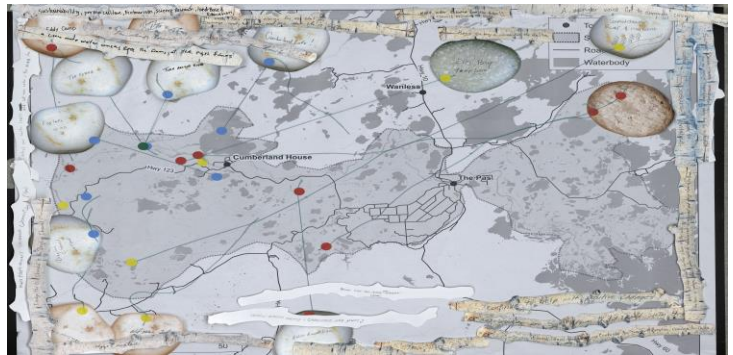
Indigenous Engagement – in the Saskatchewan Delta



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Km
200
Northwest Territories
Slave River Delta
Slave River
Peace River
Peace-Athabasca Delta
Bennett Dam
Athabasca River
Alberta
British Columbia
Saskatchewan
Manitoba
E.B. Campbell Dam
North & South Saskatchewan Rivers
Saskatchewan River Delta
Gardiner Dam

Big Picture – What's happening in the Deltas

- Change in seasonality of flows
- Less water since early 1900s
- Sediment deposition has been disrupted
- Less lateral connectivity between river and wetlands
- Declines in biological productivity
- Loss of traditional livelihood, language and IDENTITY

Saskatchewan River Delta
Image credit: Norm Smith

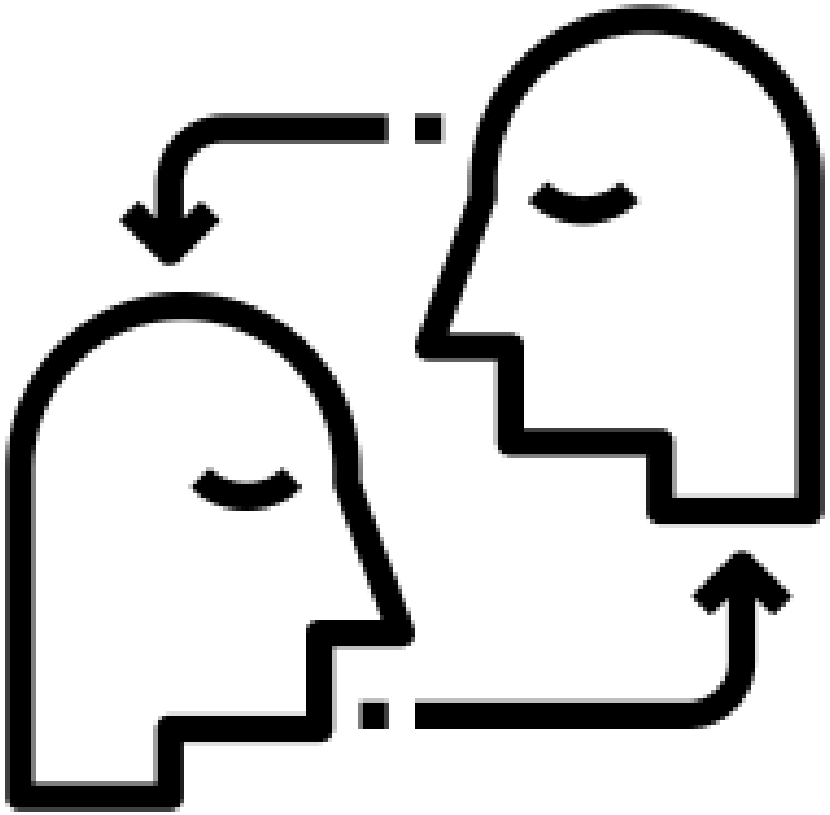
Existing operations are not meeting the e-flows needs of the Saskatchewan River and Delta

Hydropeaking is a concern here because of the proximity of EB Campbell Dam

Delta Stewardship Planning

What are we to do with this evidence? We need a plan

EMPATHY and TRUST



Three GWF Projects Converge

Integrated Modelling Program for Canada

Global Water Futures

Distributed Water Science

We need more than water

Challenge

Modeling approaches could account for the following:

Dam induced flow manipulations
Impacts of upstream development on fish and animals

Sediment regime restoration and costs – include local economic benefit

Verification of model parameters and dynamics with community members and local and traditional knowledge holders

"Does this flow make the river and delta healthy?"

"Is this the right flow for producing animals?"

Research Objectives:

Obj. 1 To determine preferences for **flow conditions** (e.g., timing, color, smell, the extent of flooding, fluctuations, and seasonality) among people from Cumberland House

Obj. 2 To determine the **impact** flow conditions have on fish, animals and people in the delta, according to the people who live there

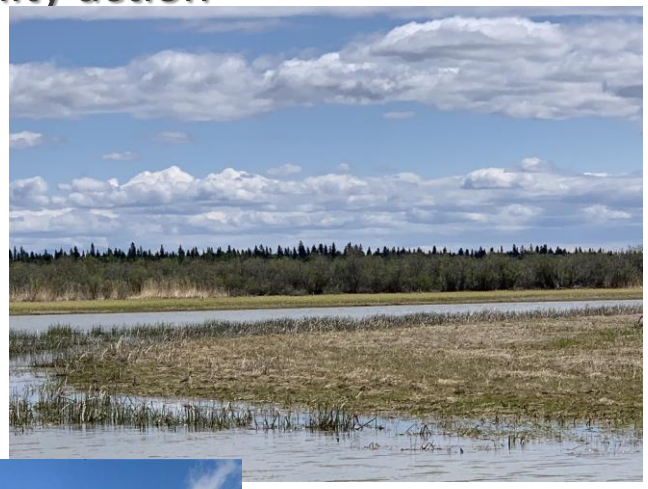
Obj. 3 To convey to hydrological modelers, **knowledge about the needs of the people in Cumberland House**, so they can ensure their models are responsive to the community's needs, and better inform collaborative modeling as a practice

Sharing Photos with Narratives

Images teach

Pictures can tell a story

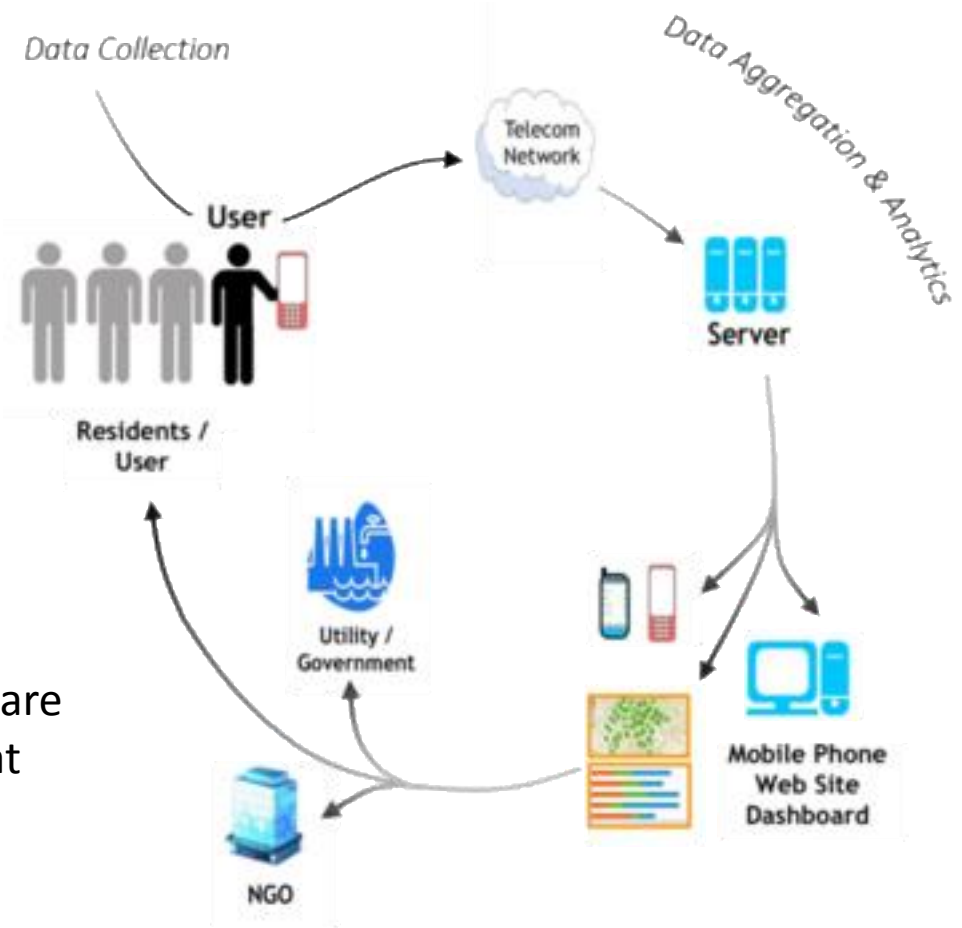
Emphasizes individual and community action



COMMUNITY ENGAGEMENT

Modeling Collaboration

Distributed Water Water Science



Who do users want to share data with and under what circumstances?

Distributed Water Science

Welcome GStrick

LOGOUT

MAP

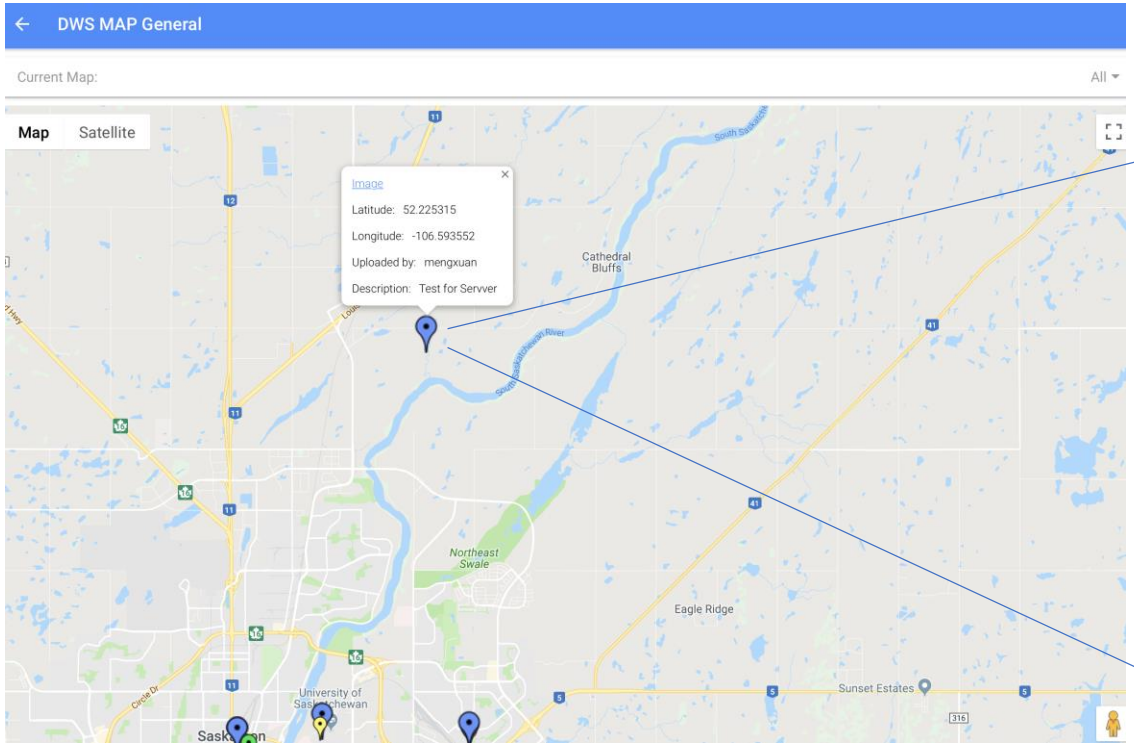
UPLOAD BASIC IMAGE

UPLOAD CULVERT

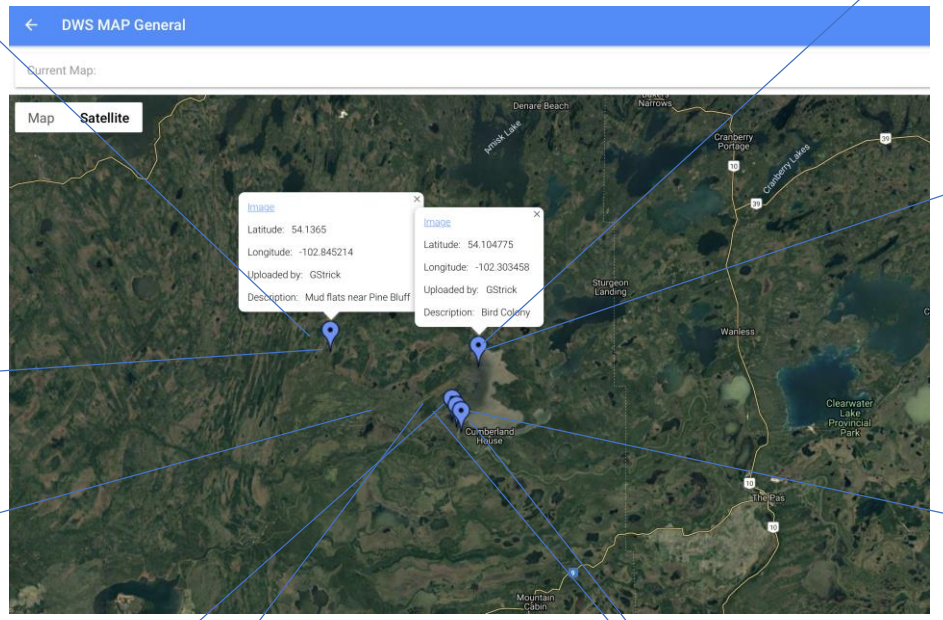
UPLOAD STREAMFLOW

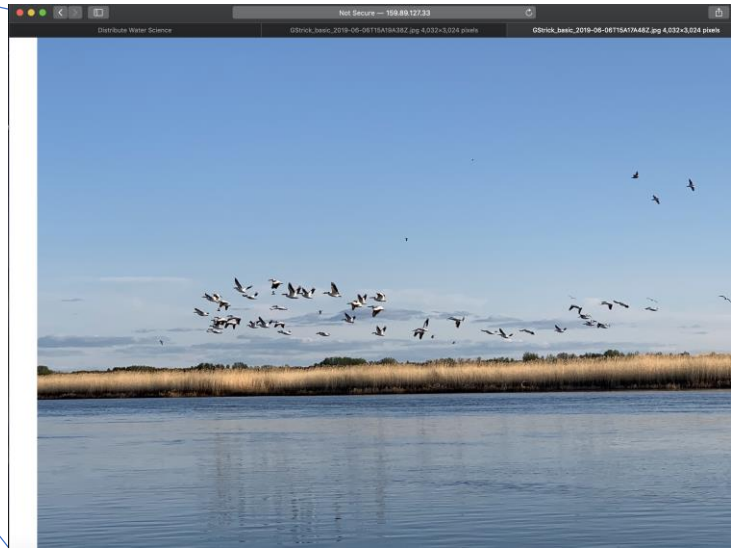
UPLOAD DEBRIS JAMS

Example of Photo Capture



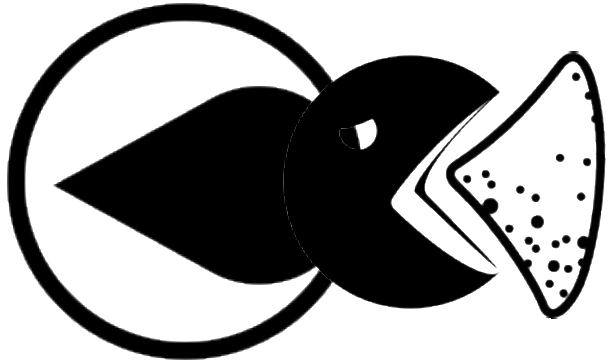
Sask River Delta





We need more than water

- Sample and Test sediment at each reservoir
- Build sediment transport models
- Work with community to design and cost-out restoration options



Sediment sampling

How IMPC can support the Delta?

- Provide a variety of incoming flow conditions that reflect:
  - Changes in water resources demands and operations
  - Climate change scenarios
  - Seasonal changes in flows
  - A willingness to take consider what the delta needs in your model

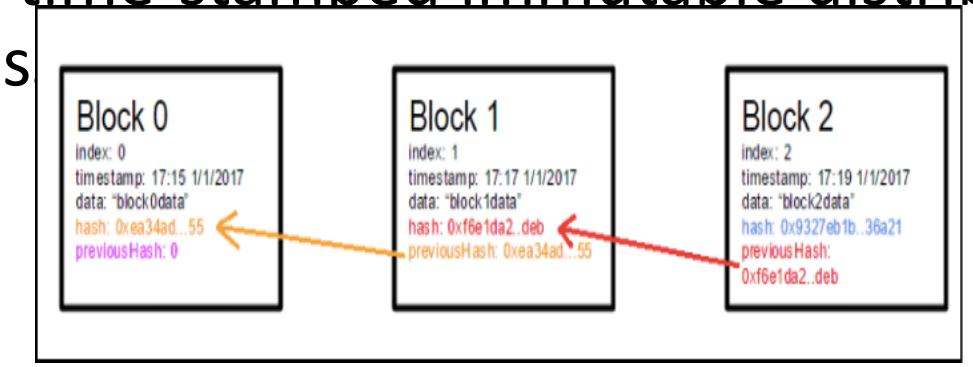
Supplemental Slides below

Blockchain ?

In simple terms,

- BLOCK: collection of data
  - Blocks are connected with other blocks chronologically creating linked chain

A time-stamped immutable distributed ledger for digital as



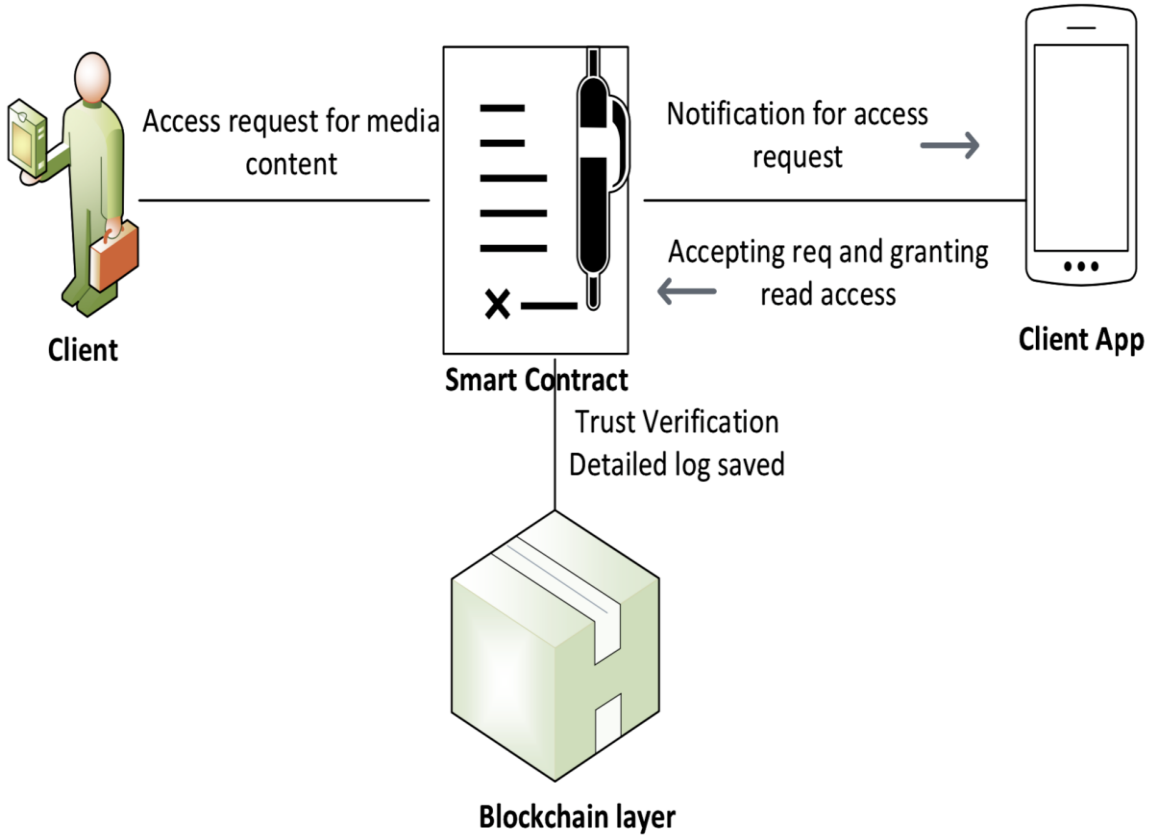
Why Blockchain?

- To give the participants the right to protect their content without storing the content with one centralized location or trusted third party
- Sharing the cost of infrastructure
- Shared Trust
- No single point of failure
- No central Database
- Cannot track user across relying parties

Key Benefits

- Decentralized network
- Secure and trustable sharing
- Tamper-proof
- Fairness and Transparency
- Having universal unique identity
- Consent
- Obscurity

Role in DWS

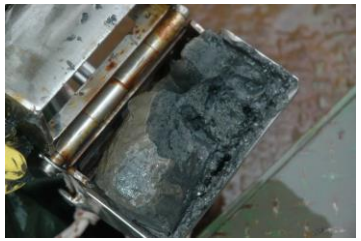

Access request for media content
Notification for access request
Accepting req and granting read access
Client
Smart Contract
Client App
Trust Verification
Detailed log saved
Blockchain layer

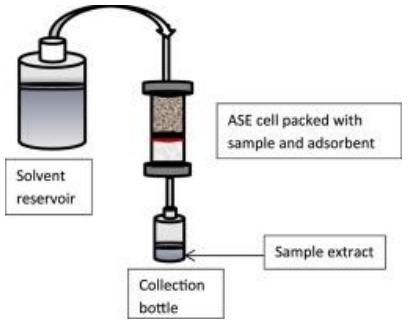
New in DWS for blockchain

- Trust Factor generation- AI and ML integration
- Consensus algorithm

Sediment processing

- **Sieving (<2mm):** only the relevant particles
- **Freeze-drying:** remove water without altering chemicals in samples
- **Extraction:** separate chemicals from sediment particles for analysis





Chemical analysis

- Analyze samples for a number of known priority contaminants (dioxin-like chemicals, metals, pesticides, etc.)
- Broadly screen for unknown contaminants

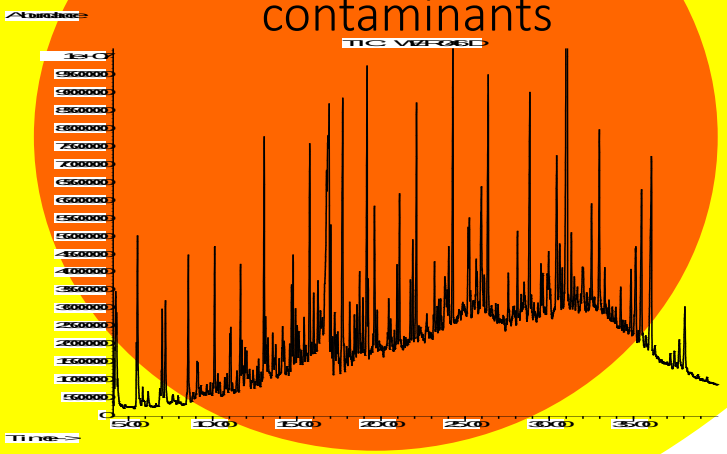
The chemicals we have used are very diverse…

- Complex mixture
- Chemical Analysis of priority substances can only reveal a small portion of chemicals
- Biotests are suitable to evaluate complex environmental mixtures

>65 Mio known chemicals

Over 1000 of chemicals with elevated concentrations

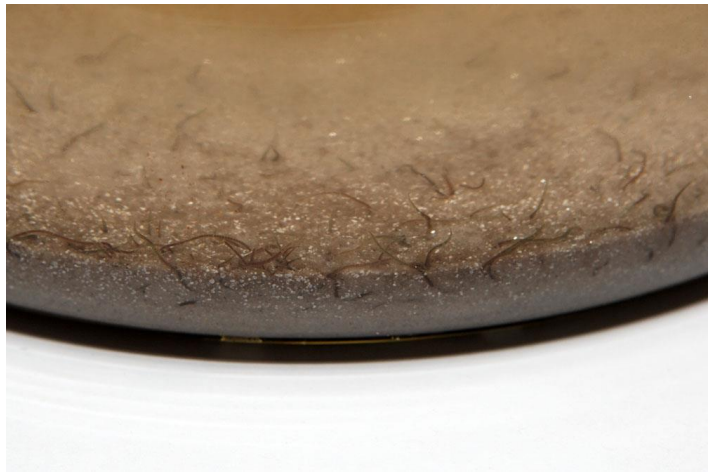
- Limited number of priority contaminants

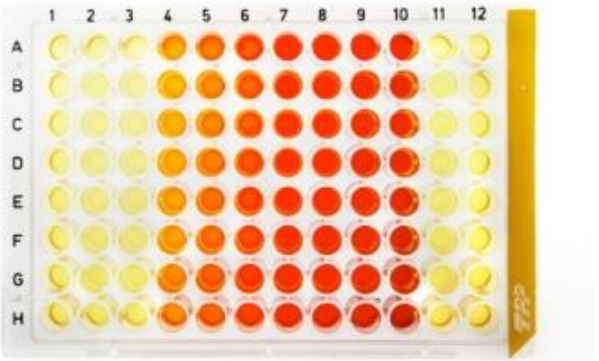
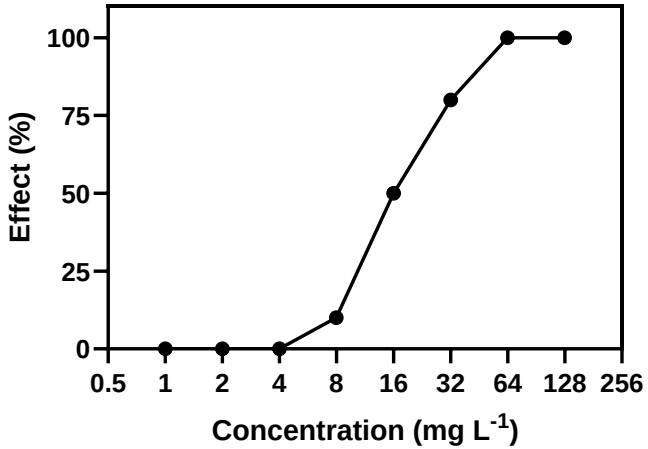


Is there a problem?

Sediment biotests

- Are used to study the effects of contaminants on organisms
- Test can make use of sediment-dwelling organisms (e.g. blackworms, midge larvae) to study effects on their survival, growth and reproduction



Sediment biotests

- Other test use isolated cells to screen for specific groups of chemical, e.g. dioxins, hormone-like chemicals, etc.