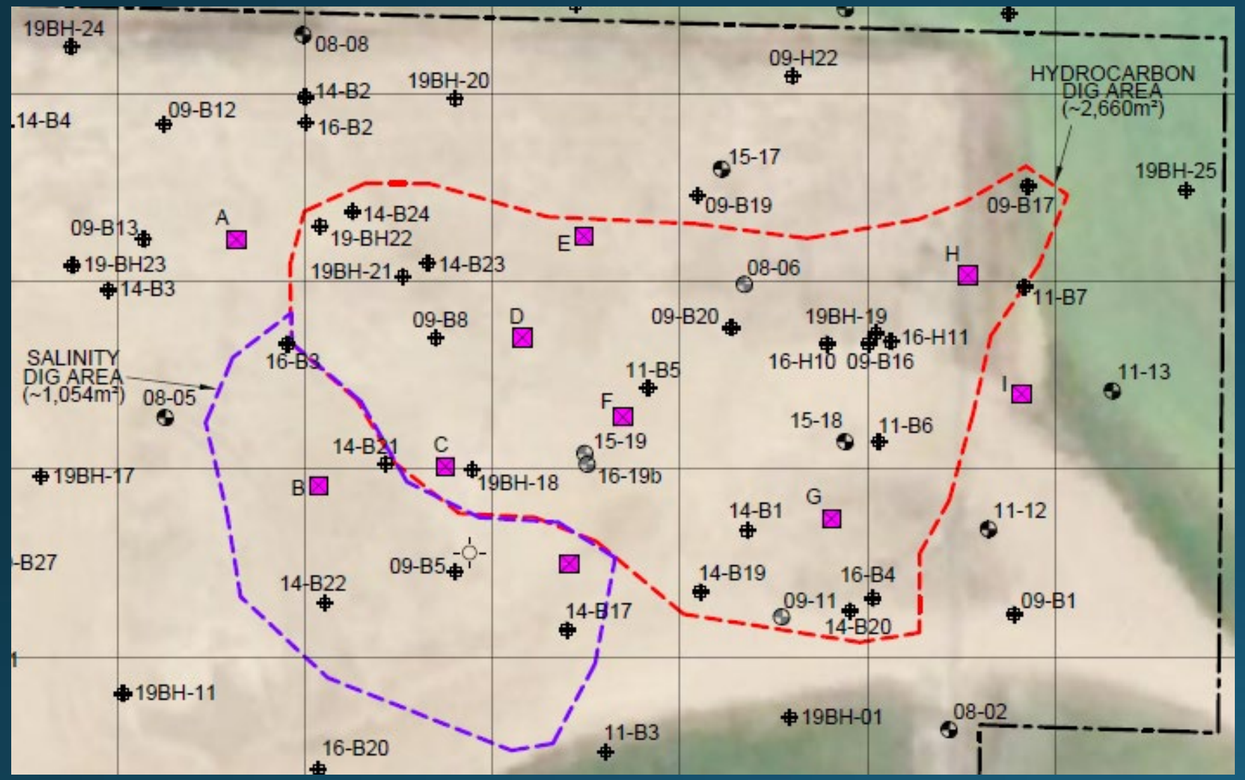
- Issues identified in data review:
  - Current guidelines not used for comparison purposes in analytical tables
- Lack of vertical delineation
- Lack of lateral delineation
- Insufficient characterization

ASSESSMENT PHASE



- Test Pit Investigation:
  - to collect soil data to address the identified data gaps
  - to trial AISCT technology
- 10 test pits excavated
- Soil samples were screened using OVA and AISCT at 1 m intervals
  - worst case sample submitted for laboratory analysis by Ambipar
  - all samples were screened using AISCT for comparison against OVA and lab data

ASSESSMENT PHASE



- Field screening, laboratory and AISCT data comparison (test pits):
  - 54% of samples would have been excavated unnecessarily (false positive @ >100 ppm OVA screening criteria)
  - 11% of samples required remediation but would have been missed by OVA (<100 ppm)
- Depth of impacts extended (3.5-5 m vs. 2.5 m specified in the RAP)
- Chloride impacts identified outside work scope area in test pit "A"

ASSESSMENT PHASE – Portion of Test Pit Data

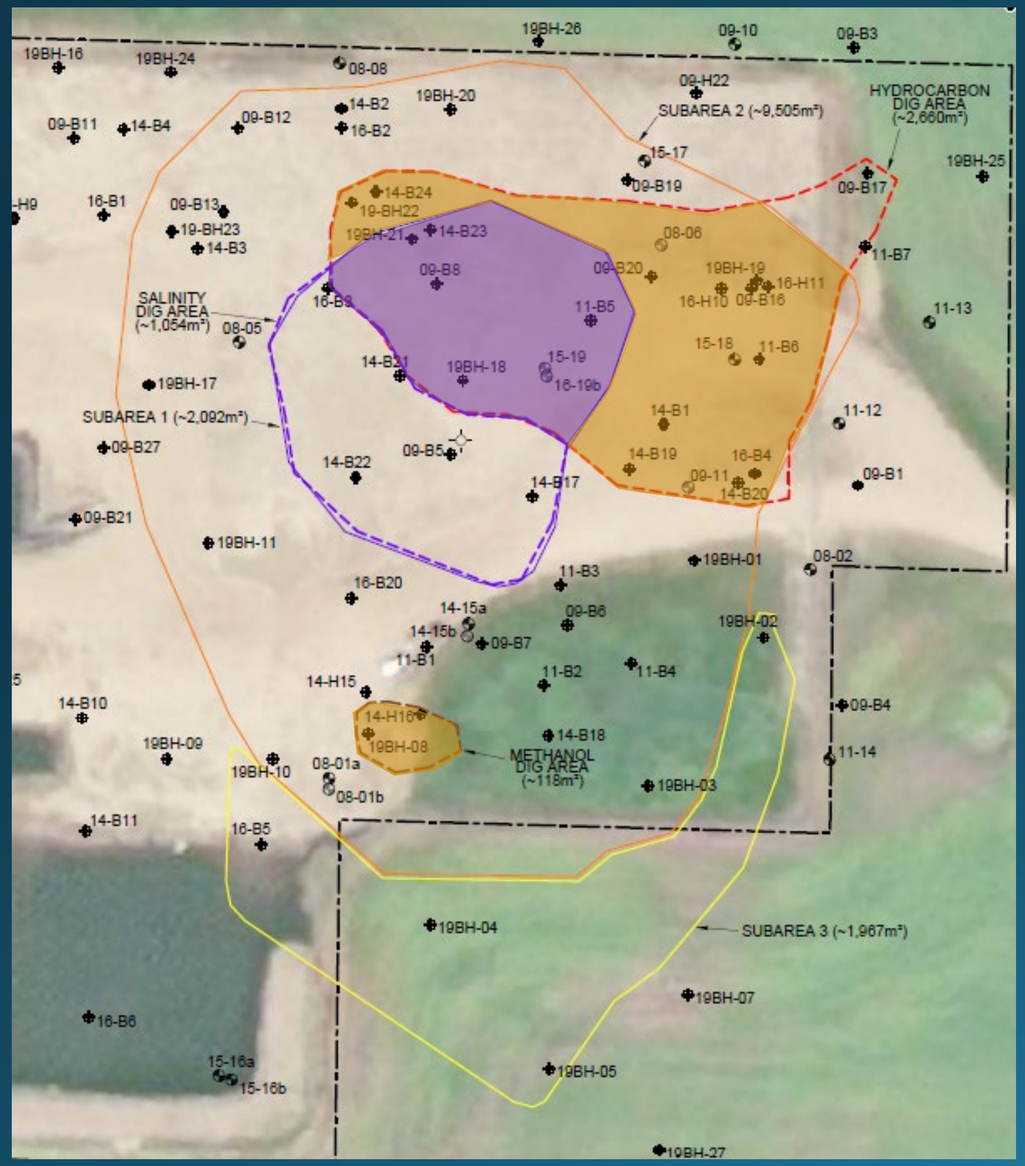
AISCT PHC – 95% Correct Prediction

Sample log		GC - Laboratory (mg/kg)			AISCT (20%) (mg/kg)		
Sample ID	OVA (ppm)	F1	F2	F3	F1	F2	F3
Test Pit A 1.0m	20				M.C.	M.C. (within buffer)	M.C.
Test Pit A 2.0m	50				M.C.	M.C.	M.C.
Test Pit A 3.0m	110	<10	<10	12	M.C.	M.C.	M.C.
Test Pit A 4.0m	15				M.C.	M.C.	M.C.
Test Pit A 5.0m	5				M.C.	M.C.	M.C.
Test Pit B 1.0m	10				M.C.	M.C.	M.C.
Test Pit B 2.0m	5				M.C.	M.C.	M.C.
Test Pit B 3.0m	10				M.C.	M.C.	M.C.
Test Pit B 4.0m	15	<10	<10	19	M.C.	M.C.	M.C.
Test Pit B 5.0m	10				M.C.	165.2 (within buffer)	M.C.
Test Pit C 1.0m	55				M.C.	454.6	M.C.
Test Pit C 2.0m	200	160.0	482.0	42.0	M.C.	670.8	M.C.
Test Pit C 3.0m	65				M.C.	M.C.	M.C.
Test Pit C 4.0m	30				M.C.	M.C.	M.C.
Test Pit C 5.0m	0				M.C.	M.C.	M.C.
Test Pit D 1.0m	2100				M.C.	697.2	M.C.
Test Pit D 2.0m	3100	700.0	175.0	159.0	M.C.	154.7 (within buffer)	M.C.
Test Pit D 3.0m	800				M.C.	833.0	M.C.
Test Pit D 4.0m	320				M.C.	162.4 (within buffer)	M.C.
Test Pit D 5.0m	15				M.C.	M.C.	M.C.
Test Pit E 1.0m	5	<10	<10	13.0	M.C.	M.C.	M.C.
Test Pit E 2.0m	5				M.C.	M.C.	M.C.
Test Pit E 3.0m	0				M.C.	M.C.	M.C.
Test Pit E 4.0m	0				M.C.	M.C.	M.C.
Test Pit E 5.0m	0				M.C.	M.C.	M.C.
Test Pit F 1.0m	200				M.C.	M.C.	M.C.
Test Pit F 2.0m	25				M.C.	673.6	M.C.
Test Pit F 3.0m	460	640.0	90.0	19.0	M.C.	178.5 (within buffer)	M.C.
Test Pit F 4.0m	10				M.C.	M.C.	M.C.
Test Pit F 5.0m	0				M.C.	M.C.	M.C.
Test Pit G 1.0m	30				M.C.	M.C.	M.C.
Test Pit G 2.0m	125				M.C.	M.C.	M.C.
Test Pit G 3.0m	25				M.C.	M.C.	M.C.
Test Pit G 4.0m	640	80.0	11.0	17.0	M.C.	M.C.	M.C.
Test Pit G 5.0m	10				M.C.	M.C. (within buffer)	M.C.

Sal – AISCT >90% Correct Prediction

Sample log	Laboratory Ambipar (mg/kg)	AISCT (mg/kg)
Sample ID	Cl	Cl
Test Pit A 1.0m		N.D.
Test Pit A 2.0m		128.1
Test Pit A 3.0m	3,510	4502.9
Test Pit A 4.0m		Over Max.
Test Pit A 5.0m		2271.2
Test Pit C 1.0m		1250.5
Test Pit C 2.0m	1,020	1079.6
Test Pit C 3.0m		2220.8
Test Pit C 4.0m		1999.5
Test Pit C 5.0m		2325.1
Test Pit E 1.0m	15	70.6
Test Pit E 2.0m		N.D.
Test Pit E 3.0m		N.D.
Test Pit E 4.0m		N.D.
Test Pit E 5.0m		51.6
Test Pit G 1.0m		N.D.
Test Pit G 2.0m		169.5
Test Pit G 3.0m		844.6
Test Pit G 4.0m	1,040	1002.3
Test Pit G 5.0m		1264.3
Test Pit J 1.0m	7	99.9
Test Pit J 2.0m		71.2
Test Pit J 3.0m		64.5
Test Pit J 4.0m		63.7
Test Pit J 5.0m		N.D.

REMEDIATION PHASE

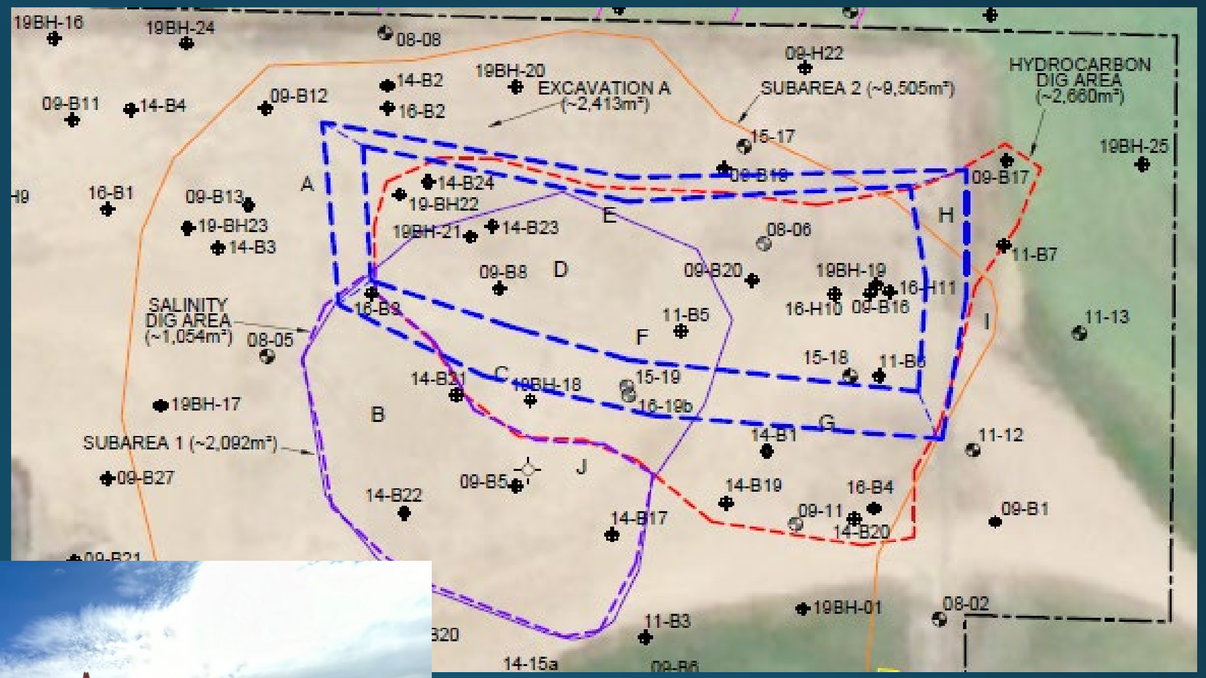


Remediation Targets:

- Tier 2 for PHC Parameters – FAL and DUA/PWA pathway exclusion
- Tier 2 chloride guidelines calculated with subsoil salinity tool (SST) for 3 subareas:
  - Subarea 1
    - Depth specific guidelines (1.5, 2.0, 2.5, 3.0 m)
  - Subarea 2
  - Subarea 3

Program challenge – how to effectively field screen to meet the site-specific guidelines?

REMEDIATION PHASE



Strategic excavation in small lifts to remove contamination

AISCT results available ~20 minutes

Submitted lab samples when confident to be 'clean'

AISCT used to identify boundary/delineation prior to excavation

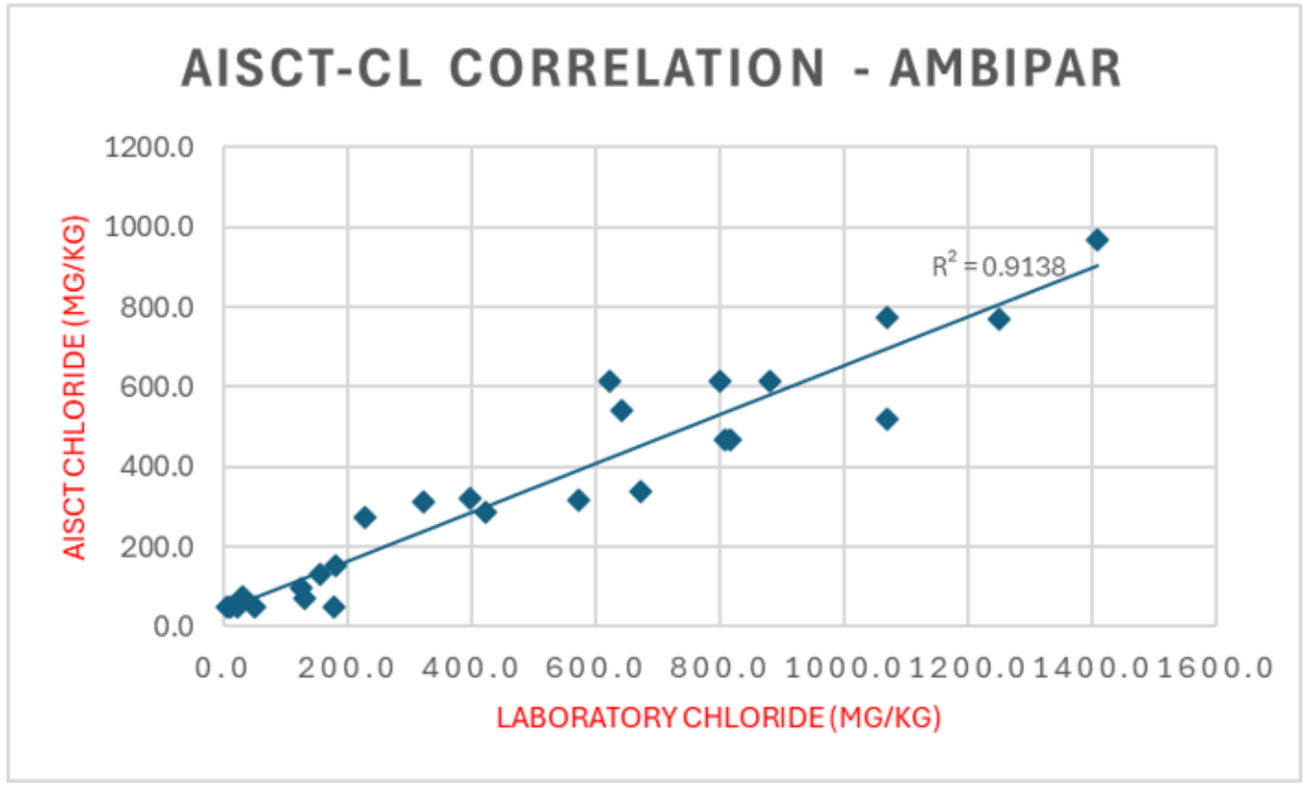
REMEDIATION PHASE – HYDROCARBON RESULTS

Parameter	Value
# Samples Analyzed	215
# of Exceedances Predicted	31
# of Laboratory Samples	24
# Correctly predicted	24
Correct Prediction	100%

	GC - Laboratory (mg/kg)			AISCT (20%) (mg/kg)		
Sample ID	F1	F2	F3	F1	F2	F3
WEST WALL 2 2.0	176.0	<10	22.0	M.C.	M.C.	M.C.
WEST WALL 3 2.0	18.0	<10	27.0	M.C.	M.C.	M.C.
WEST WALL 4 3.0	<10	<10	20.0	M.C.	M.C.	M.C.
NORTH WALL 2 3.0	<10	<10	21.0	M.C.	M.C.	M.C.
NORTH WALL 3 3.0	<10	<10	31.0	M.C.	M.C.	M.C.
NORTH WALL 4 3.0	<10	<10	19.0	M.C.	M.C.	M.C.
NORTH WALL 5 2.0	<10	<10	11	M.C.	M.C.	M.C.
1-1 BASE 2 3.5	<10	<10	13.0	M.C.	M.C.	M.C.
1-1 BASE 1 4.0	<10	20	99	M.C.	M.C.	M.C.
2-1 BASE 2 4.0	<10	<10	38	N.D.	M.C.	M.C.
2-1 BASE 3 4.0	<10	14	40	N.D.	M.C.	M.C.
2-2 BASE 2 4.0	<10	13	56	M.C.	M.C.	M.C.
1-1 BASE 4 4.0	<10	<10	78	N.D.	M.C.	M.C.
2-1 BASE 5 4.0	<10	14	55	M.C.	M.C.	M.C.
2-2 BASE 1 4.0	<10	<10	46	M.C.	M.C.	M.C.
2-2 BASE 3 4.0	<10	15	48	M.C.	M.C.	M.C.
2-2 BASE 4 4.0	<10	<10	43	M.C.	M.C.	M.C.
WEST WALL 1 2.0	62	30	53	M.C.	M.C.	M.C.
WEST WALL 2 2.0	132	32	49	M.C.	M.C.	M.C.
WEST WALL 3 2.0	52	21	43	M.C.	M.C.	M.C.
WEST WALL 4 2.0	<10	<10	36	M.C.	M.C.	M.C.
METH WEST WALL 0.5	<10	<10	71	M.C.	M.C.	M.C.
5-1 BASE 1 3.5	<10	<10	39	M.C.	M.C.	M.C.
5-2 BASE 2 3	<10	<10	31	M.C.	M.C.	M.C.

REMEDIATION PHASE – CHLORIDE RESULTS

Parameter	Value
# Samples Analyzed	228
# of Exceedances Predicted	42
# of Laboratory Samples	28
# Correctly predicted	27
Correct Prediction	96.4 %



REMEDIATION PHASE – OUTCOMES

Parameter	Result	Implication
Tonnage	Reduced 3,000 Tonnes to landfill by elimination of false positives	$156,000
On-site Liability	560 Tonnes evaluated as clean but was impacted and removed	$30,000
Time	Reduced project duration by at least 3 days	14% less project time
Safety	Eliminated >60 loads transported on highways Eliminated rush trips to laboratory Eliminated 3 days of manhours and equipment on-site	>300 Driving Hours >150 On-site Hours
Manifested Liability	2,440 Tonnes of manifested soil not in a landfill	Long term?
Laboratory	Reduced sample requirements by >50% and reduced TAT from 24 hr rush to 3 day	>$3,000
Supplemental Assessments	Had AISCT been used prior fewer assessments would have been needed, eliminating the test pitting program and others.	>$12,000

AISCT – FROM CONSULTANT'S PERSPECTIVE

- **AISCT provided real-time PHC and chloride data:**
  - Delivered on promised accuracy
  - Provided characterization data which would have been missed by traditional field screening methods
  - Reduced volume of soil requiring offsite disposal/clean backfill
  - Eliminated bias from some traditional decision making
  - Reduced manpower

AISCT – FROM CONSULTANT'S PERSPECTIVE

- **AISCT Results:**
  - Prediction tool - accurately predicts 'clean' versus 'dirty'
  - Cannot be treated as laboratory data; not used for 'closure' alone
    - BUT…. it provides certainty about which samples to take, when to take them and what to expect when you get the results
    - Efficiently streamlines the decision-making process when time means cost

AISCT – FROM CONSULTANT'S PERSPECTIVE

- **Cost:**
  - Cannot be compared to traditional field screening methods
  - Reduce project timelines
  - Reduce volume of soil requiring landfilling/clean backfill
  - Reduce field personnel
  - Environmental costs
    - Less equipment/trucking/tipping/fuel consumption
    - Less KMs travelled, less risk of incidents
  - Eliminate/reduce supplementary assessments
    - Faster/cheaper site closure

AISCT – FROM CONSULTANT'S PERSPECTIVE

- **Potential Uses of AISCT:**
  - Assessment Programs
    - Fewer supplemental assessments
    - Area Base Closure programs
  - Remediation Programs
    - Planning stages – to better characterize or delineate impacts prior to remediation; improve scopes and RAPs/CAPs, reduce magnitude of scope change or potential cost overrun at time of remediation
    - During remediation – to selectively excavate contaminated soil to reduce soil volume

Thank You!

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