

Effective Sample Management During Large-Scale Spill Response

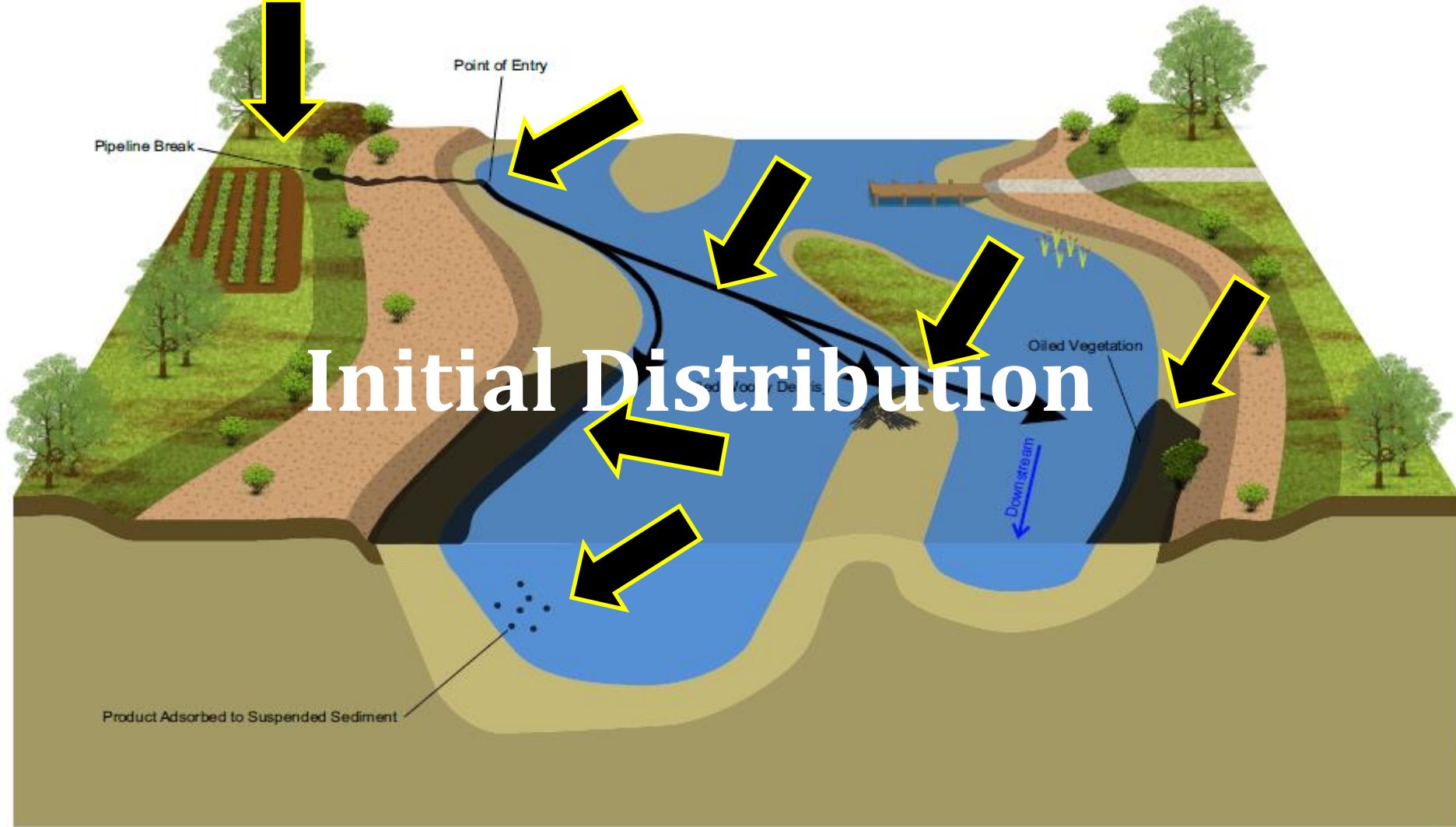
Matrix Solutions Inc.
Integrated Services • Innovative Solutions



Outline

- North Saskatchewan River Oil Spill Overview
- Sample Management for a Spill
 - Organizational Structure
 - Hurdles and Solutions





Spill Overview

- July 21, 2016 – approximately 225m³ of crude oil/condensate released
- Large, multi-disciplinary, dynamic response effort
 - ~1,250,000 hours spent
 - 2,500 people (including dozens of consulting teams)

Surface Water		Sediment	
Number of Sample Sites	Number of Samples	Number of Sample Sites	Number of Samples
360	5,900+	550	1,800+

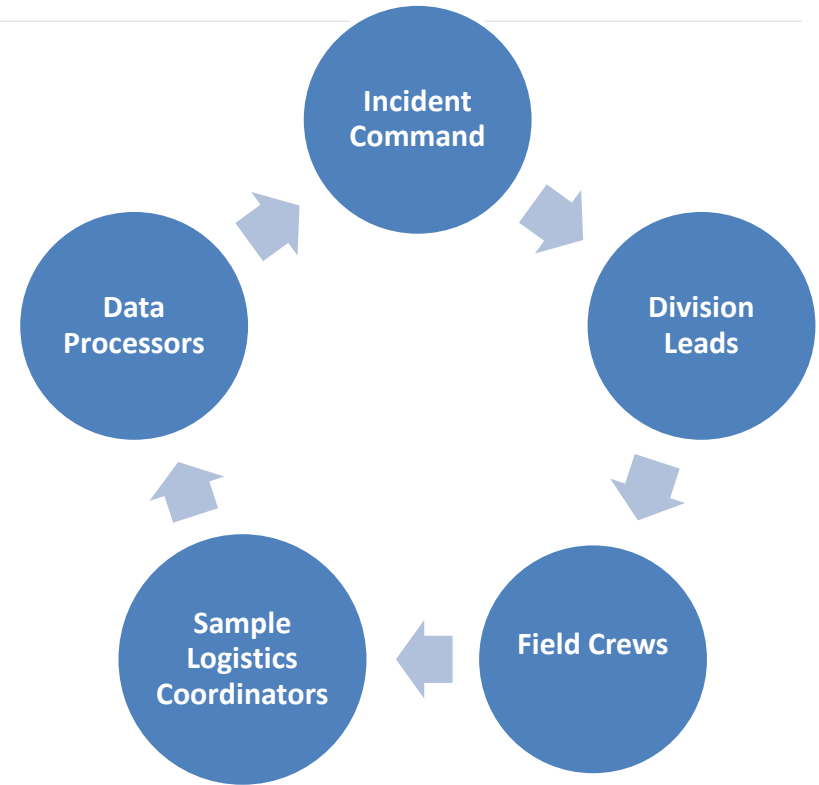


Sample Management Hurdles and Solutions

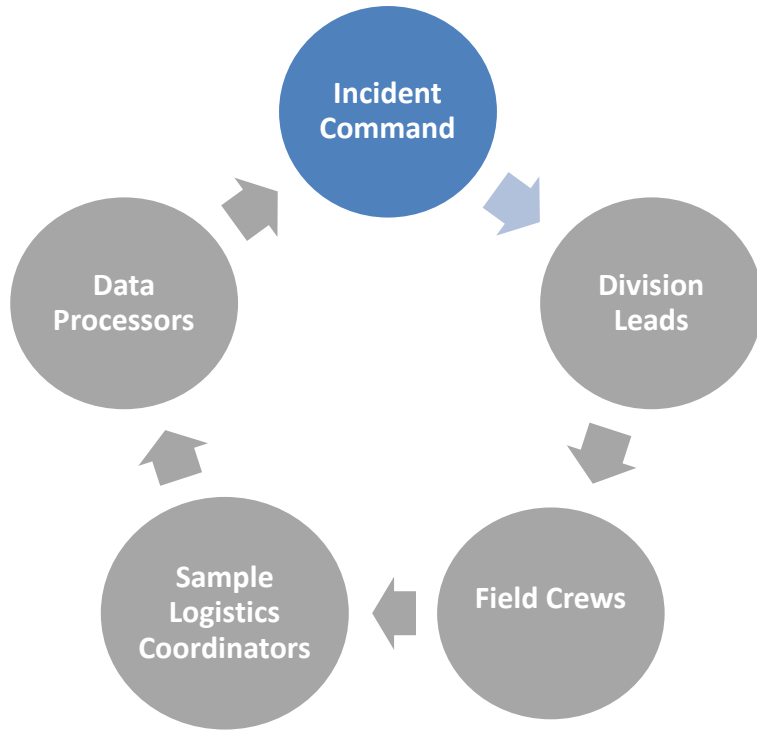


Sample Management Organizational Structure

- Hurdle: How do we organize everyone?
- Solutions:
 - Rigid communication structure
 - Well defined roles and responsibilities



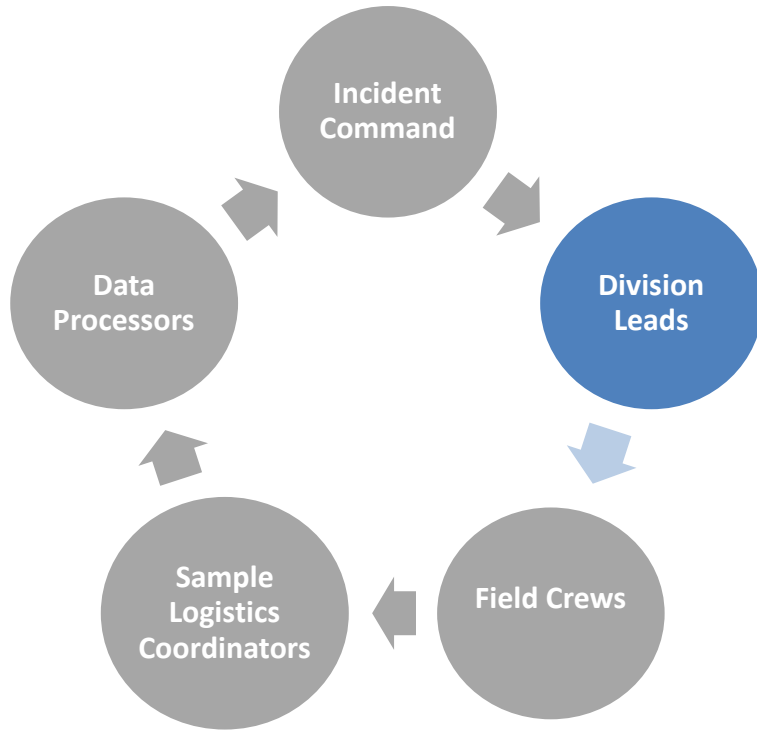
Sample Management Incident Command



- Technical working group made up of client representatives, regulators, technical experts, and consultants
- Standardized daily sampling plans were created and included:
 - Sampling locations
 - Sampling methods
 - Sampling frequency



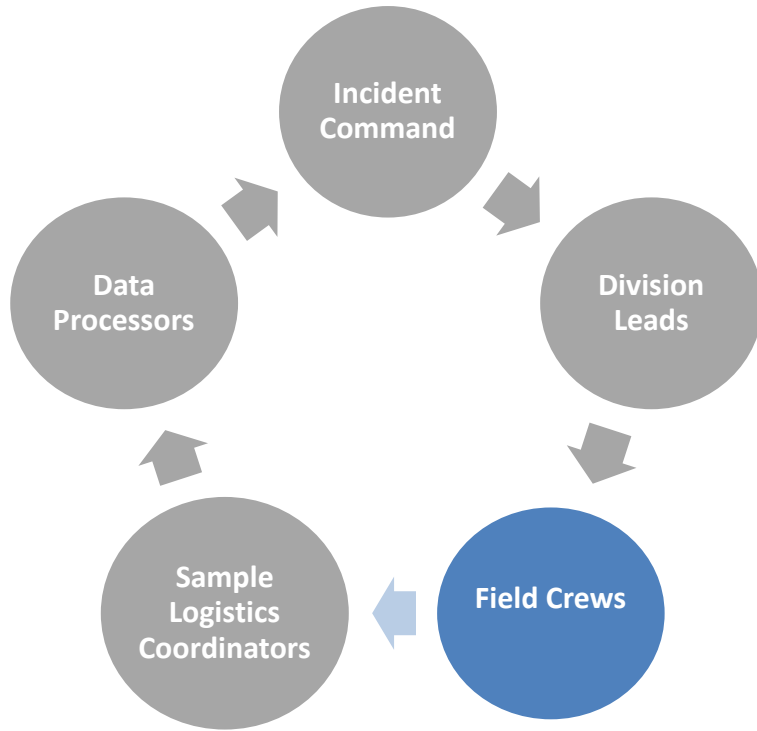
Sample Management Division Leads



- Division leads responsible for their section of the river:
 - Allocating resources (assigning field crews)
 - River logistics
 - Safety check-ins
- Daily updates to incident command



Sample Management Field Crews

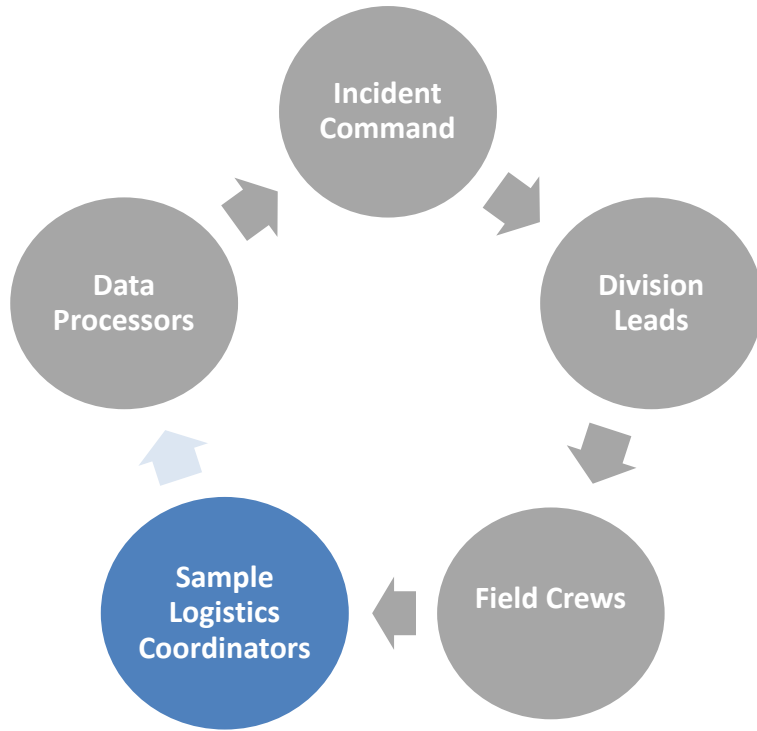


- Execute standardized sampling plans:
 - field notes
 - photo logs
 - sample collection



Sample Management

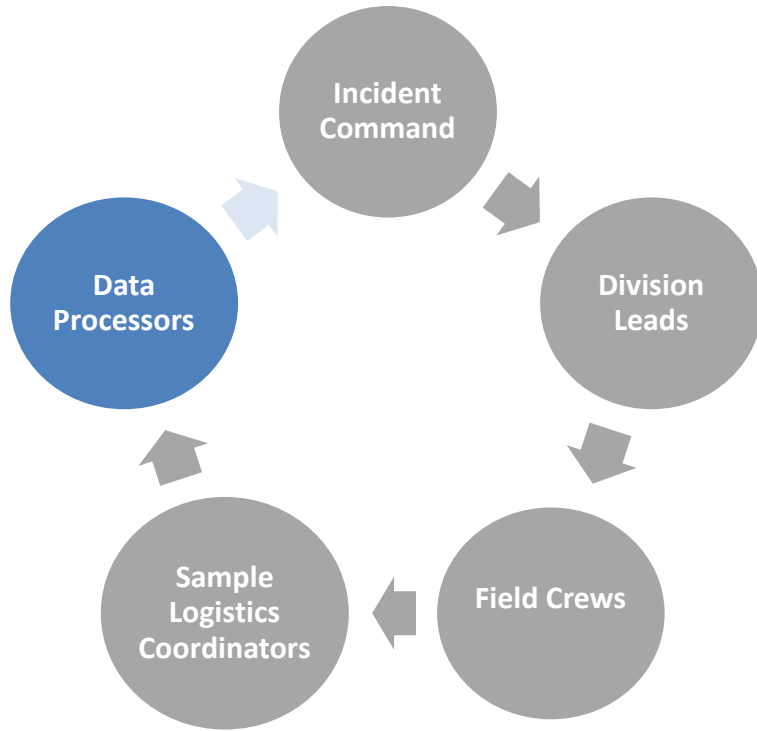
Sample Logistics Coordinators



- Equipment Management:
 - Sign in and out equipment
 - Calibrate and replace equipment
 - Collect, scan, and review field notes
- Sample Collection Lead:
 - Sort samples based on where they are going (i.e., mobile lab, Edmonton, Calgary)
 - Create CoCs
 - Organize sample shipments
 - Communicate with Matrix Environmental Data Services



Sample Management Data Processors



- Data Storage/Organization
- Data QA/QC
- Preparation of daily results and exceedance summaries and figures for distribution to Incident Command, regulators, and stakeholders
- Worked closely with Sample Logistics Coordinators



Hurdles and Solutions

Health and Safety

Hurdle:

- How to keep our first responders safe? How do they know what to do?

Solutions:

- First responder digital information package generated within ~30 minutes of spill notification
- Satellite phones, SPOT/Garmin inReach systems
- Safety representatives closely involved with all aspects of project planning and execution



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Hurdles and Solutions

Health and Safety

- Hurdle:
 - How to ensure timely notification of H&S issues and reporting of H&S statistics
- Solutions:
 - Hazard, Near Miss, and Incident Reporting App and Database
 - Automatic notifications built into the app
 - Safety statistics are easily pulled from the database

I am submitting a non-work HNI ☐

Select if you are submitting an HNI that occurred outside of Matrix work.
Note: nonbill is work related and should be selected as a project below.

* Project

* Employee

* Occurrence date

* Description

* Corrective action

* Classification

Hazard ID: a condition, practice, or any source that has the potential to result in injury or loss.
Near Miss: an unplanned event that did not result in injury or loss but, under different circumstances, has the potential to do so.
Incident: an occurrence that results in injury, illness or other loss.

High importance ☐

Select if you want the following:

- Escalated review priority
- High importance flag set on email(s)
- Inclusion in High Importance report in H&S Statistics Portal

Attachment

I want a copy of this HNI emailed to me ☐

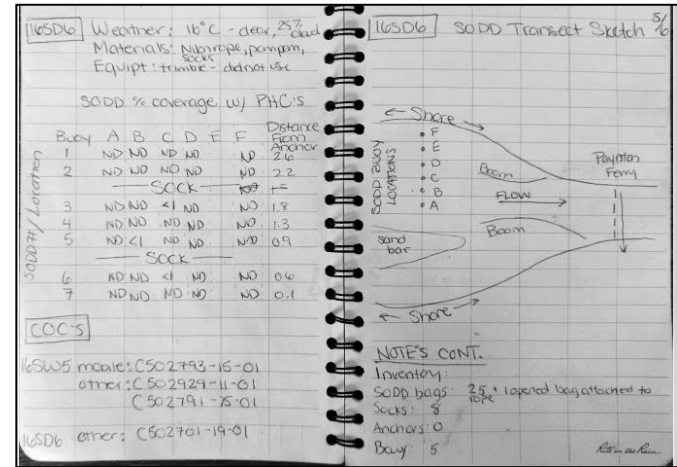
TMurfitt@matrix-solutions.com

☐ Submit another

Hurdles and Solutions

Naming Protocols

- Hurdle:
 - How to ensure consistent and logical naming of samples
- Solutions:
 - Sample naming protocol
 - Unique sample identification number (15 digits)
 - Standardized sample point names (e.g. 17-CRB004)



Hurdles and Solutions

Data Processing

Hurdle:

- Hours of post-field data processing
- How to eliminate transcription errors

Solutions:

- Streamlining field data collection:
 1. High precision GPS (Trimble) pre-loaded with georeferenced field maps
 2. Digital data collection apps
 - Wildlife observation app
 - Field screening apps (soil/SW/GW)
 - Borehole logging app
 - GW monitoring app
 3. Partially pre-filled and electronic COCs
 4. On-site GIS services

App Store 9:06 PM

ARC - Wildlife Observations Submit

1 *
Observer
Tap to answer

2 *
Species
Tap to answer

3 *
Number Observed
Tap to answer

4
Location / Description
Tap to answer

5
Easting (Zone: 11)
Tap to answer

6
Northing (Zone: 11)



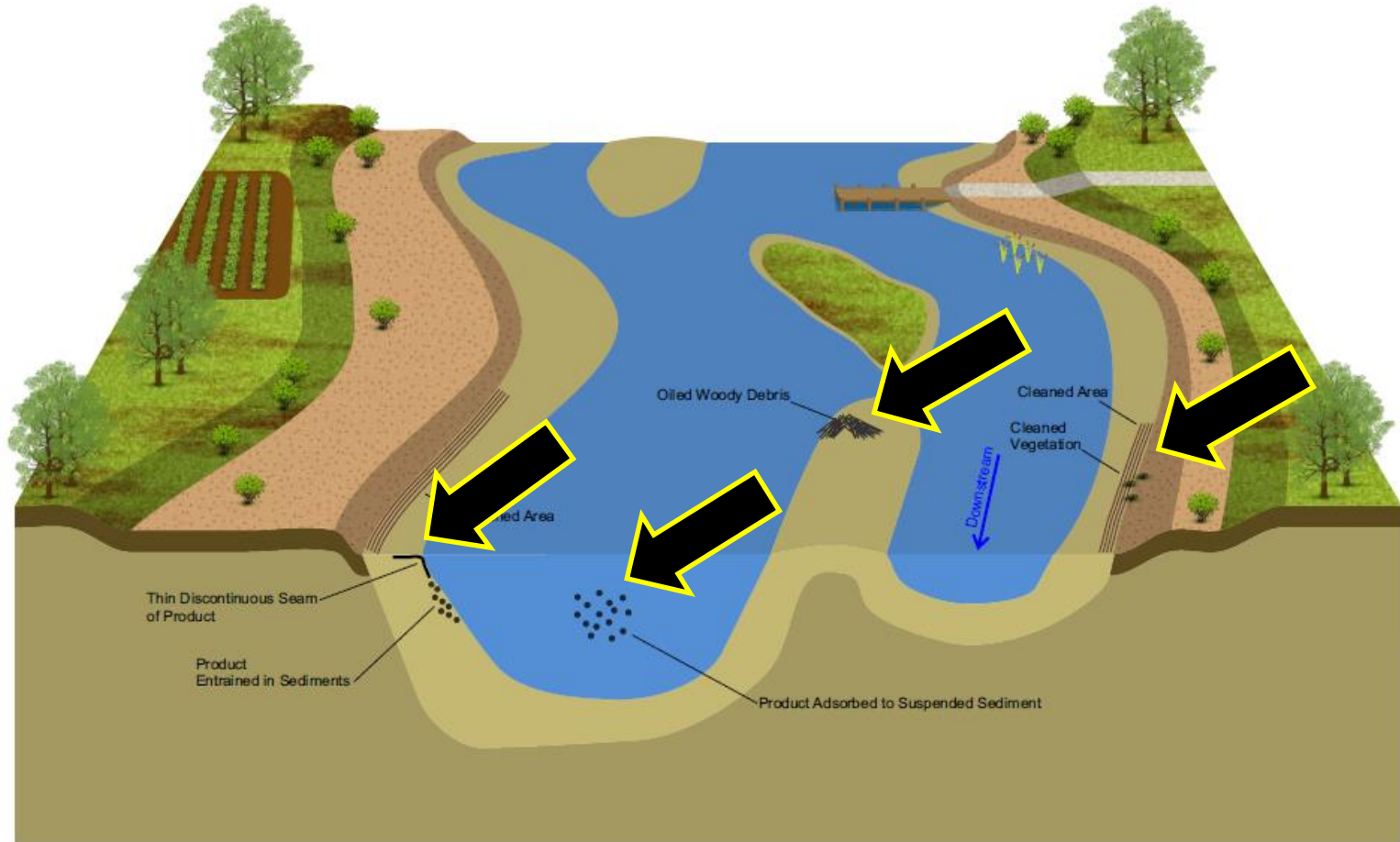
Hurdles and Solutions

Data Management

- Hurdle:
 - How to manage, process, and store large amounts of data for this spill
- Solutions:
 - Rigid communication structure, roles and responsibilities well defined
 - One centralized spill email for all communications, field notes, COCs, GPS files, etc.
 - Managing the workload on our environmental database system
 - Centralized Data Hub – summaries, tables, maps, charts, and stats



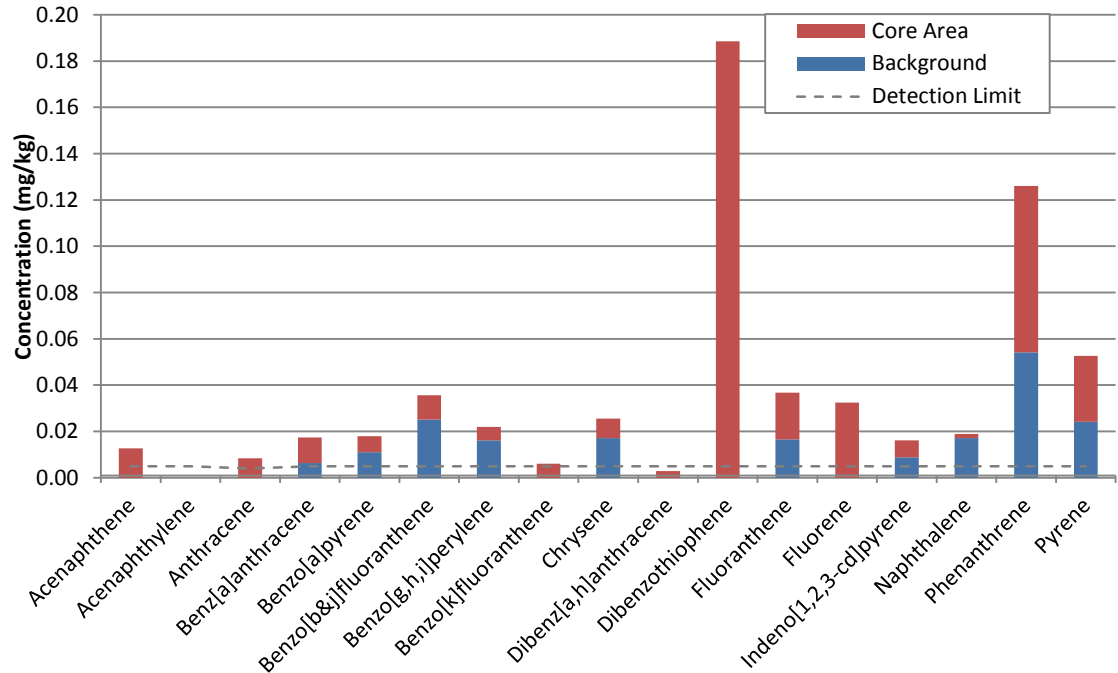
Residual Distribution



Hurdles and Solutions

Background Sources

- Hurdle:
 - Determining Sources of Hydrocarbons
- Solution:
 - Analysis of Parent and Alkylated PAHs for Fingerprinting and Source Apportionment (Chemistry Matters)

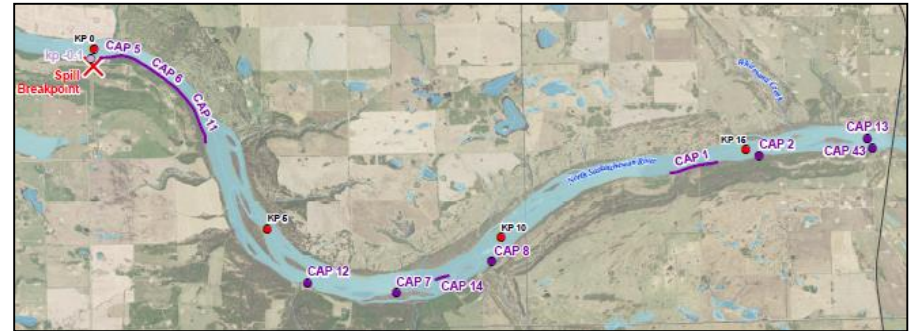


95th Percentile Concentrations from Background and Core Area Sediment

Hurdles and Solutions

Field Sample Locations

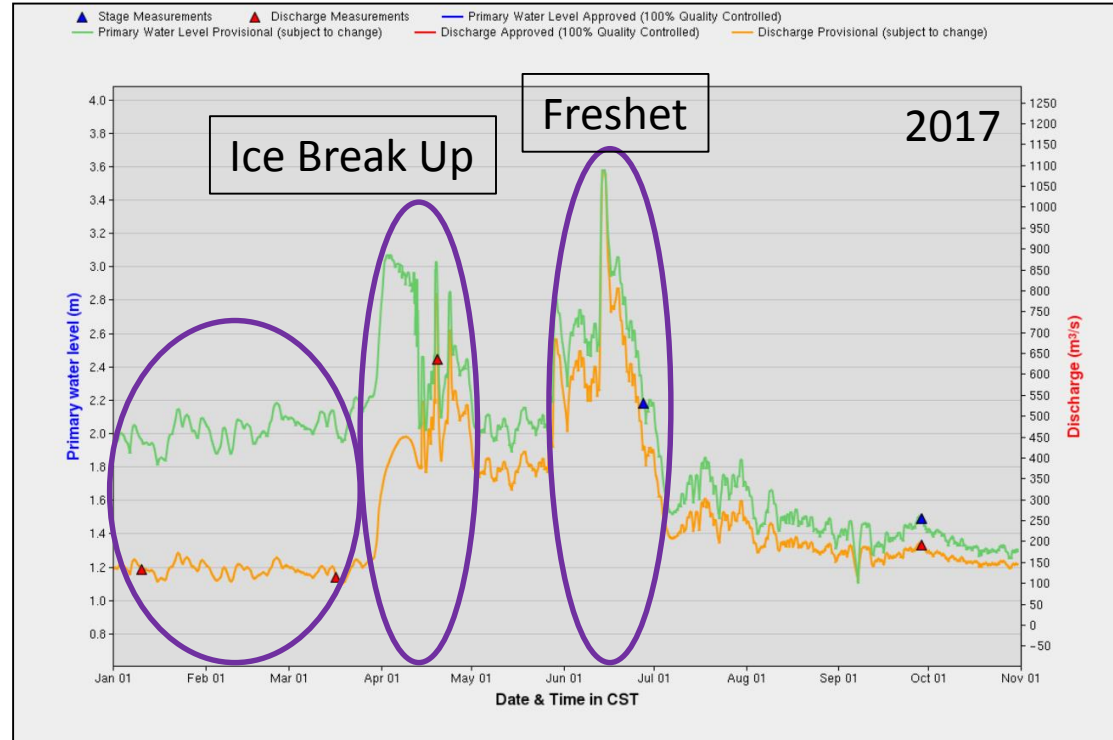
- Hurdle:
 - Determining suitable sampling locations in a study area >600 km
- Solutions:
 1. Hydraulic Model
 2. Aerial Photo Interpretation
 3. Alignment with SCAT teams



Hurdles and Solutions

River Conditions

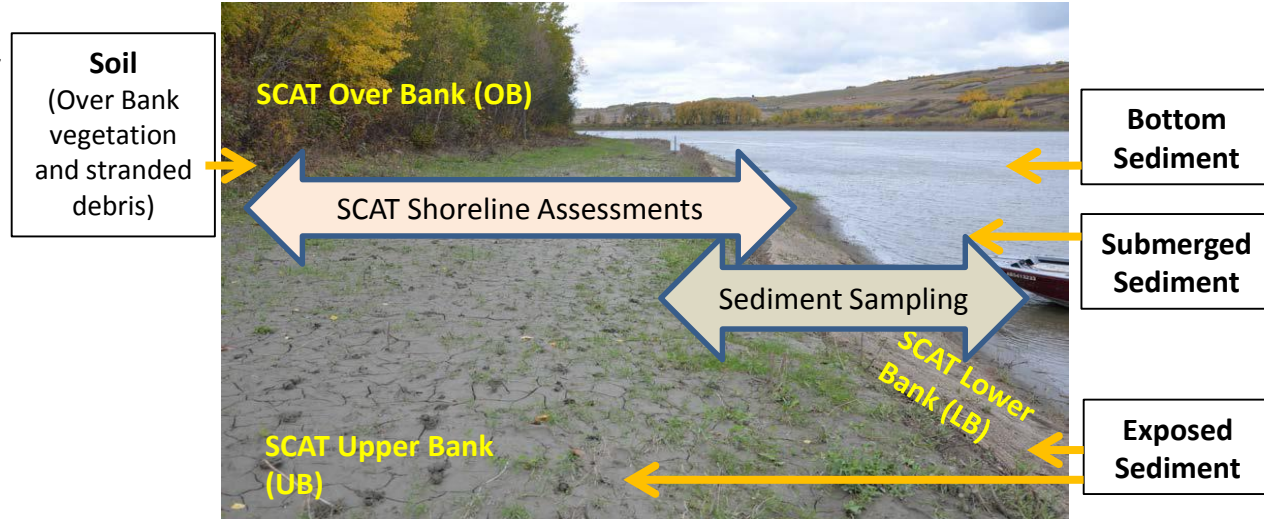
- Hurdle:
 - Changing Flow and Water Levels
- Solutions:
 1. Field Timing:
 - Real-time water level monitoring data
 - Webcams installed along the river
 - Regular communication with operators in the area



Hurdles and Solutions

River Conditions

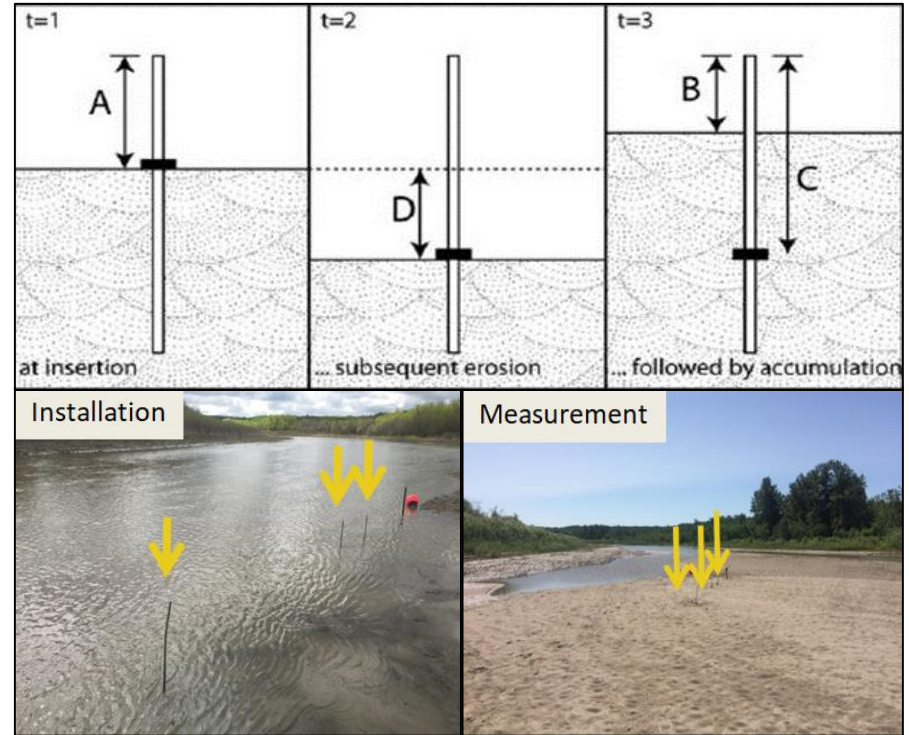
- Hurdle:
 - Changing Flow and Water Levels
- Solutions:
 1. Field Timing
 2. Defining the Shoreline



Hurdles and Solutions

Product Entrainment

- Hurdle:
 - Determining Product Entrainment
- Solutions:
 1. Depth of Disturbance Rods



Hurdles and Solutions

Product Entrainment

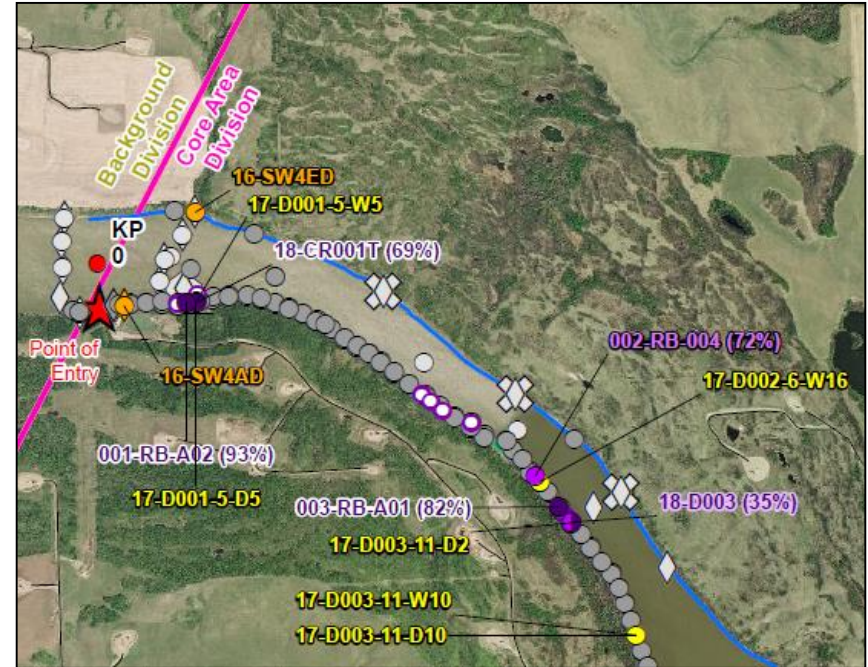
- Hurdle:
 - Determining Product Entrainment
- Solutions:
 1. Depth of Disturbance Rods
 2. Dredge and Cores



Hurdles and Solutions

Residual Product Location

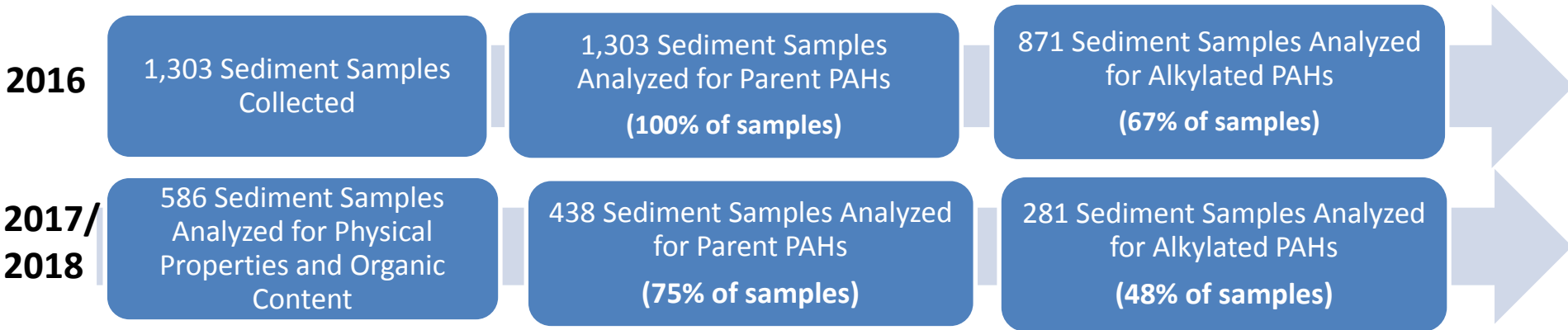
- Hurdle:
 - Delineation of discontinuous product lenses
- Solutions:
 - Alignment with SCAT data and previous known locations and at both submerged/exposed locations
 - Statistical approach (modified Visual Sample Plan software output)
 - Using visual indicators (e.g. sheening) to guide sample collection



Hurdles and Solutions

Analytical Decision Trees

- Hurdle:
 - Large volume of samples for analysis (high analytical costs)
- Solution:
 - Analytical Decision Tree



Questions?

Never Stop Looking for Efficient Solutions

