FREDsense®

ADB E-Marketplace

COVID-19 Portable Field Monitoring

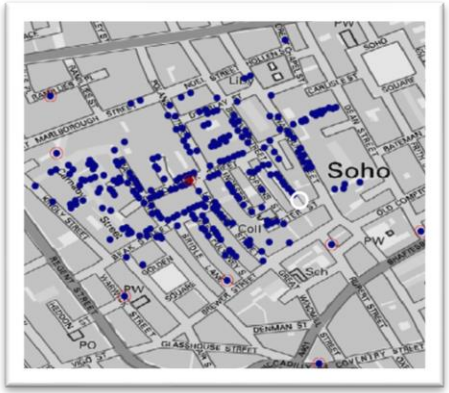
FREDsense®

Be the first biological platform to revolutionize water analysis for anyone, anywhere

FREDsense is a portable water quality company moving complex chemistry into the field.

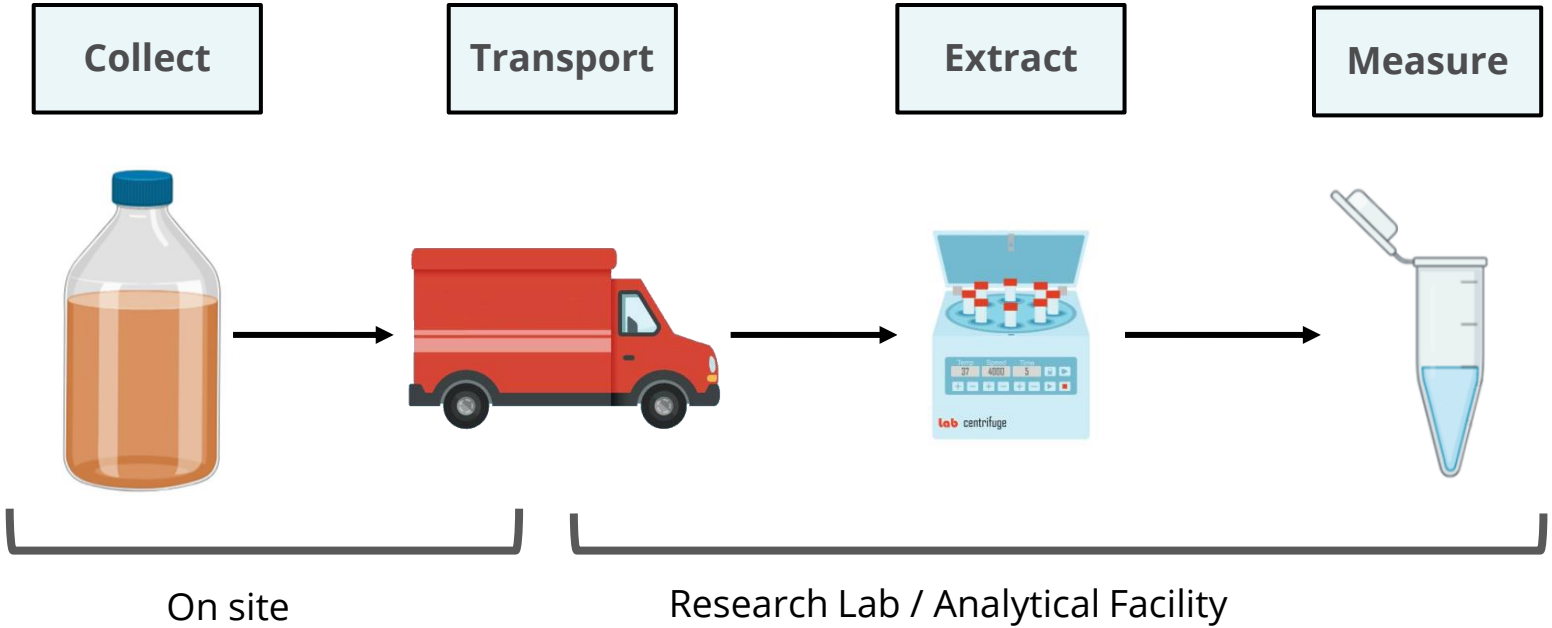
What is Wastwater Based Epidemiology (WBE)?
It's What You Flush!

In **1854**, Dr. John Snow was able to connect between the deaths from **cholera** and contaminated drinking water (Soho, London)

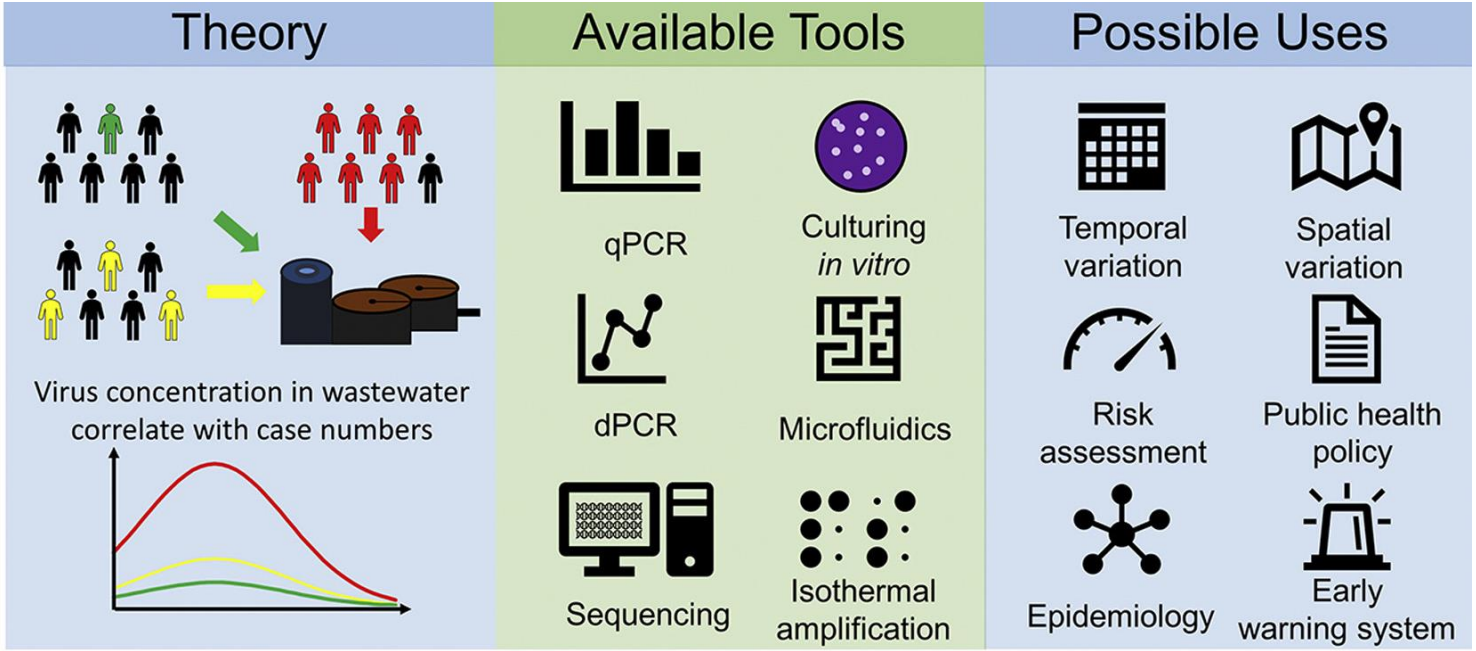


In **2021**, WBE can detect COVID-19 **~2 weeks earlier** than other testing methods!

Current Wastewater Monitoring Workflows



WBE Outcomes and Data Uses



Jones et al 2020 – Current Opinions in Environmental Science and Health

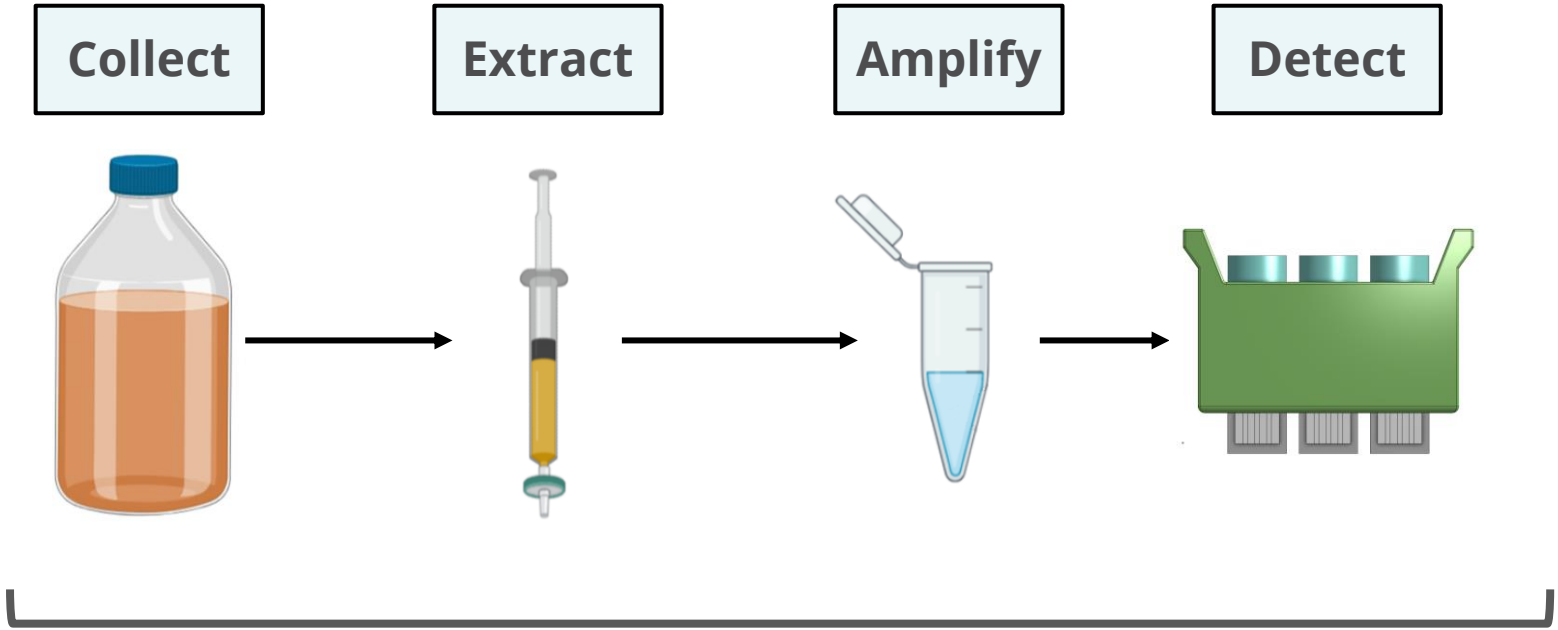
So, Why Isn’t WBE Everywhere?

Current limitations of WBE sampling and lab analysis involve:

- Complex Supply Chains
- Travel To Centralized Labs
- Minimum 24 Hour Turn Around
- High Cost $500-$1000 USD.
- Heavy Infrastructure Requirements

We need lower cost, faster and more robust approach!

Main Steps of the FRED Detection System



Method of Detection – How Are We Different

Traditional Methods

qPCR N1/N2 CDC Targets

FREDsense Method

qPCR N1/N2 &
Gene Specific Electrochemical Detection

Advantages

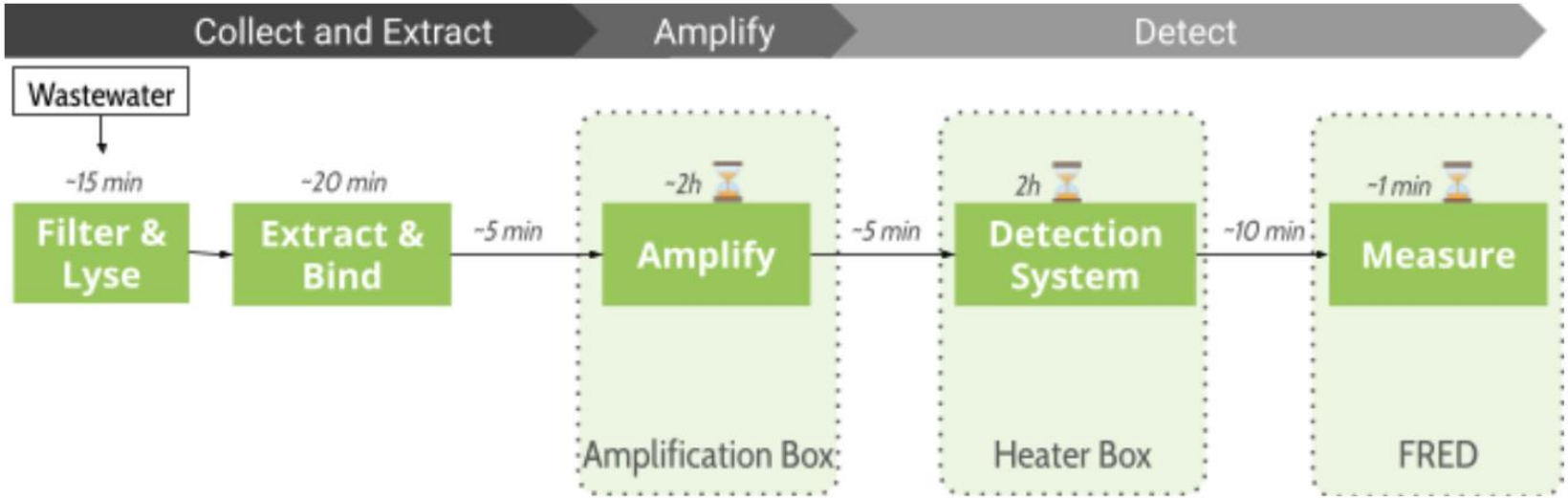
High Accuracy, Lower Detection Limit, Field Enabled

A Field Based Approach to WBE

Field Based Analysis Equipment

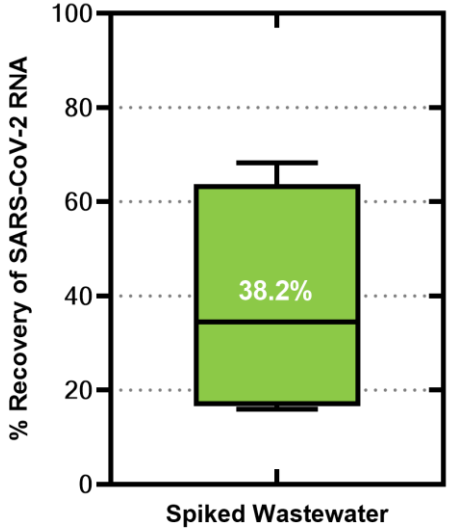
- Portable
- Battery Operated
- No Lab Equipment Necessary
- 20-30 minutes of operator time
- Results in <4 hours
- Detection as low as 5 gene copies / mL
- Simple results anywhere

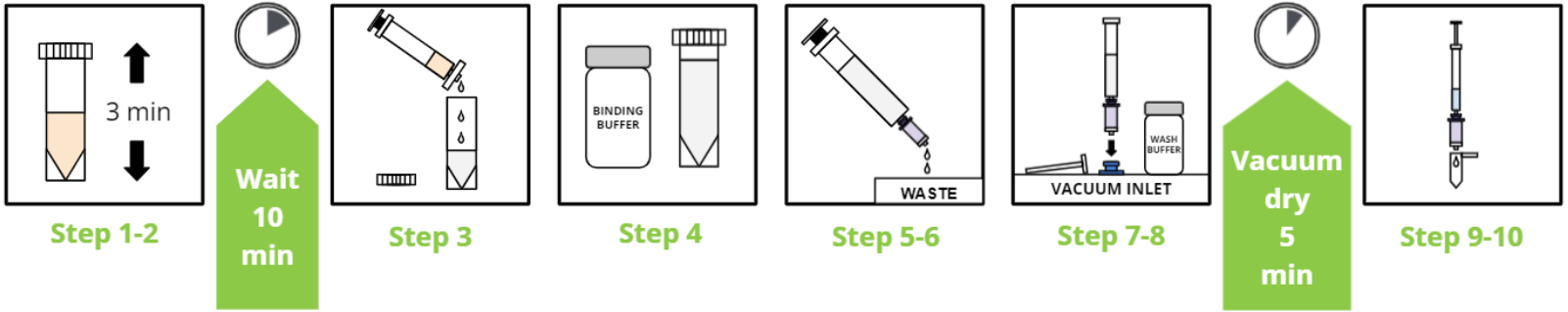
Protocol For Use



Collect and Extract RNA

- Rapid on-site extraction of SARS-CoV-2 RNA
- ~40% RNA recovery of SARS-CoV-2
- Simple Syringe Based Method For Detection

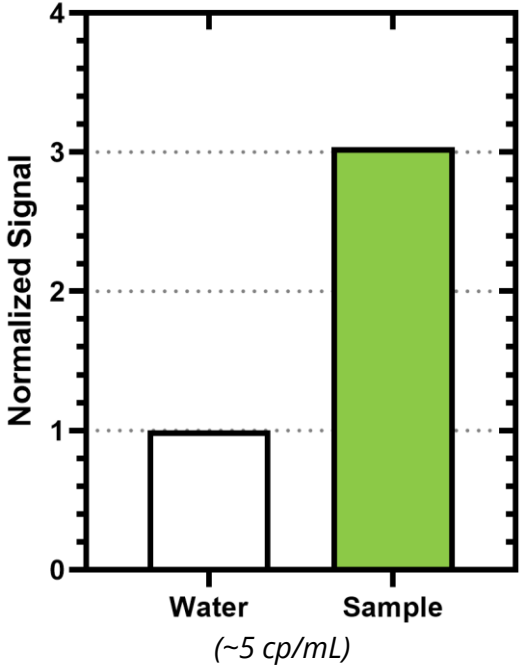




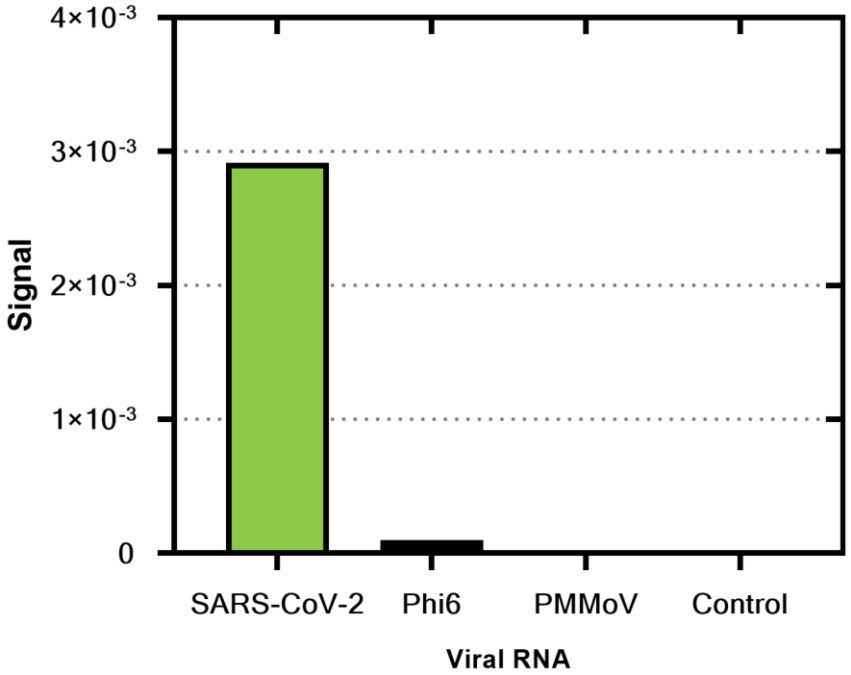
Limit of Detection

The FRED-COVID system has been demonstrated in a range of wastewater matrices, from large cities (>1 M population) to small villages (<100 population).

FRED-COVID has been able to successfully detect COVID-19 in these real-world wastewater matrices at levels below 10 copies/mL.



Sensor Specificity



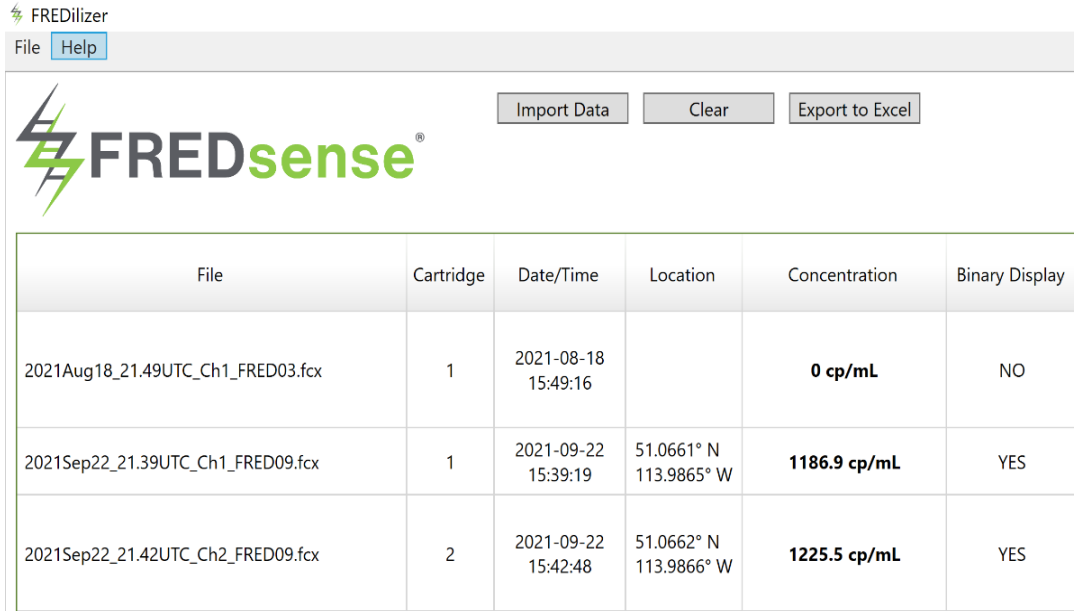
With specificity as one of the core design principles behind this sensor system, an initial specificity test was performed against common viral controls.

<5% signal error was recorded to off-target controls, with no false positives yet encountered in wastewater samples.

Sensor Interface

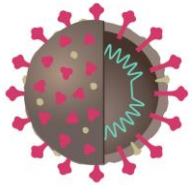
Easy Reporting of COVID-19 Information in Dashboard

- Time
- Date
- Concentration
- Binary Output
- Easy quantitative output



File	Cartridge	Date/Time	Location	Concentration	Binary Display
2021Aug18_21.49UTC_Ch1_FRED03.fcx	1	2021-08-18 15:49:16		**0 cp/mL**	NO
2021Sep22_21.39UTC_Ch1_FRED09.fcx	1	2021-09-22 15:39:19	51.0661° N 113.9865° W	**1186.9 cp/mL**	YES
2021Sep22_21.42UTC_Ch2_FRED09.fcx	2	2021-09-22 15:42:48	51.0662° N 113.9866° W	**1225.5 cp/mL**	YES

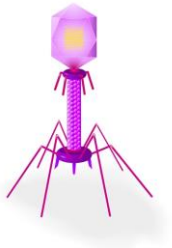
Sensors For SARS-CoV-2 Testing



SARS-CoV-2
N & S genes

Targeting the CDC N1 and N2 regions as well as the conserved S protein

- 37 sensors



***Pseudomonas* Φ6**
Bacteriophage

Process control virus with similar extraction behavior to SARS-CoV-2

- 5 sensors

Pepper mild mottle virus (PMMoV)

Normalize signal for environmental factors

- 6 sensors

City Scale WBE Public Health Platform

Project Goal:

Lab Validation and **field implementation** pilot, in Japan, Israel, Philippines, a first ever, field-based COVID-19 analysis system across a municipality infrastructure for real-time monitoring of community risk.

Project Aims:

1. Prepare a series of FREDsense COVID-19 analyzers
2. Implement, test and gather metrics on impacts of field analysis compared to status quo.
3. Work with partners to develop a full integration into a sewershed

How It Works

Key Values

- **Drive cost –** Reduce 90% of cost compared to current methods
- **Drive access –** for low-income communities
- **Drive engagement –** field analysis empowers local communities
- **Drive impact –** faster turn around time to decision

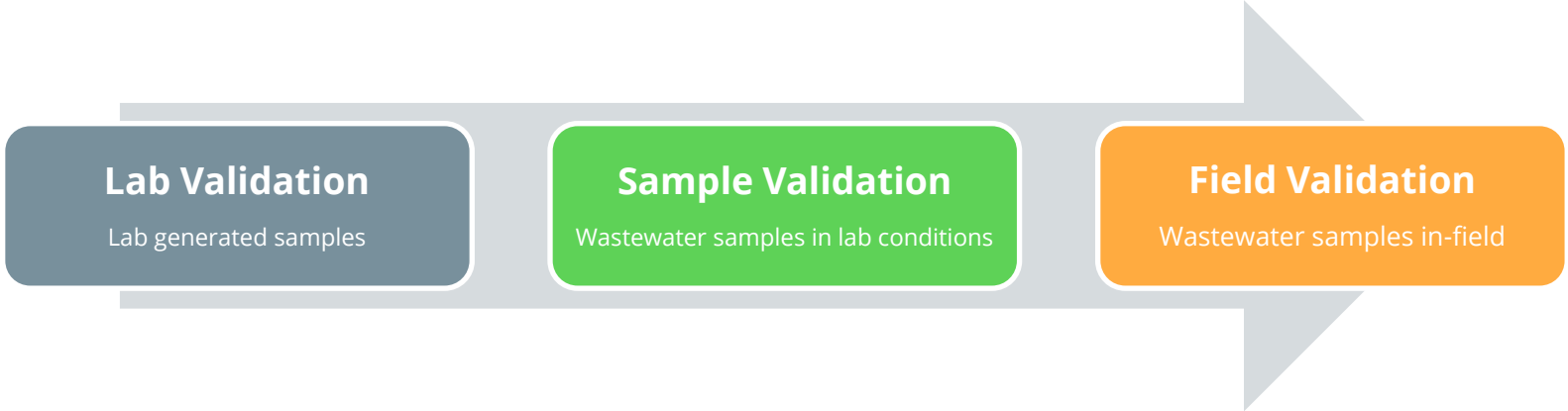
Metrics, Outcomes and Viability

Validation and Demonstration

- Validate project approach
- Build key datasets for Health Agency
- Generate case studies

Project Long-Term Viability

- Implement solutions in new areas
- Build new targets (Ebola, Cholera, etc.)
- Reduce infrastructure requirements



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