



C.E.C.
Analytics

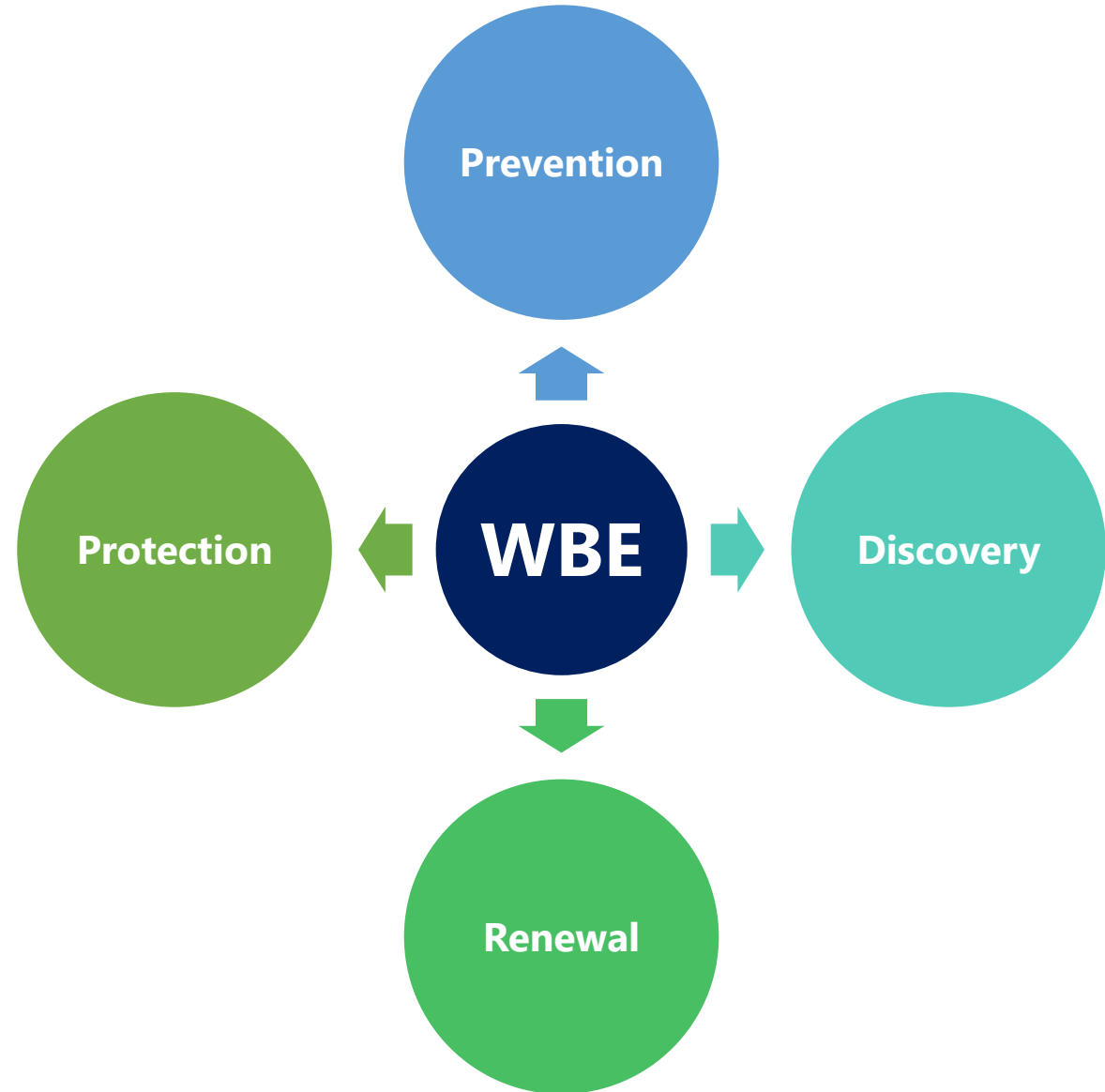
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Wastewater Monitoring in the Workplace

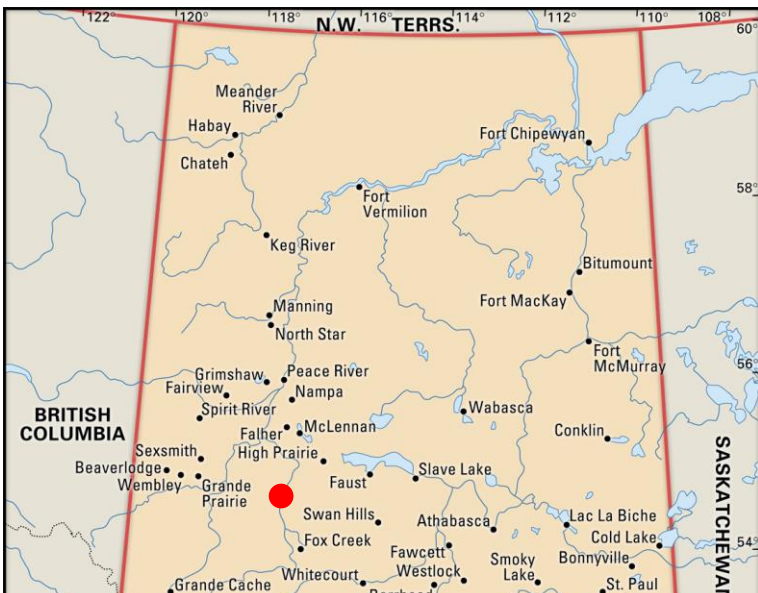
Early detection of viral
outbreaks and drug-use in the
mining industry



How does WBE Enhance Health & Safety



C.E.C. Analytics



Remote towns and municipalities may not have:

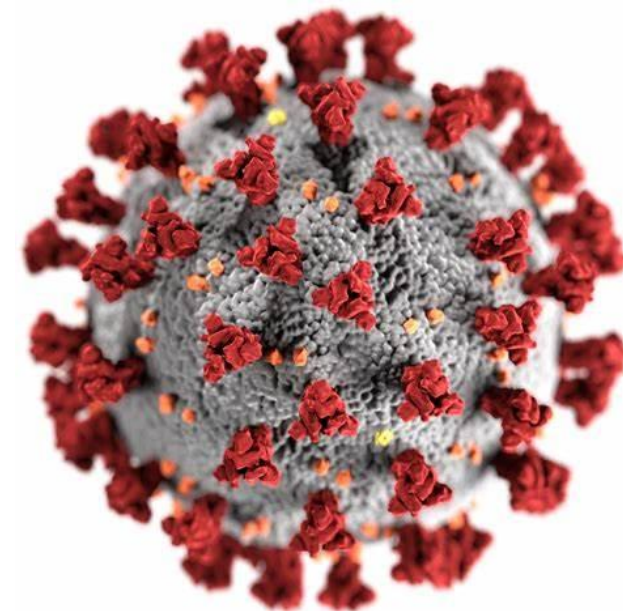
- Similar access to health care as Urban centers
- Available funds and resources

The public health of a rural town directly impacts the health of the surrounding economy

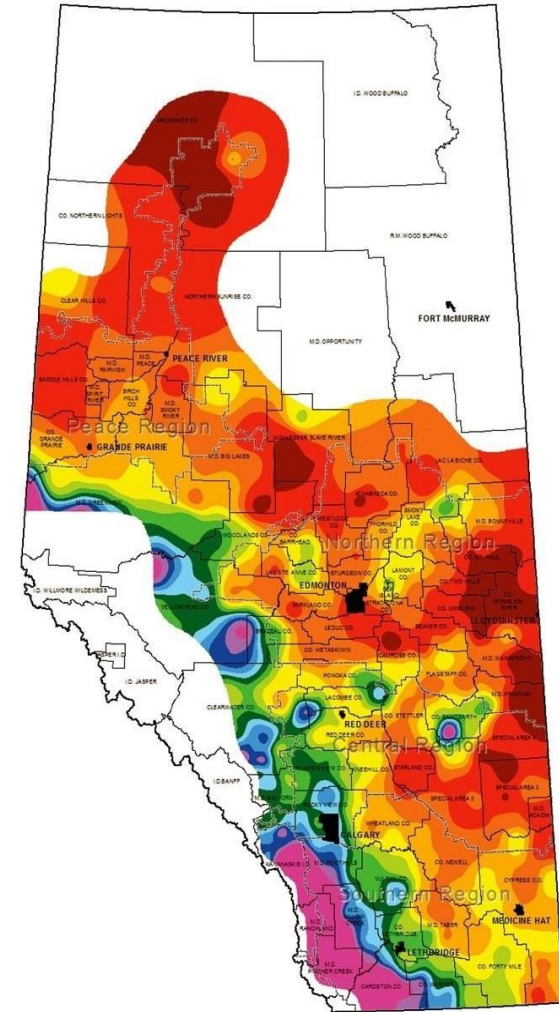


What is Wastewater Epidemiology (WBE)?

- **WBE: Wastewater-Based Epidemiology**
- Uses information from wastewater and translates the presences/absence as well as quantification of parameters to the over-all state of public health in that sampled community.
- SARS-CoV-2 RNA is excreted in stool for ~7 days prior to testing positive using traditional swabbing tests
- **Benefits of WBE:**
- Allows proactive identification of cases, prior to symptom onset and clinical testing
- Allows testing of whole populations
- Non-intrusive (sampling happens in the background)
- Provides institutions with an additional risk management tool
- Identify first cases before they turn into outbreaks
- Allow institutions and provincial health authorities to proactively respond
- Real-time monitoring of affected populations
- Monitor effectiveness of interventions



More data allows for more informed decisions....



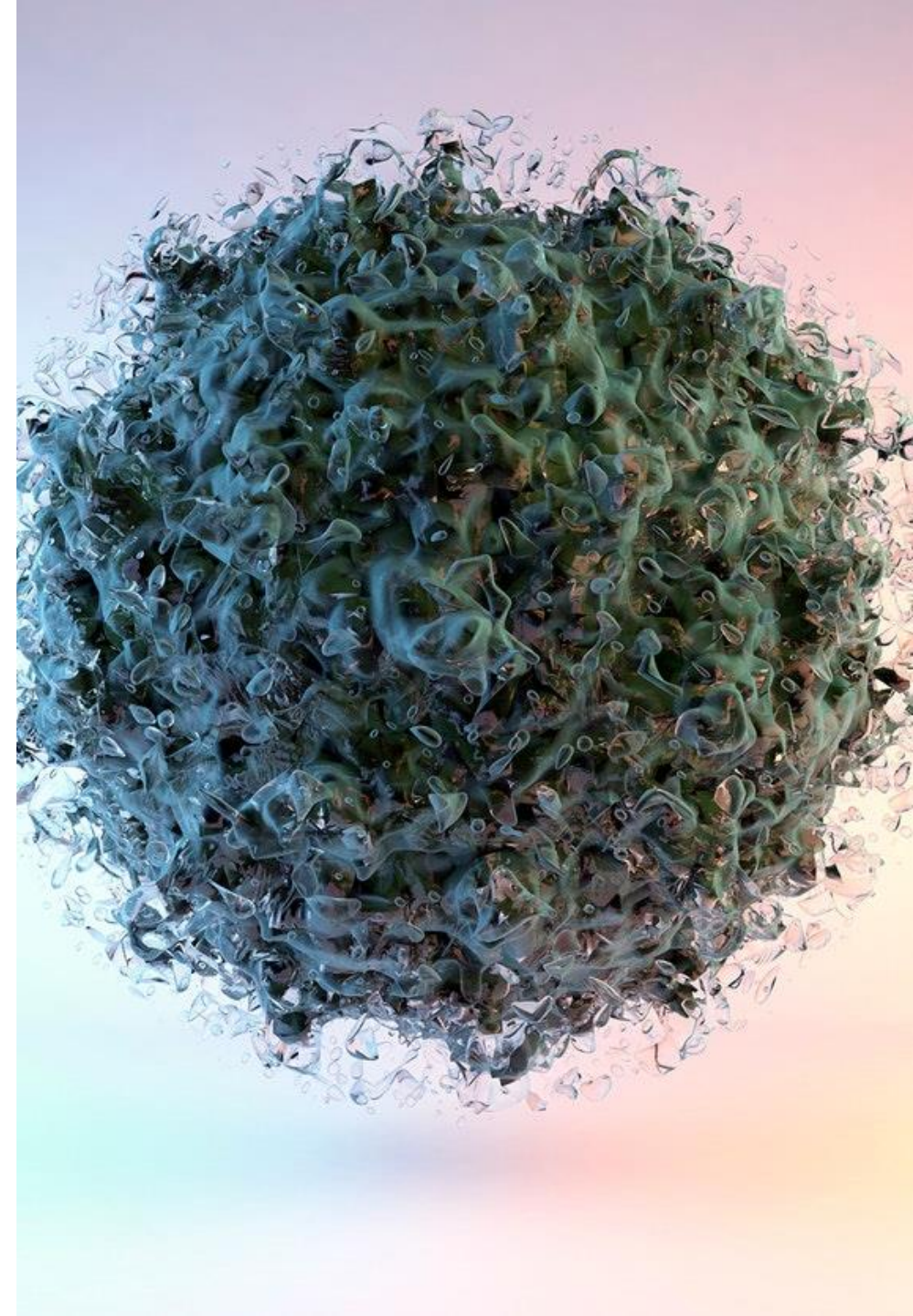


Why WBE is not a common practice?

- Wastewater has always been viewed as 'out of site, out of mind' and simply as a waste product with no value
- There has been little to no links to public health within industry

Link between Wastewater and public health

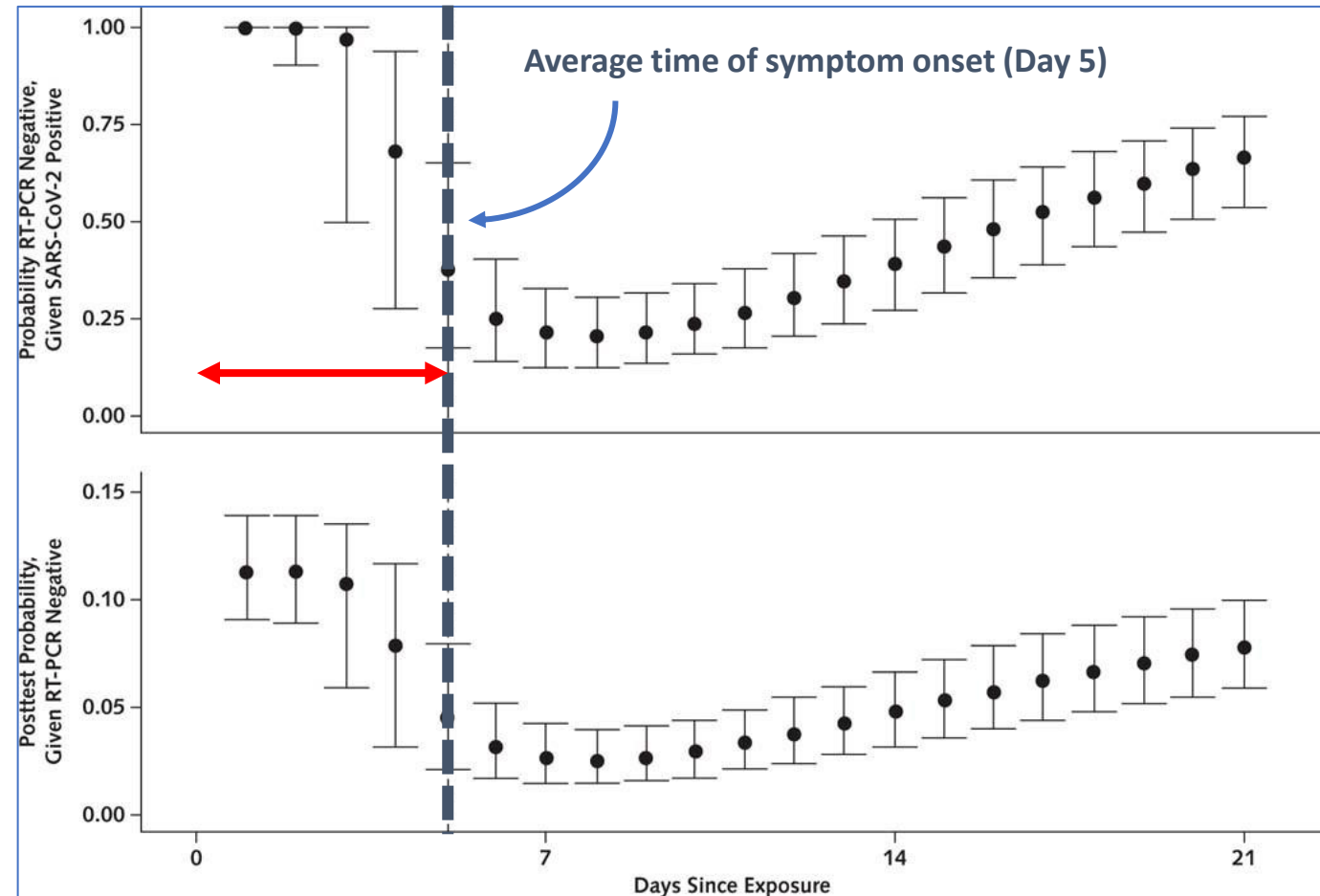
- The link between wastewater and public health is critical and the study of wastewater epidemiology will become intertwined with enhanced work place safety strategies in the near future.
- Historical uses of wastewater epidemiology:
 - Polio outbreak
 - Salmonella outbreak
- More recently wastewater epidemiology has taken the spot light in the fight against SARS-CoV-2



Notable Current and Future Uses for WBE

Focuses:

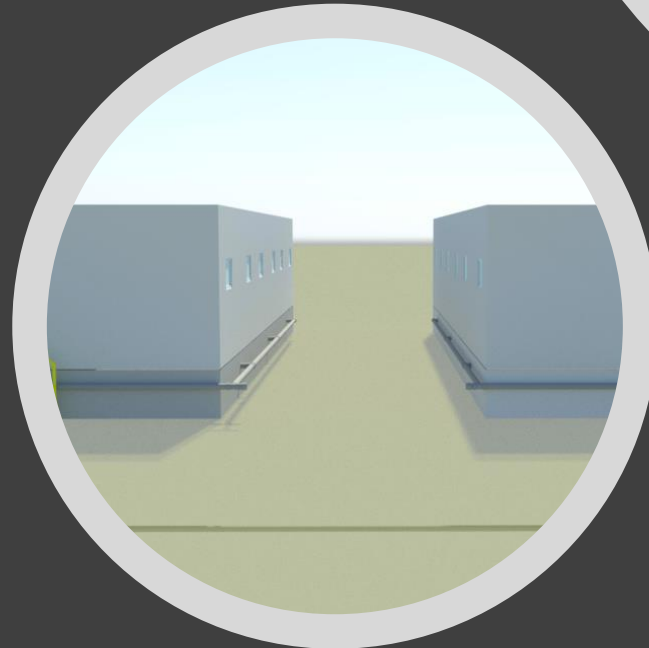
- **Monitoring SARS-CoV-2 and variants**
- Other viruses (influenza)
- Other bacterial infections (tuberculosis)
- Antibiotic resistance bacteria



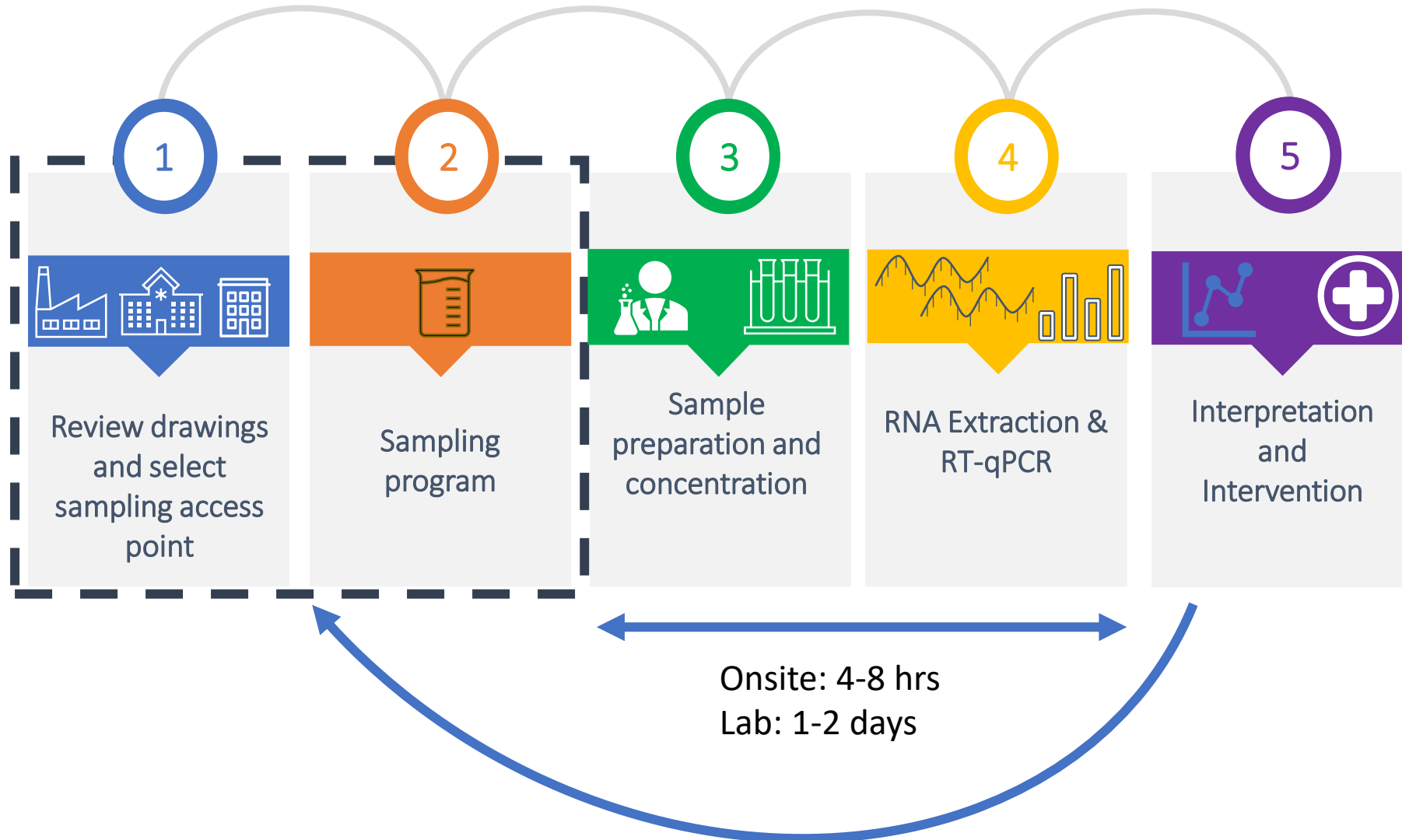
(Kucirka, L., Lauer, S., Laeyendecker, O., 2020)

What locations are we currently testing

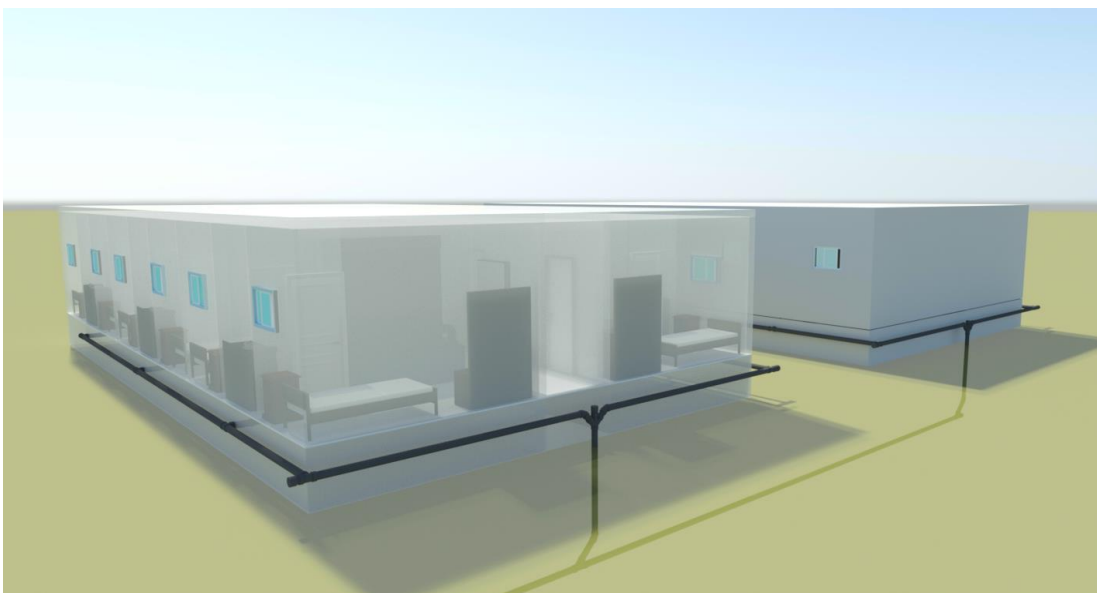
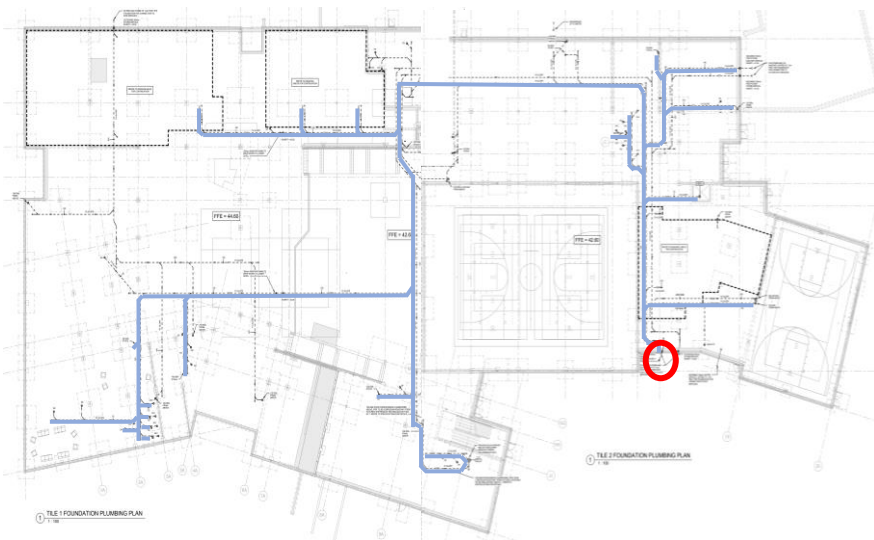
- **Schools**
- **Long-term Care homes**
- **Hospitals**
- **WWTP infrastructure**
- **Remote Camps (Energy and Mining)**
- **Dormitories**
- **Residential properties (Condominiums)**



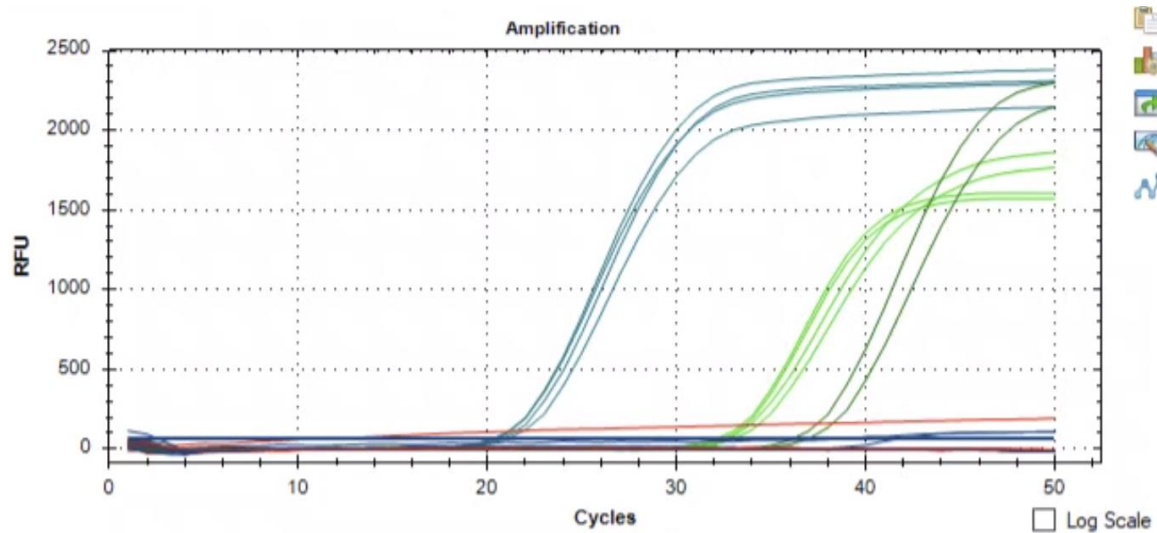
How it is done



Sampling using a tailored approach

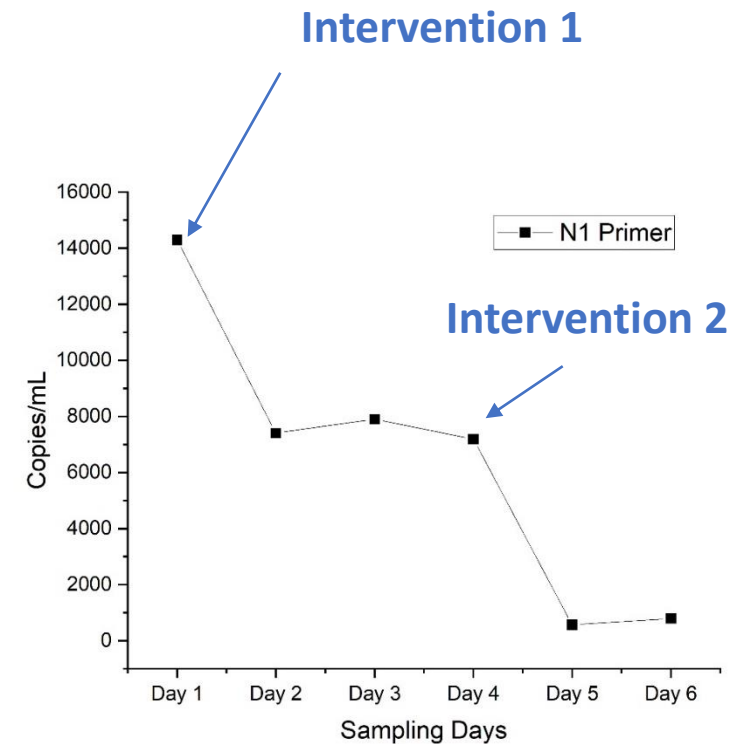
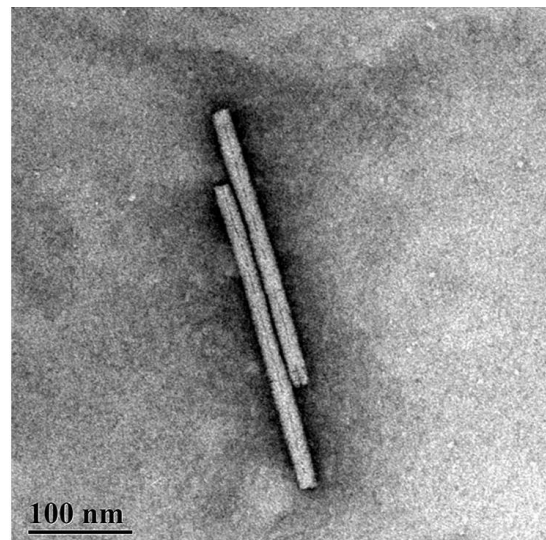


Data Analysis



N1, N2	These are two different targets in the nucleocapsid gene of SARS-COV2 virus
Ct	Cycle threshold: # of cycles required for the signal to cross the threshold (i.e. exceeds background level). Ct \leq 40 positive reaction, indicative of the presence of the nucleic acid target (N1 or N2).

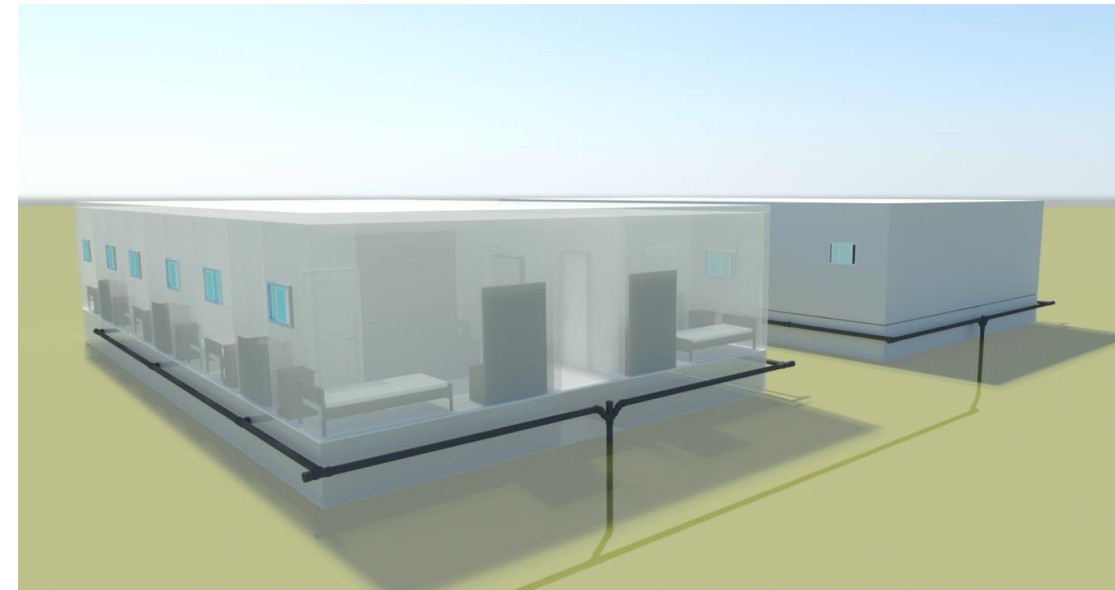
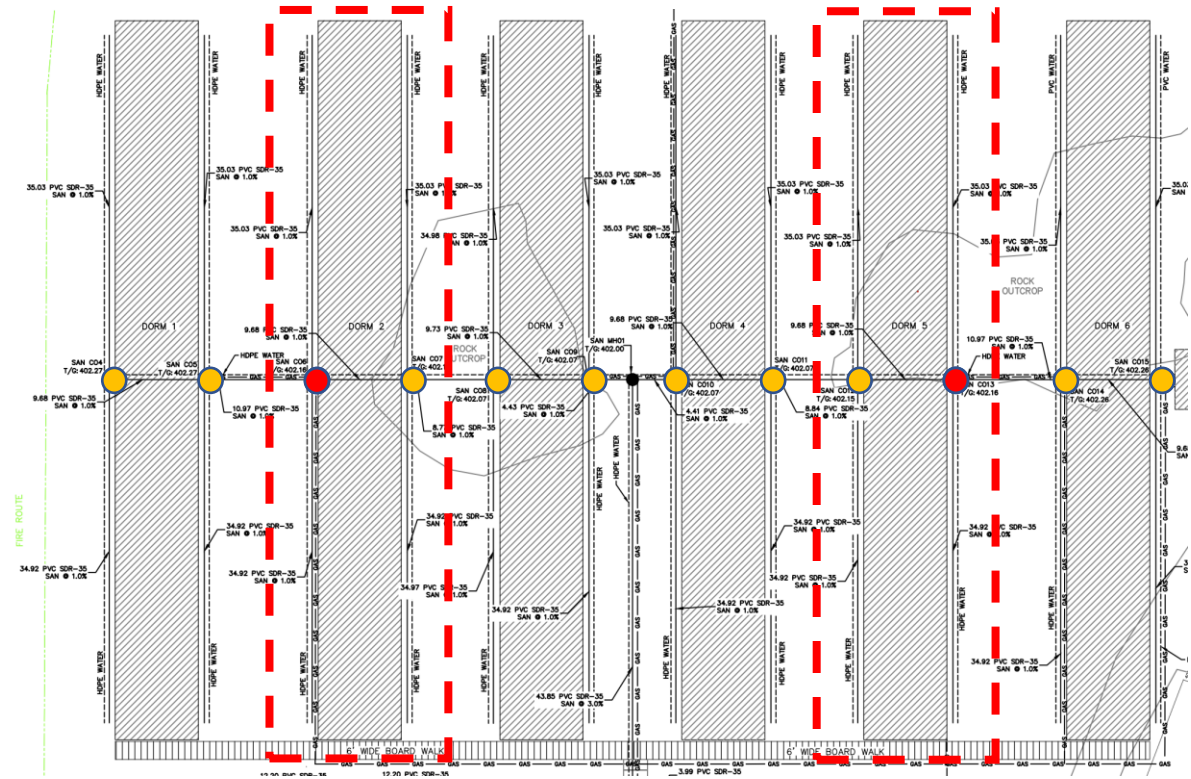
Incorporating Pepper mild mottle virus (PMMoV)



Mine Site Case Study

Remote Camp:

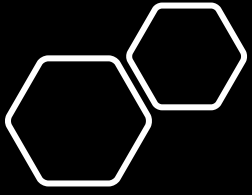
- 6 dormitories
- 12 samplers were required for high resolution sampling
- Sampling period was tailored around day/night shift and rotations



Main Points to Consider for Worker Safety

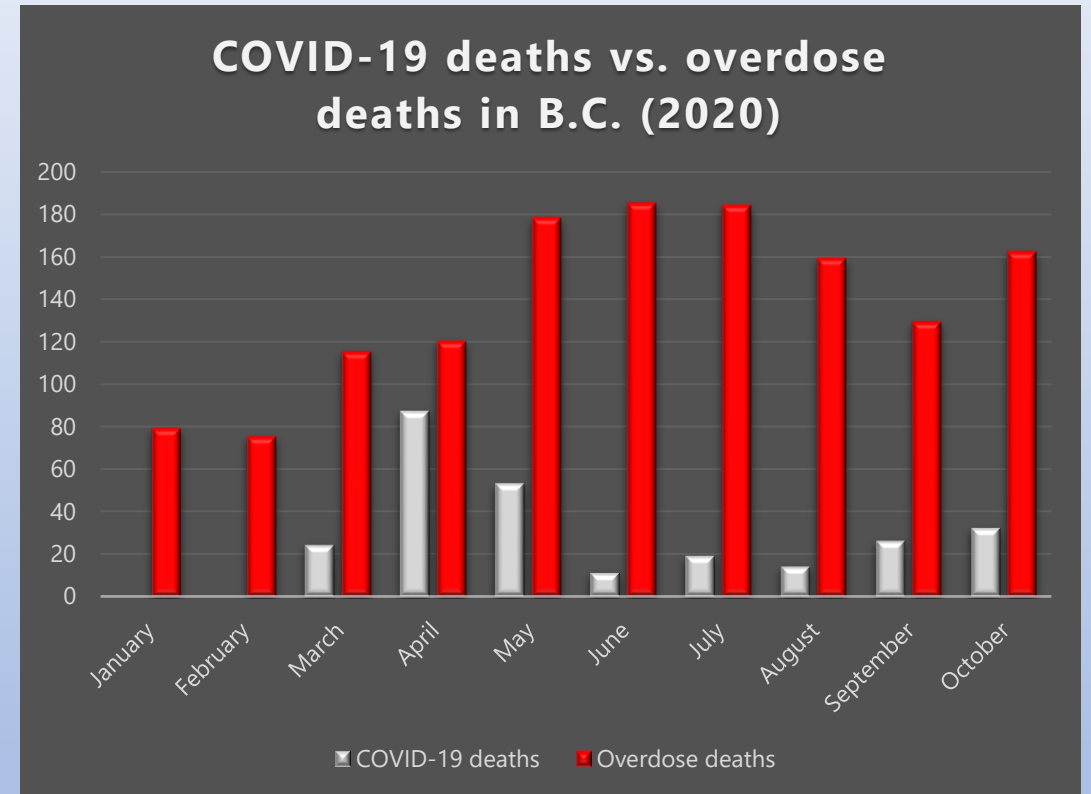
- **Early Detection** of SARS-CoV-2 (up to 7 days before breakout)
- **Proactive monitoring**
- Maintain a healthy workplace, avoiding costly shut downs and shift disruptions
- Additional and **complimentary monitoring** method for swab tests
 - Can be more sensitive and specific during early onset of infection
- **Non-invasive** and consistent sample collection
- Provides client with **additional risk management tool** which can lead to a faster and more effective response
- Sampling can be done at **any industrial location**. Each one of these facilities has a sanitary line.
- **Reduce organizational risk and liability**





Beyond COVID-19

- C.E.C. Analytics has started the feasibility of non-invasive drug analysis for estimation of drug consumption in facilities and remote camps
- Targets:
 - Opioids
 - Cocaine
 - Heroin
 - Drug precursors for methamphetamines



Beyond COVID-19

- Recent data show that drug overdoses at work are increasing at a rate of 24% annually within industry (CDC, 2020).



**Transportation
& warehousing**



**Construction
& Extraction**



**Healthcare &
social
assistances**

- Provide opioid awareness peer training for high risk worker groups and identify other additional opportunities to implement worker-oriented opioid overdose prevention strategies.

Illicit Drug Monitoring

- Monitoring wastewater is a **nonintrusive** and inexpensive way to obtain real-time data that accurately reflects community-wide drug usage while **ensuring the anonymity of individuals**.
- WBE studies raise no ethical issues because WBE data are not collected on individuals (ethical research guidelines for sewage epidemiology, 2015).

How does WBE Enhance Health & Safety



WBE provides early detection of COVID-19 and keeps the workplace safe



Prevention

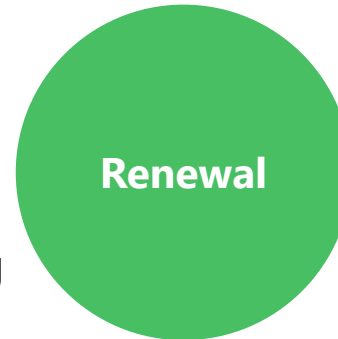


Proactive monitoring and a proven method for early detection of COVID-19



Mining Industry is one of the first for early adoption of this method

Renewal



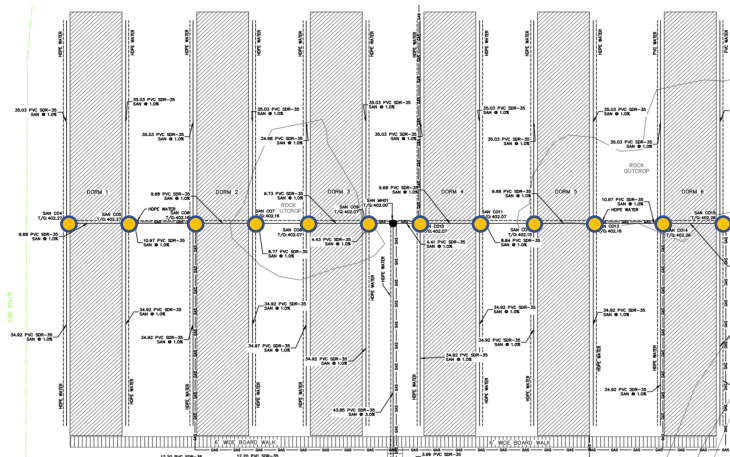
WBE provides a peace of mind for industry knowing that every avenue is currently used for COVID-19 monitoring

WBE



How to start

- C.E.C. Analytics is a full service provider
 - Develop a sampling plan that is tailored to your operations
 - Provide equipment and materials to collect samples
 - Onsite and/or remote support for installation of samplers
 - Coordinate with laboratories and assist with analysis and intervention strategies



WBE in Canada

- [Calgary engineer develops portable wastewater sampler that tests for COVID-19 - constructconnect.com](#)
- [Wastewater is a COVID-19 'early warning system,' Ontario spends \\$12M to test sewage \(yahoo.com\)](#)
- [Sewage surveillance: How scientists track and identify diseases like COVID-19 before they spread | National Post](#)
- [Testing sewage for COVID-19 could be 'early warning' system, Ontario researchers hope | CBC News](#)
- [COVID-19 found in Yellowknife wastewater - Winnipeg Free Press](#)
- [Researchers monitoring wastewater for COVID-19 at Edmonton long-term care facilities \(msn.com\)](#)
- [Sewage surveillance: How scientists track and identify diseases like COVID-19 before they spread | Canadian Geographic](#)
- [University of Guelph testing campus residences' wastewater to detect COVID-19 | CTV News](#)
- [Testing wastewater could give early warning of second wave of COVID-19 | CTV News](#)

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