We will begin shortly.
Participants, kindly note the following for this seminar.

Please rename your Zoom name to: Name, Org or Project
(e.g. Las Fernando, ADB)

PLEASE TURN YOUR MIC OFF DURING THE PRESENTATION

RAISE HAND WHEN YOU WANT TO TALK

USE THE CHAT BOX FOR QUESTIONS/CONCERNS

WE HAVE A Q&A PORTION AFTER THE PRESENTATION

Pacific WASH Webinars

Wastewater Surveillance – helpful in the Pacific for COVID-19 response and beyond?

1 October 2021

TA6551-REG: Strengthening WASH practices and hygiene behavioral change in the Pacific

TA9685-REG: Implementing a Differentiated Approach to Urban Development in the Pacific

Schedule

Allotted time	
5 min	**Introductions:** Emma Veve, Deputy Director General, Pacific Department, ADB Lusia Sefo-Leau CEO PWWA
30 min	**Presentations:** 1. Health agency perspective – Rachael Poon 2. Utility sewer network sampling perspective - Tiffany Chen 3. Laboratory overview of methods perspective - Melody Lau 4. Bringing it together into a program - Sudhir Pillay
25 min	Panel Discussion and Q&A facilitated by Marlene Hsu
5 min	**Closing remarks** Maria Tran, co-team leader, ADB WASH Pacific Regional TA

Victoria's adaptive wastewater surveillance program for SARS-CoV-2

Rachael Poon
Principal Scientist
Wastewater Surveillance for SARS-CoV-2
Department of Health – Victoria, Australia

Victorian wastewater surveillance for SARS-CoV-2

Program objectives:

- To provide early warning and enable early case detection of SARS-CoV-2
- To increase community awareness and motivate testing for local unexpected detections
- To contribute to global learning and best practice

Surveillance in the COVID-19 response

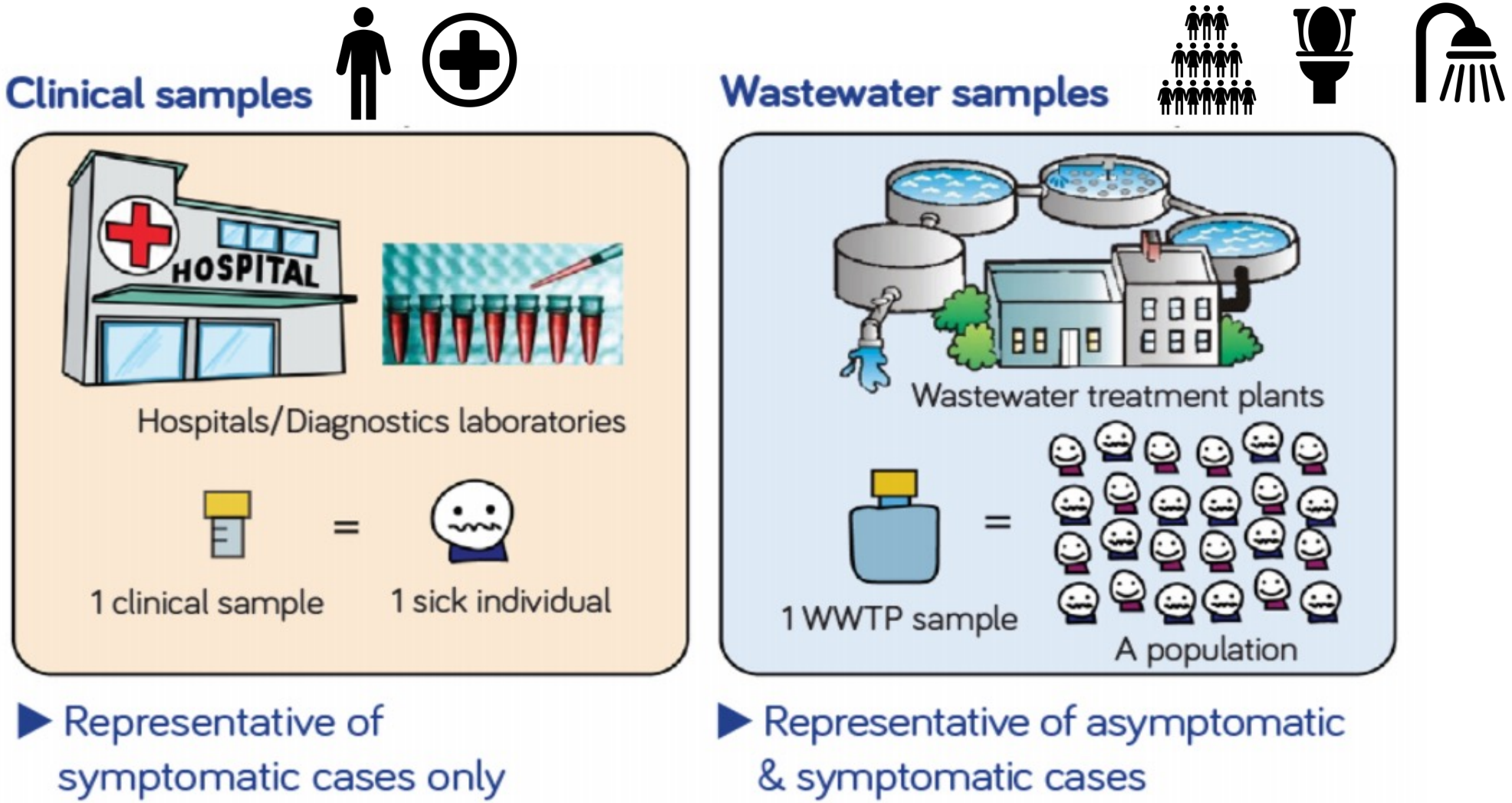


Image credit: Lun et al. [Genetic diversity and quantification of human mastadenoviruses in wastewater from Sydney and Melbourne, Australia]

Wastewater surveillance - adaptive to risk

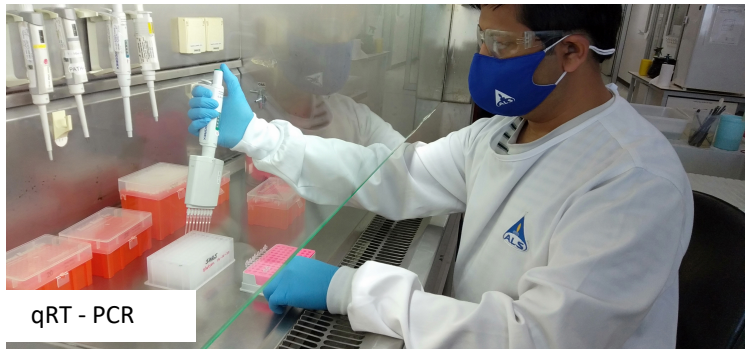
Wastewater surveillance process flow

- 1. Sample collection and transport

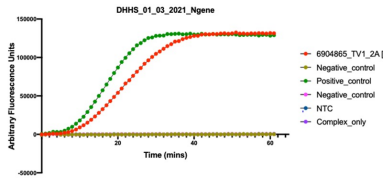
Wastewater treatment plant - inlet

Targeted site – upstream manhole

- 2. Sample analysis and independent confirmation



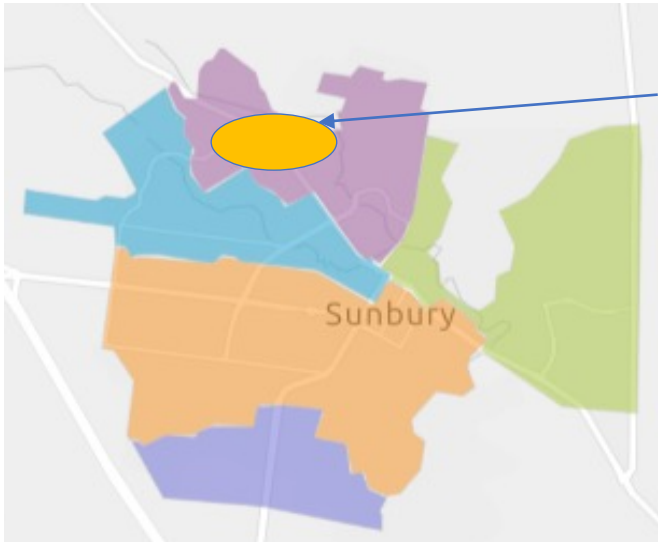
qRT - PCR



Confirmation of marginal results

amplicon sequencing, CRISPr or ddPCR

3. Determine if detect is expected or unexpected



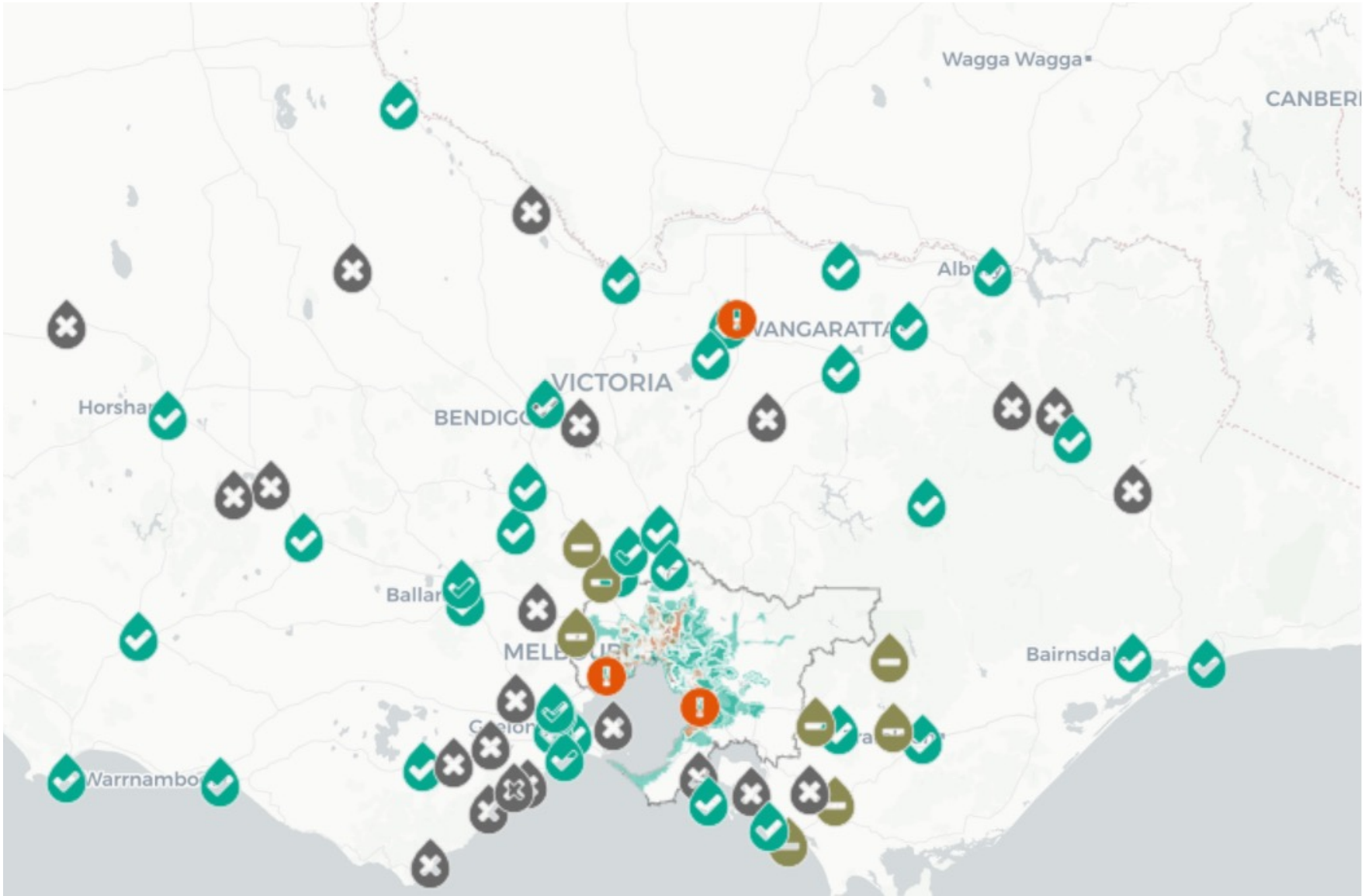
Known case

Expected detection

Unexpected detection

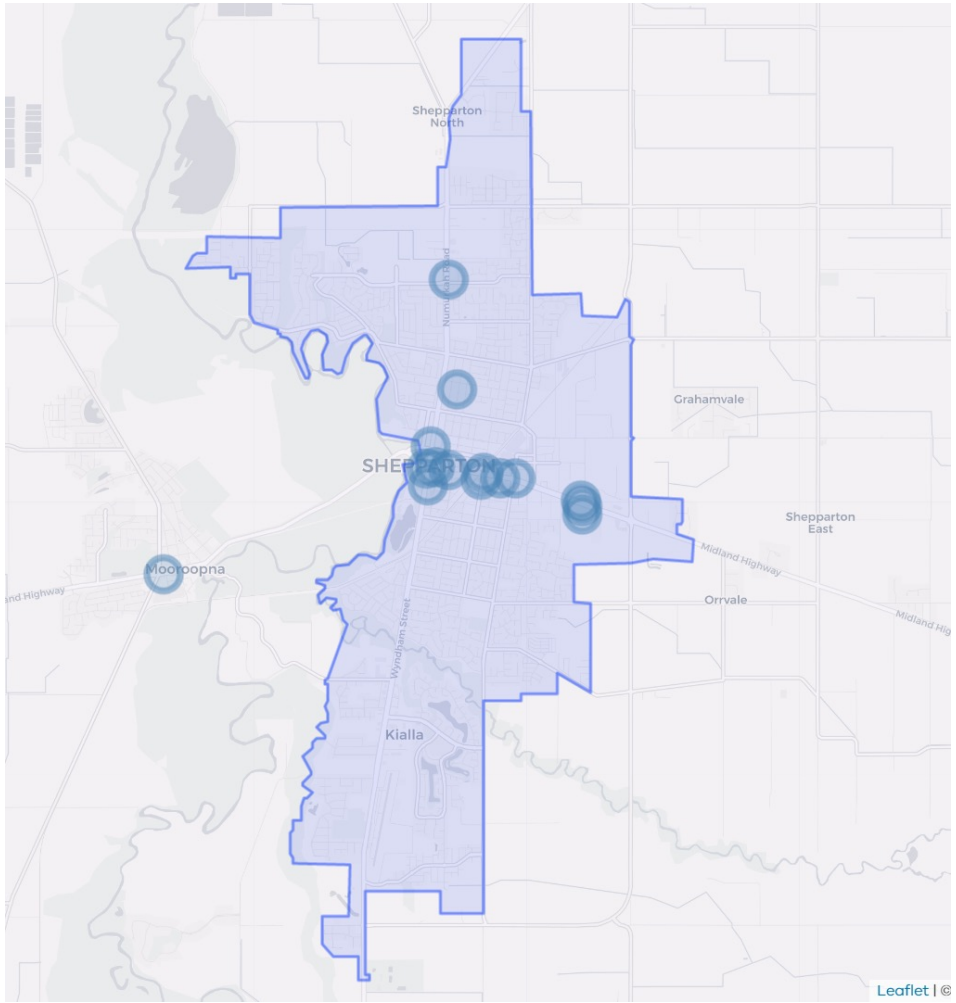
Image credits: Melbourne Water, EPHM Laboratory (Monash University) and ALS

Wastewater surveillance – low case setting



Status	Wastewater treatment plant	Network area
Unexpected detection		
Anticipated detection		
No detection		
Test result pending		
Inconclusive		
No tests performed in this period		
Testing site suspended		Not applicable

Early warning – Regional town - Shepparton



Population 37, 470

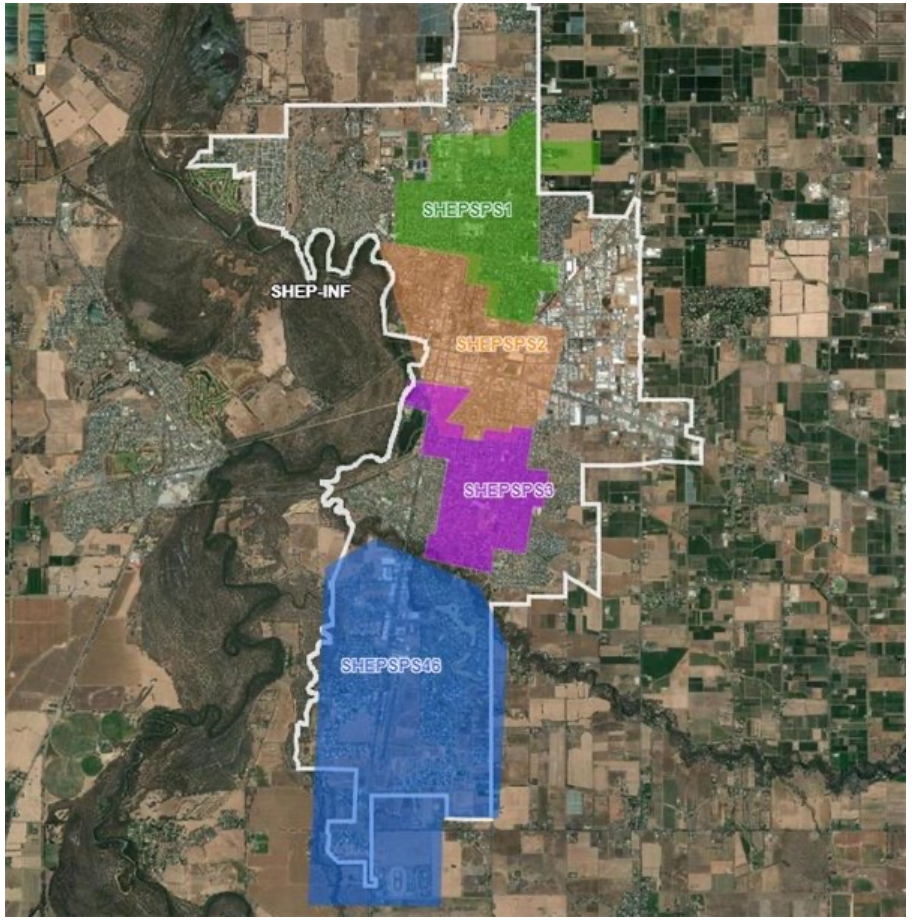
Wastewater detection 10 days before case diagnosed

Repeat detections - quantitative signal increasing

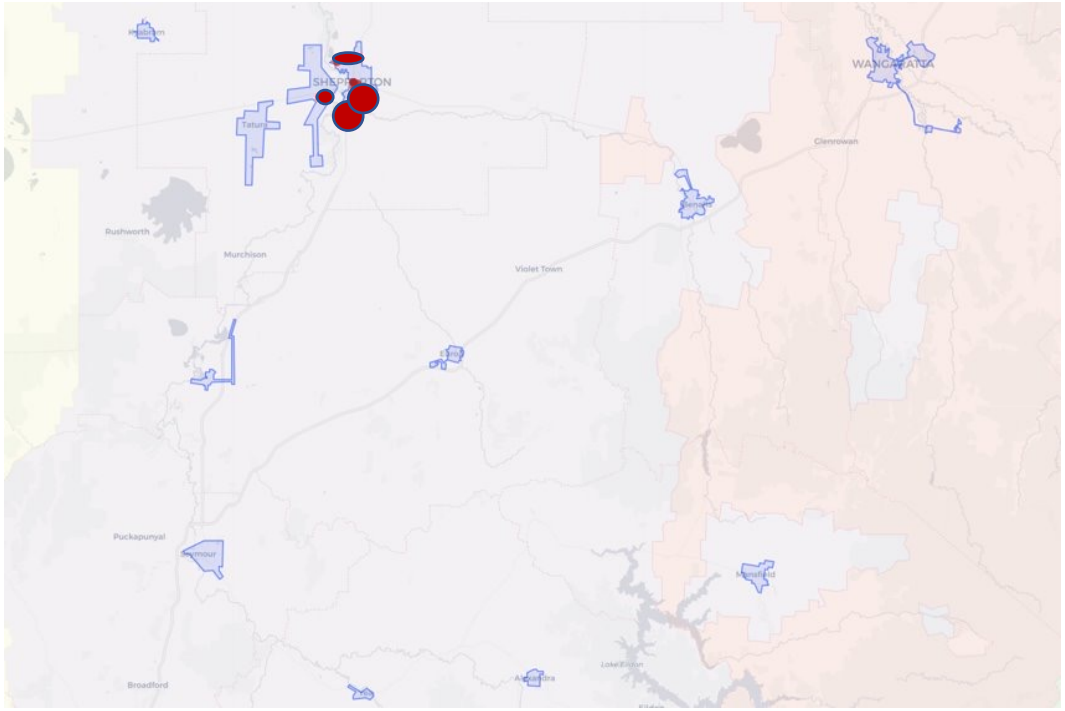
Public Health response including:

- Increased testing capacity in region
- Local communications
- Regional lockdown – limited people movement
- Intensive wastewater sampling - subcatchment sampling

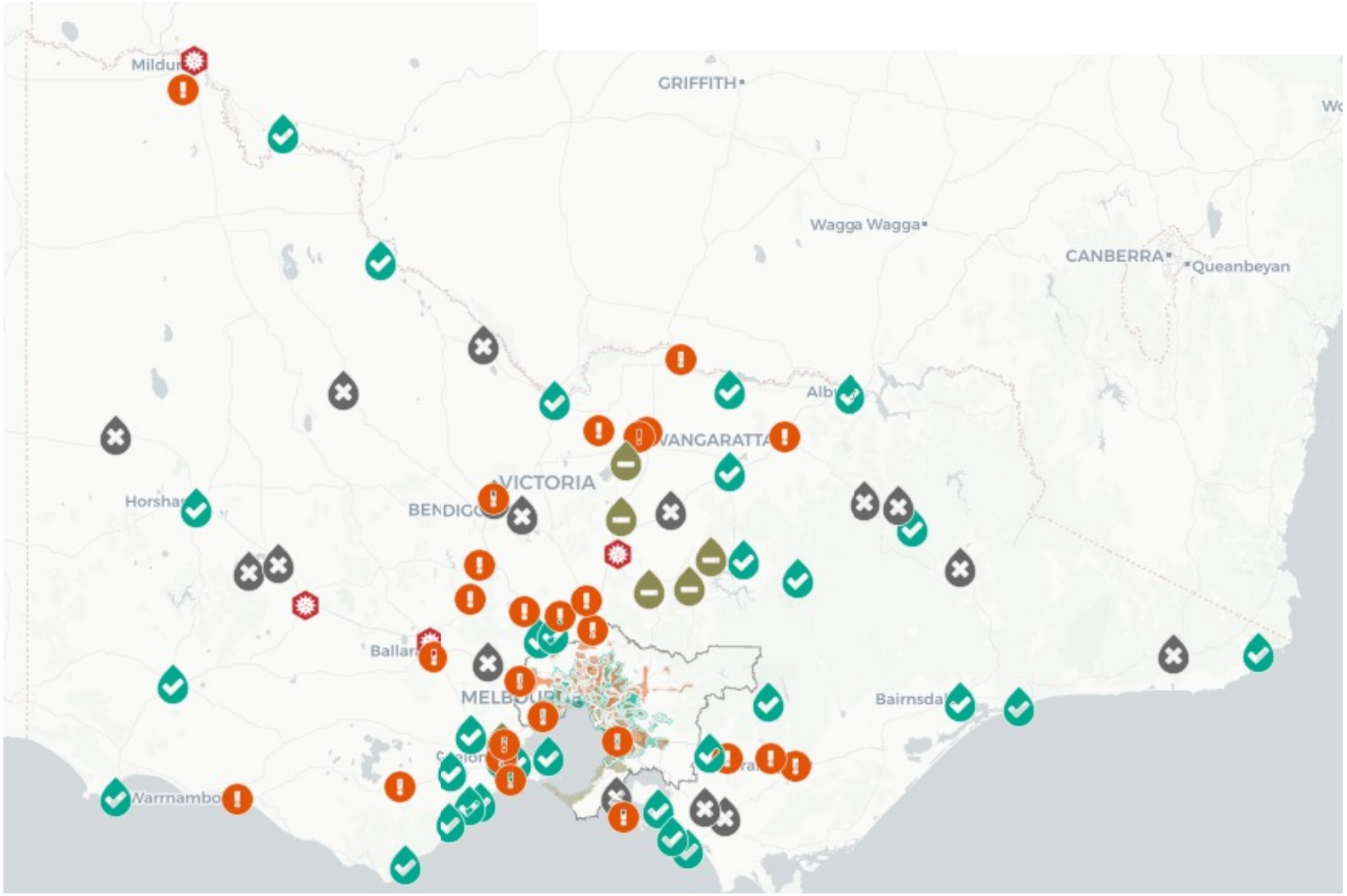
Early warning – Regional town - Shepparton



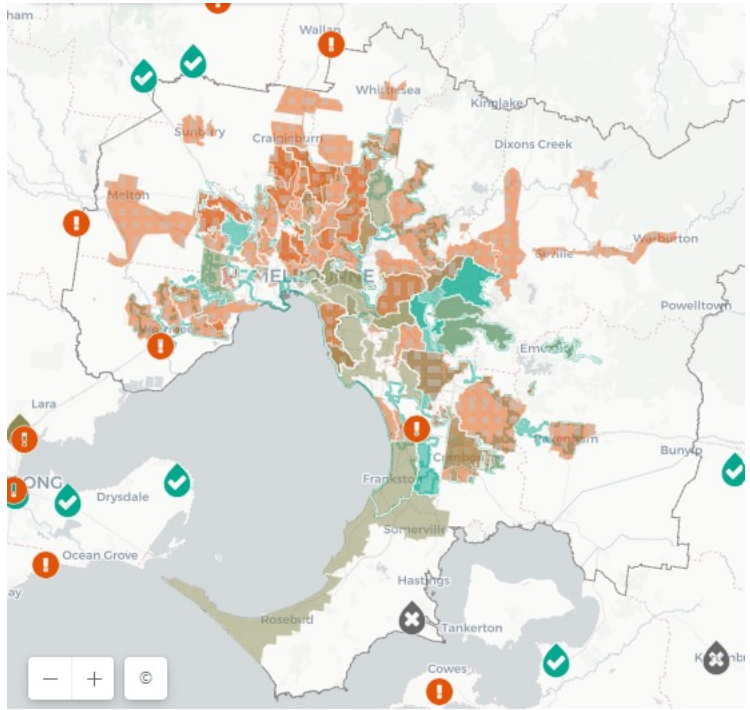
- Subcatchment sampling – try identify which areas have detections explained by known cases
- Targeted surveillance:
  - Exposure sites: Aged care, industry
  - Neighbouring catchments



Wastewater surveillance high case setting



Status	Wastewater treatment plant	Network area
Unexpected detection		
Anticipated detection		
No detection		
Test result pending		
Inconclusive		
No tests performed in this period		
Testing site suspended		Not applicable



Localised surveillance – facility level

High transmission risk locations

- High rise social housing
- Large aged care facilities
- Industry sites
- Distribution centres
- Correctional facilities
- Schools

Key learnings and important considerations

- Wastewater surveillance can be adapted to risk and setting
- Target wastewater surveillance in areas where there is actionable public health response
- For early warning important to have optimised sampling methods and timely reporting of results
  - Passive samplers rather than grab or composite samples
  - Turn around time from when sample is taken to reporting of results (metro Melb same day/next day, regional usually within 2 days)
- Communication of results - translating results to behaviour change

Acknowledgements

ColoSSoS
Collaboration on Sewage Surveillance of SARS-CoV-2

10 YEARS Water Research AUSTRALIA

Water utility partners (Vic):

Melbourne Water
Enhancing Life and Liveability

City West Water

Barwon Water

Coliban WATER

CENTRAL HIGHLANDS WATER

East Gippsland Water

GIPPSLAND WATER

GOULBURN VALLEY WATER

GWMWater

LOWER MURRAY WATER

wannonWATER

North East Water

South East Water

South Gippsland Water

WESTERN WATER

WESTERNPORT WATER

Yarra Valley Water

Research/laboratory partners (Vic):

ALS

EPHM Lab

MONASH University

Melbourne Water
Enhancing Life and Liveability

FIAT LUX
Walter+Eliza Hall
Institute of Medical Research

THE UNIVERSITY OF MELBOURNE

VIDRL

DH team: a work of many MANY hands…

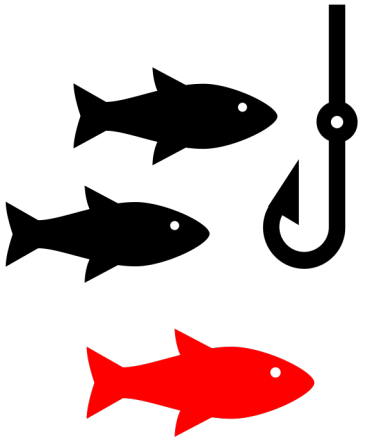
Information about the wastewater surveillance program in Victoria including test results available on the DH website:

coronavirus.vic.gov.au/wastewater-testing

Rachael Poon
Rachael.Poon@health.vic.gov.au

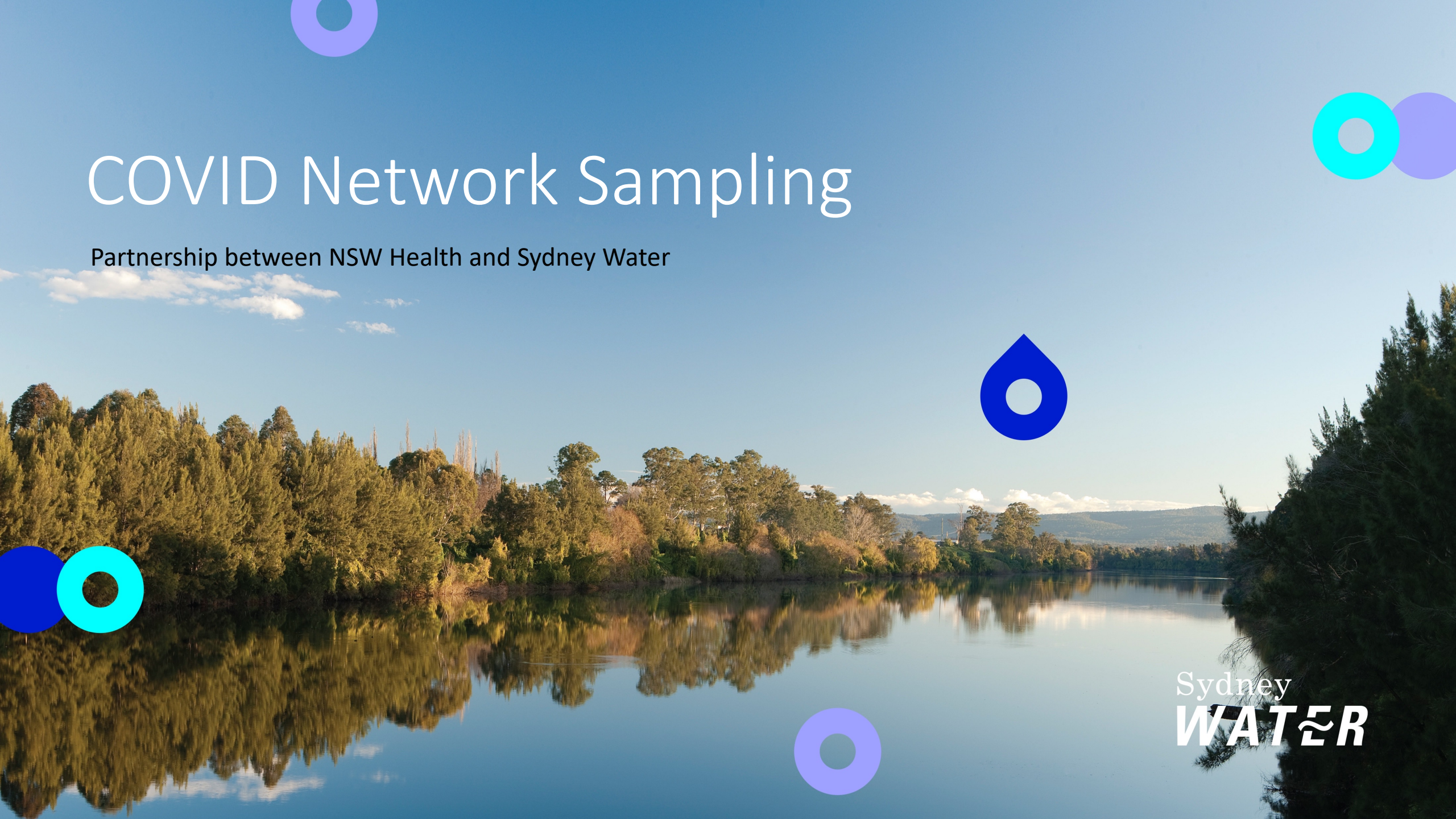
Monica Nolan
Monica.Nolan@health.vic.gov.au

and the Wastewater surveillance team:
Jennifer Jordan, Greg Wise, Ryan (Ngai Ning) Cheung,
Mira Cooper, Maree Prebble, Rebecca Ritte
Wastewatersurveillance@health.vic.gov.au



COVID Network Sampling

Partnership between NSW Health and Sydney Water



NSW Sewage Surveillance Program

First such monitoring program in Australia
Extremely Sensitive and highly reproducible method
1 case among >100,000 people

Feb 2020
- Method development and validation

July 2020
- Started program
- 50 samples per week
- WWTP and regional

October 2020
- 100 samples per week
- Reactive sampling in Sydney Water network

December 2020
- 150 samples per week
- Increased reactive sampling in response to local outbreaks

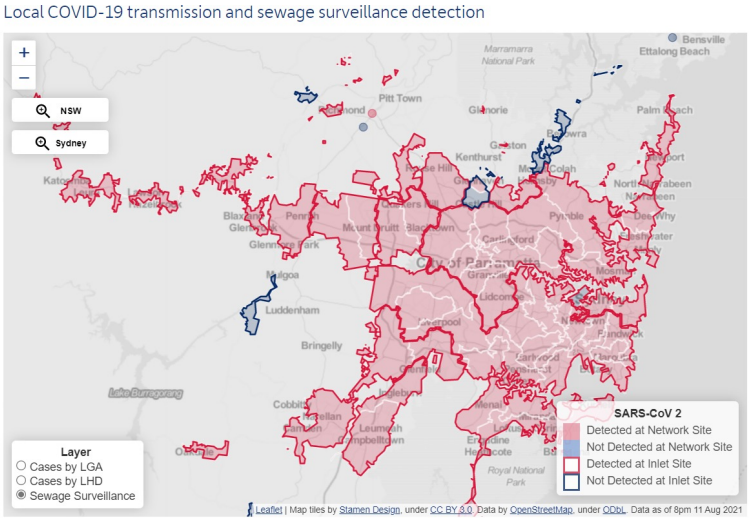
Feb 2021
- Routine Sydney Water network monitoring program established
- 65 Sydney Water sites

Nov 2021
- Projected 350 samples per week

Sampling process

Request from NSW Health → Desktop analysis for suitable site → Map, population and suburbs sent to NSW Health

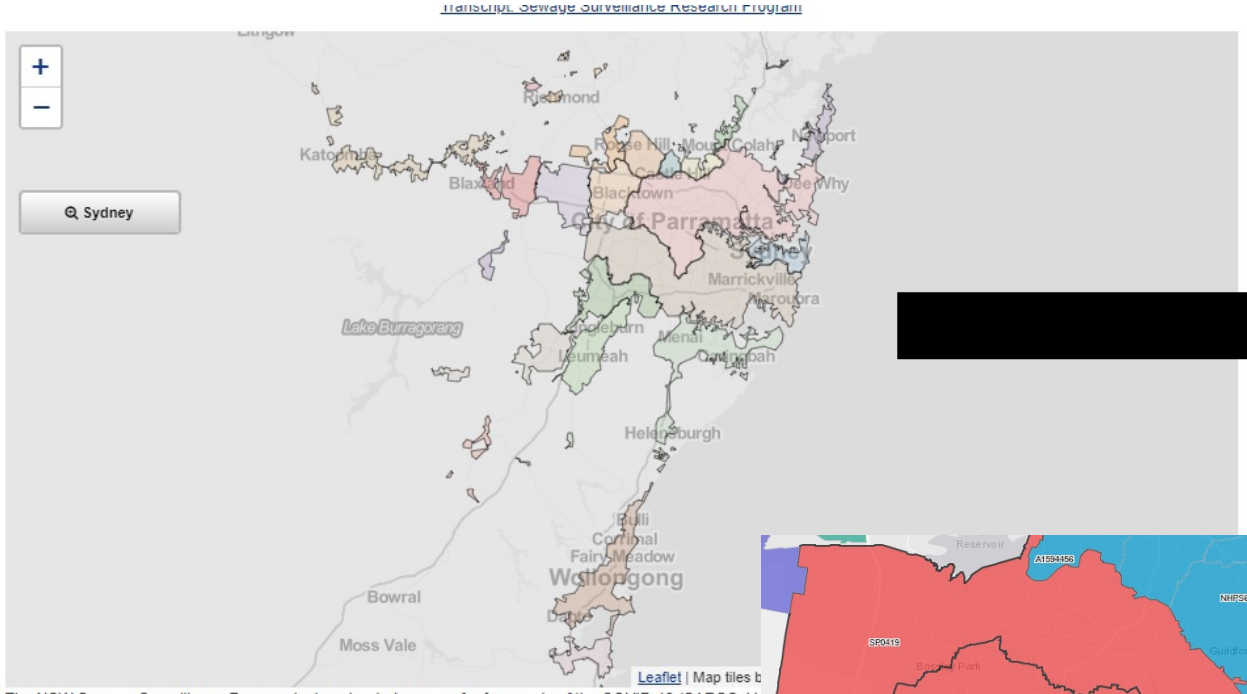
Desktop analysis for suitable site → Sample → Lab results sent to NSWHealth



https://www.health.nsw.gov.au/Infectious/covid-19/Pages/stats-nsw.aspx

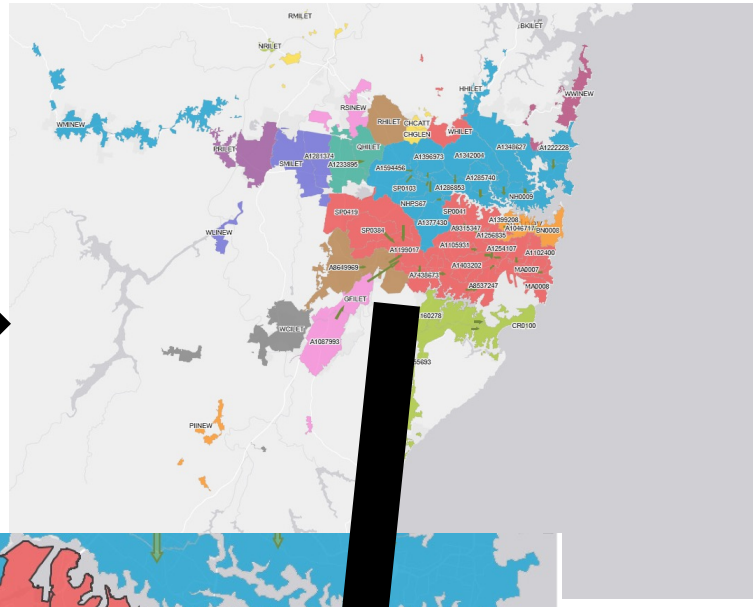
Sydney WATER

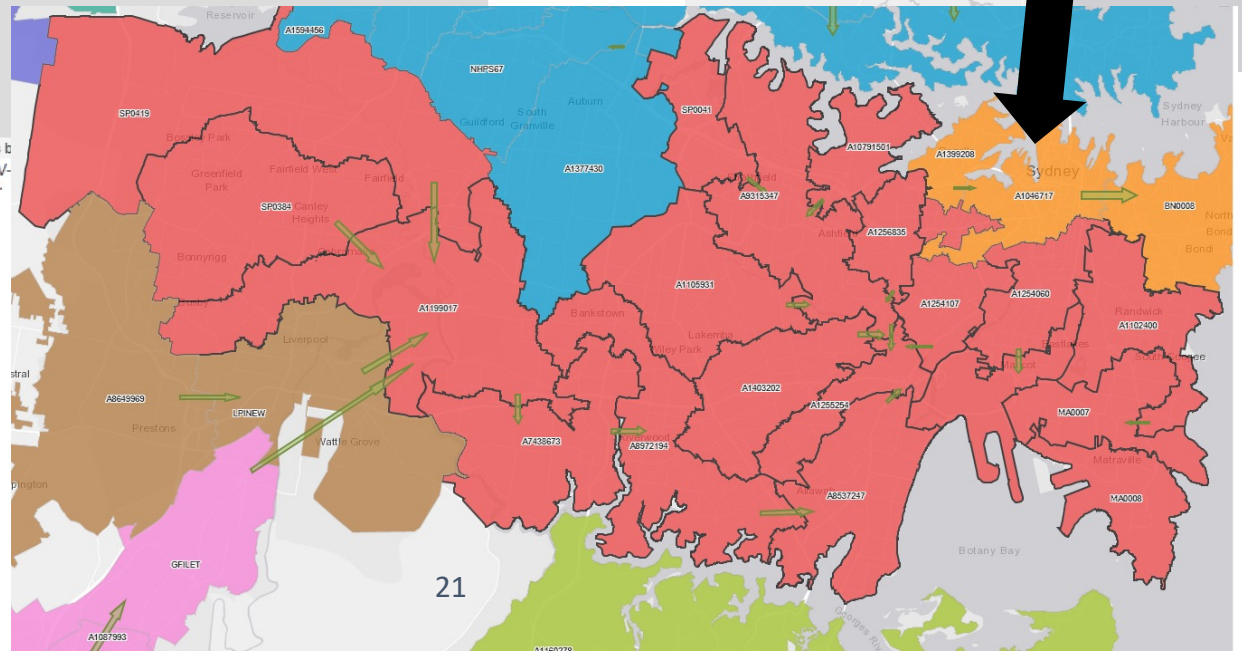
How to make meaningful decisions ?



The NSW Sewage Surveillance Program tests untreated sewage for fragments of the COVID-19 (SARSCoV-

COVID-19 Sewage Surveillance Program - COVID-19 (Coronavirus) (nsw.gov.au)





How to select a site?

Wastewater Treatment

vs

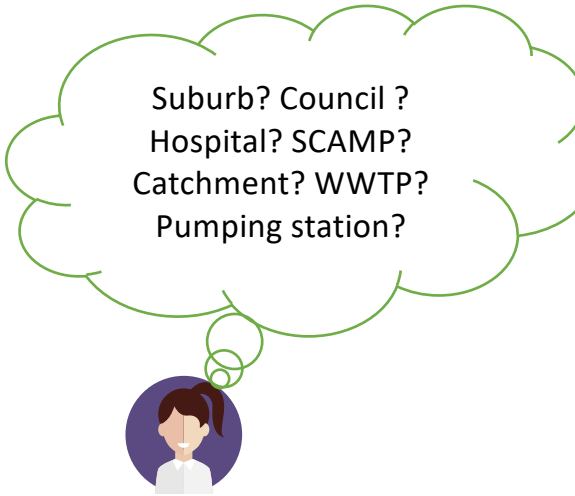
Network Sampling

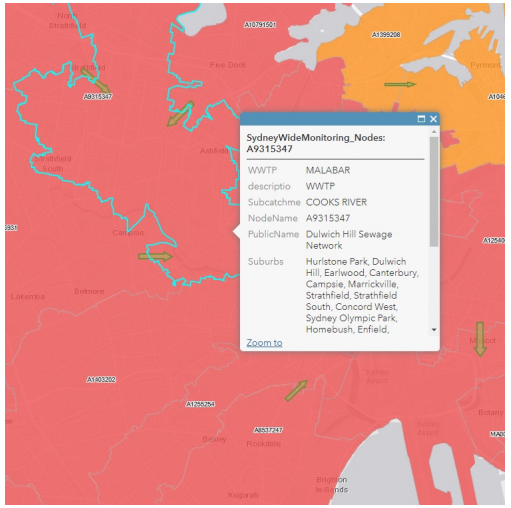
22

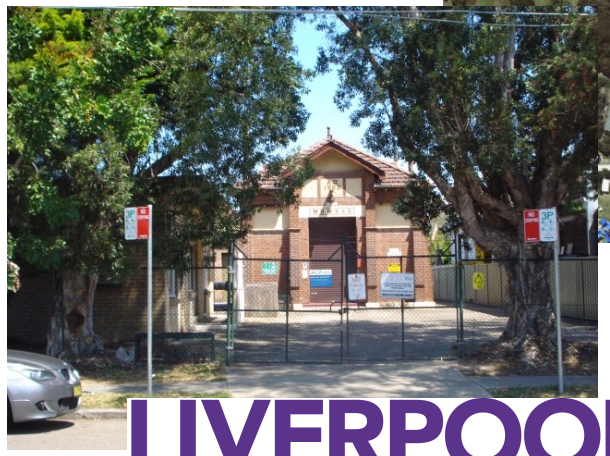
How to communicate across agencies?

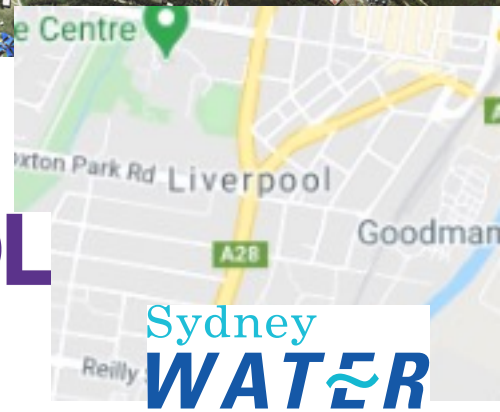
Need to communicate in a way that is:

- Fast
- Accurate
- Secure
- Easy to use
- Can be used if people are not in office
- Allows users to answer their own questions









LIVERPOOL CITY COUNCIL

Sydney WATER

Benefits to utilities

- Positive publicity and public sentiment
- Increased public literacy around sewerage management
- Less disruption to operations
- Hiring and upskilling additional personnel
- Project investment of $5+ million
- Monitoring sites available for future surveillance projects

CNN

Sewage is the latest disease detection tool for Covid-19 -- and more

Sydney WATER

COVID-19

Lab perspective

- October 2021

Government of South Australia

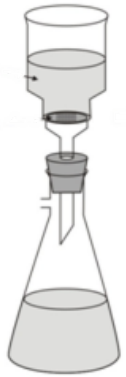
SA Water

Detection in sewage – the workflow

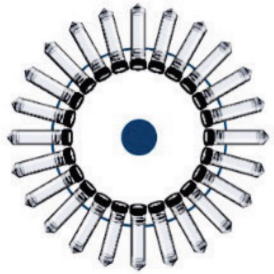
50 mL sewage sample

Centrifugation

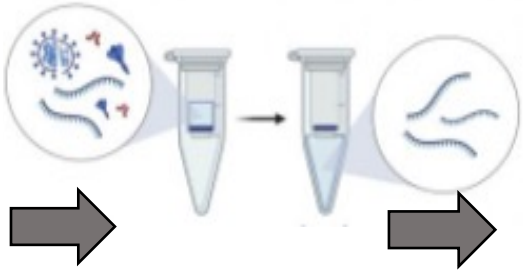
pH adjustment with HCl



Filtration

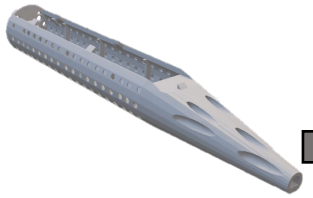


Bead Beating (Genie 2 vortex or Powerlyser 24)



RNA extraction

SARS-CoV-2 RNA detection

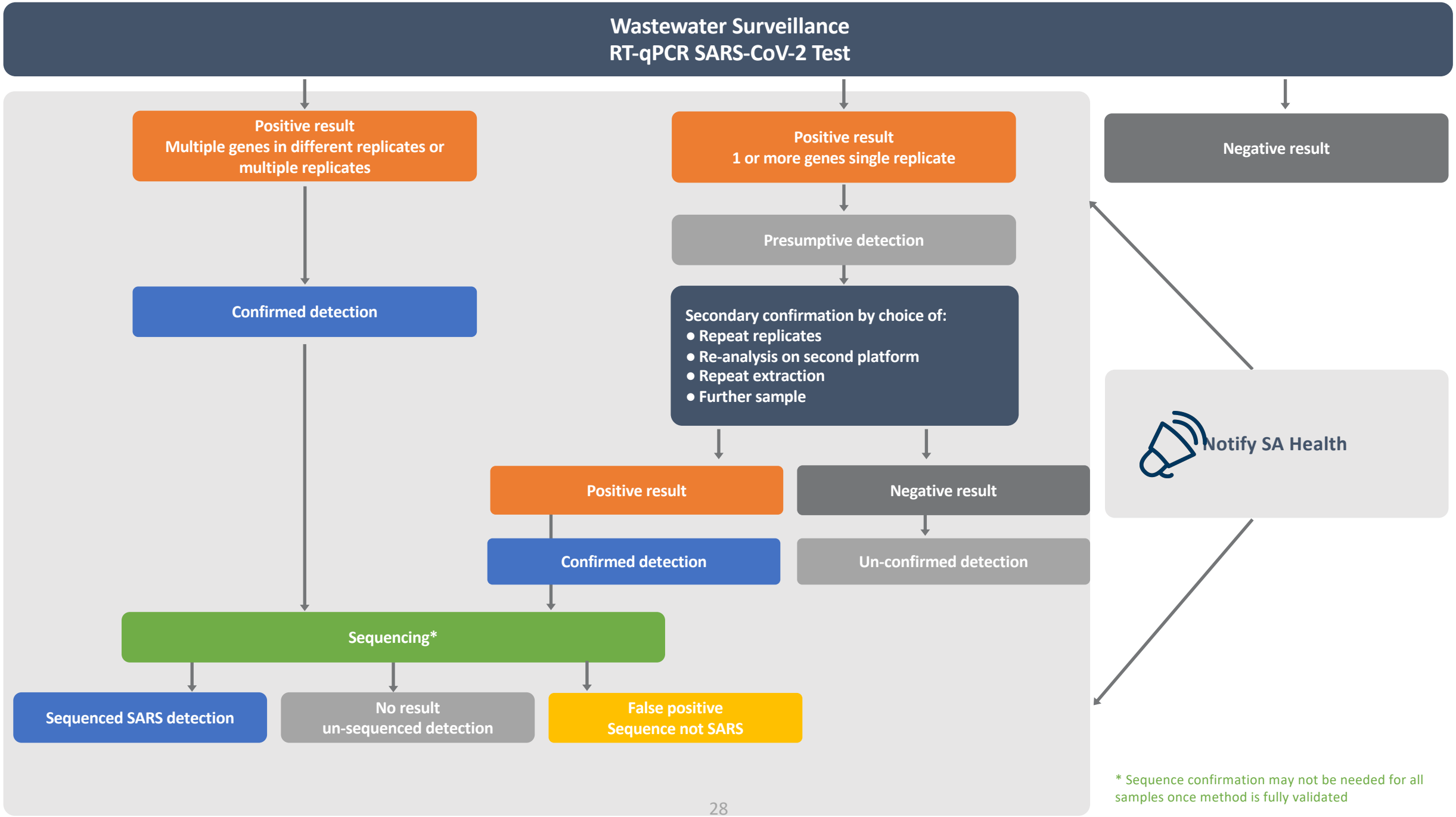


Membrane in passive sampler device

RT-PCRs

- Options
- Commercially available kits (e.g. PerkinElmer SARS-CoV-2 Nucleic Acid Detection kit (RUO)
- Published assays (e.g. US CDC primers, probes)
- More than one gene
- Quality Measurement
- QC -Recovery control/internal control/inhibition (MS2)
- PCR efficiency and LOD: twist synthetic SARS-CoV2-RNA control (10 to 10^5 copies/rxn)
- Positive control
- No template control
- Analyse each sample extract in triplicate

Wastewater Surveillance
RT-qPCR SARS-CoV-2 Test

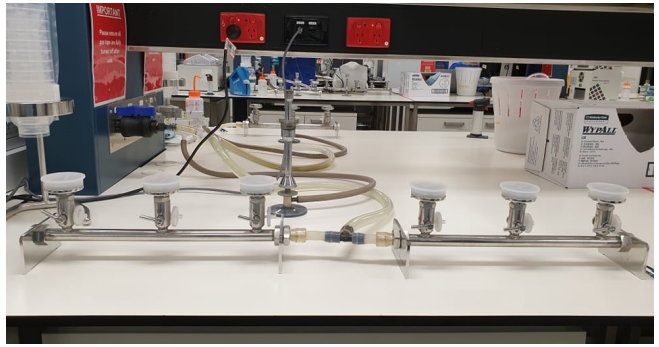


* Sequence confirmation may not be needed for all samples once method is fully validated

Laboratory requirement

- PC2 or BSL 2 or equivalent
- Good laboratory practice, lab layout to avoid contamination
- Experienced lab staff
- Equipment required for testing
  - Centrifuges
  - Filtration manifolds
  - Vortex or bead beater/homogeniser
  - PCR machines (remote access, user friendly software, raw data, easy to export data)
  - Gel electrophoresis / Agilent 2100 Bioanalyzer

Centrifuges



Filtration manifolds

Bead Beater

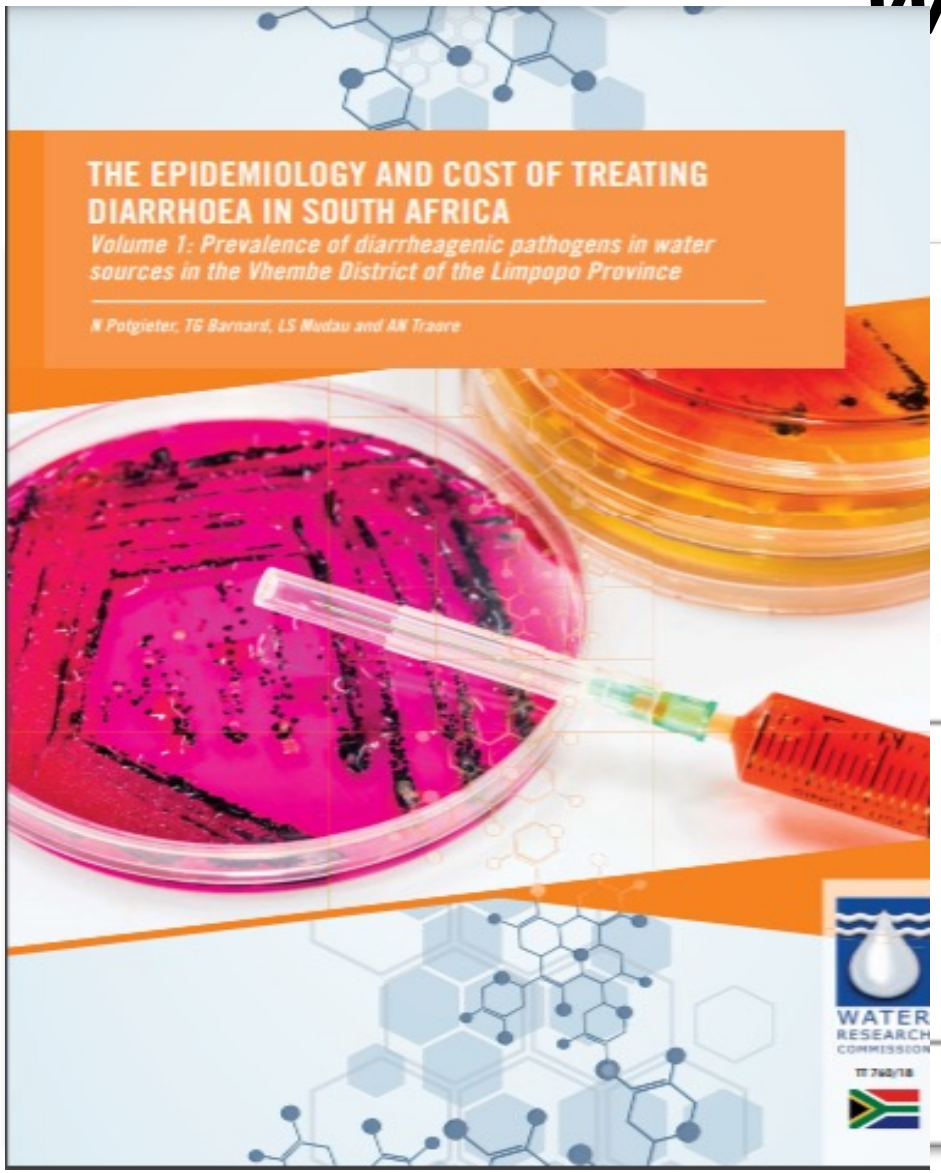
PCR machine

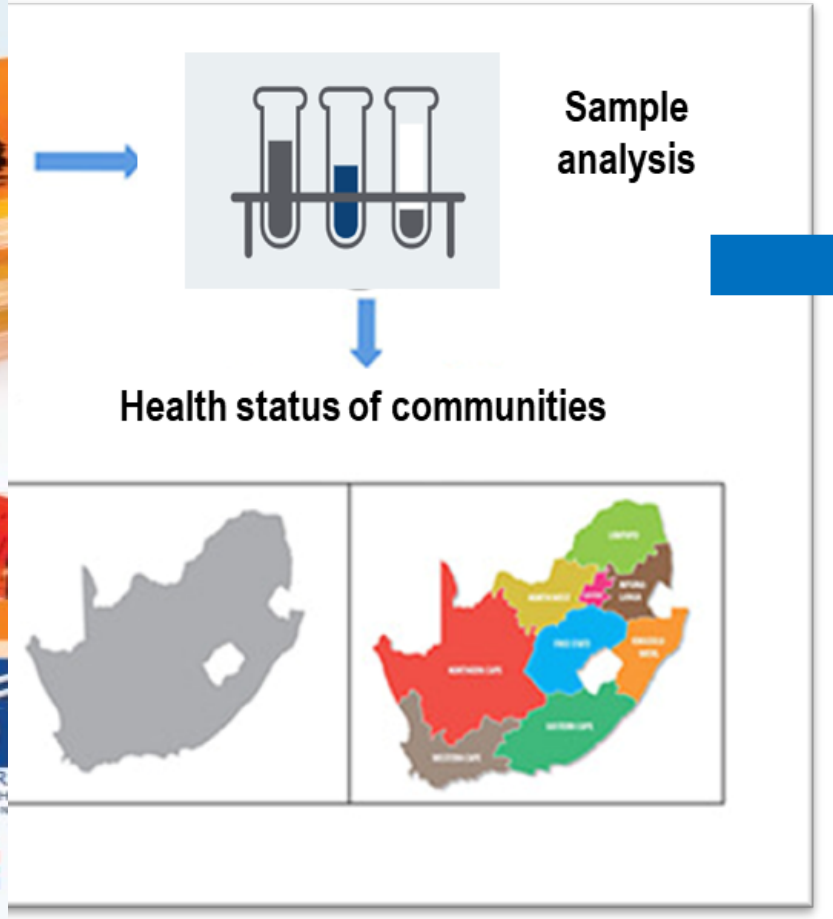
DEVELOPING WASTEWATER BASED EPIDEMIOLOGY SURVEILLANCE: *WHY & HOW*

Dr Sudhir Pillay
Water Research Commission
sudhirp@wrc.org.za

Why is Wastewater Based Epidemiology Useful?

Why Invest?





- Illicit drugs use
- Pharmaceuticals and other substances use
- Diet choices
- Genetic markers
- Biomarkers

Data is valuable for understanding the health of the population (and environment)

Objective	Results interpretation
Qualitative analysis of environmental samples	- For determining general pathogen circulation within populations
Establishing trends and/or changes in the number of disease incidences	- Characterising trends and/or changes in number of infections in communities.
Tracking the number of infections (disease burden) and mapping of hot spot areas in communities	- Useful for determining the risk levels in communities and for supporting decision making on the lifting and imposing of mitigation interventions
Metagenomics in infectious disease	- Provides a full spectrum of genetic diversity of pathogenic strains, epigenetic changes, altered gene expressions, and gene fusions—both known and novel - **Molecular method, does NOT provide info on viability**
Assessing occupational human health risks	- Based on the detection of live and infectious pathogenic strains – can inform on the risk of infections and appropriate PPE

Developing Countries: Contrast

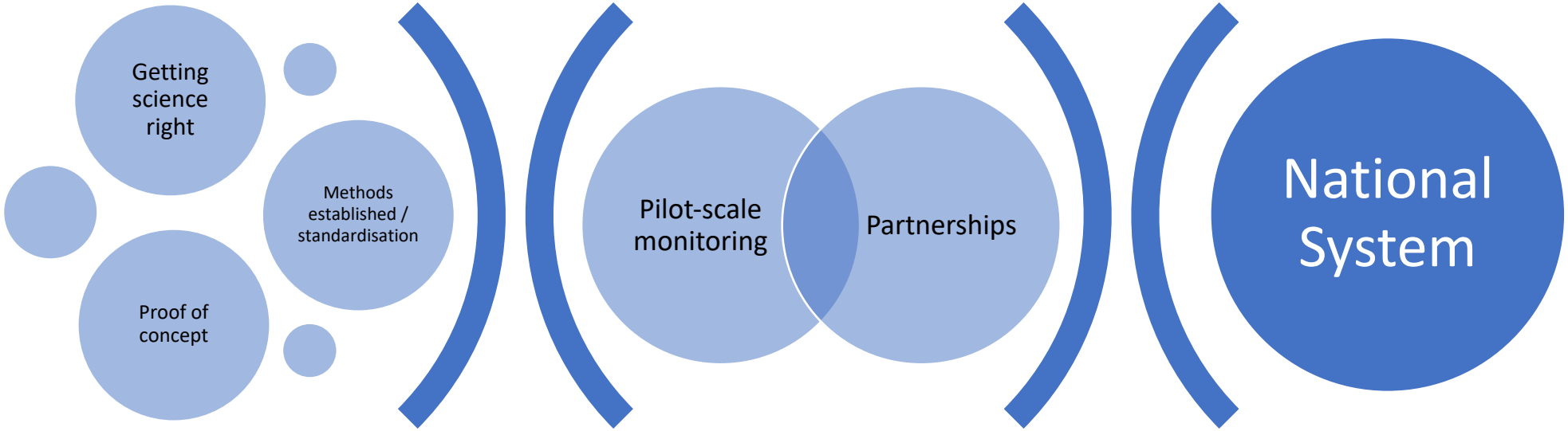
Within a city:

- High-rise buildings
- Industrial areas
- Informal settlements
- Rural component

Not Fully Sewered:

- Should we do it
- City-wide WBE crucial
- Non-sewered represents vulnerable population (high housing densities, shared facilities e.t.c)

A Programmatic Approach to WBE (step by step)



Phase I

- Established sampling program & protocol
- Preliminary sample analysis
- Established sewershed sampling profile

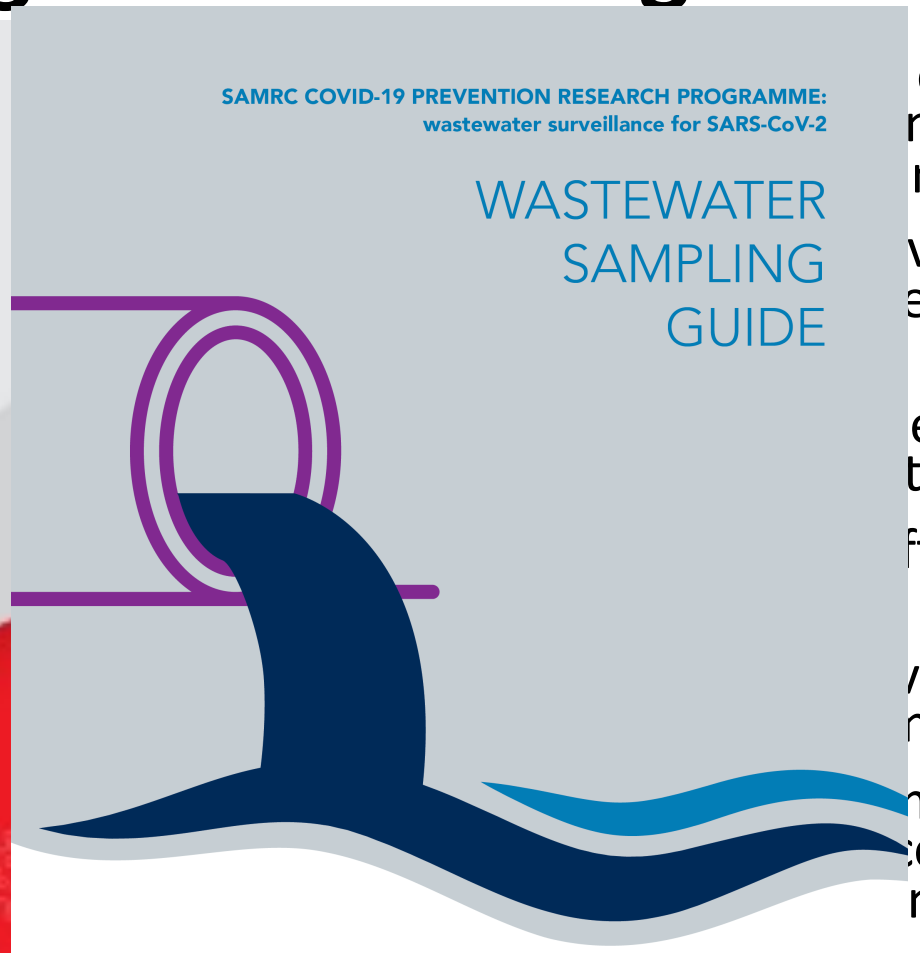
Phase II

- Established monitoring partnerships covering provincial hot spots
- Preliminary pilot surveillance monitoring data

Phase III

- Rolled out national surveillance
- National data analysis and integration
- GIS mapping – heat maps
- National communication

Getting the science right



Recommended citation: SAMRC COVID-19 PREVENTION RESEARCH PROGRAMME: Wastewater surveillance for SARS-CoV-2. WASTEWATER SAMPLING GUIDE (1 February 2021).

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Extending the science to Non-Sewered Areas

- Developing the business case for non-sewered surveillance
  - Sampling methodology – non-sewered means different things around the world
  - Usefulness vs clinical testing
- We found passive sampling to be the best
  - There is environmental influence (rainfall, e.t.c)
  - Individual toilets not useful for WBE (unless you are looking for source of outbreak)

Getting Dashboard Data

SOUTH AFRICA 2021

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

Legend

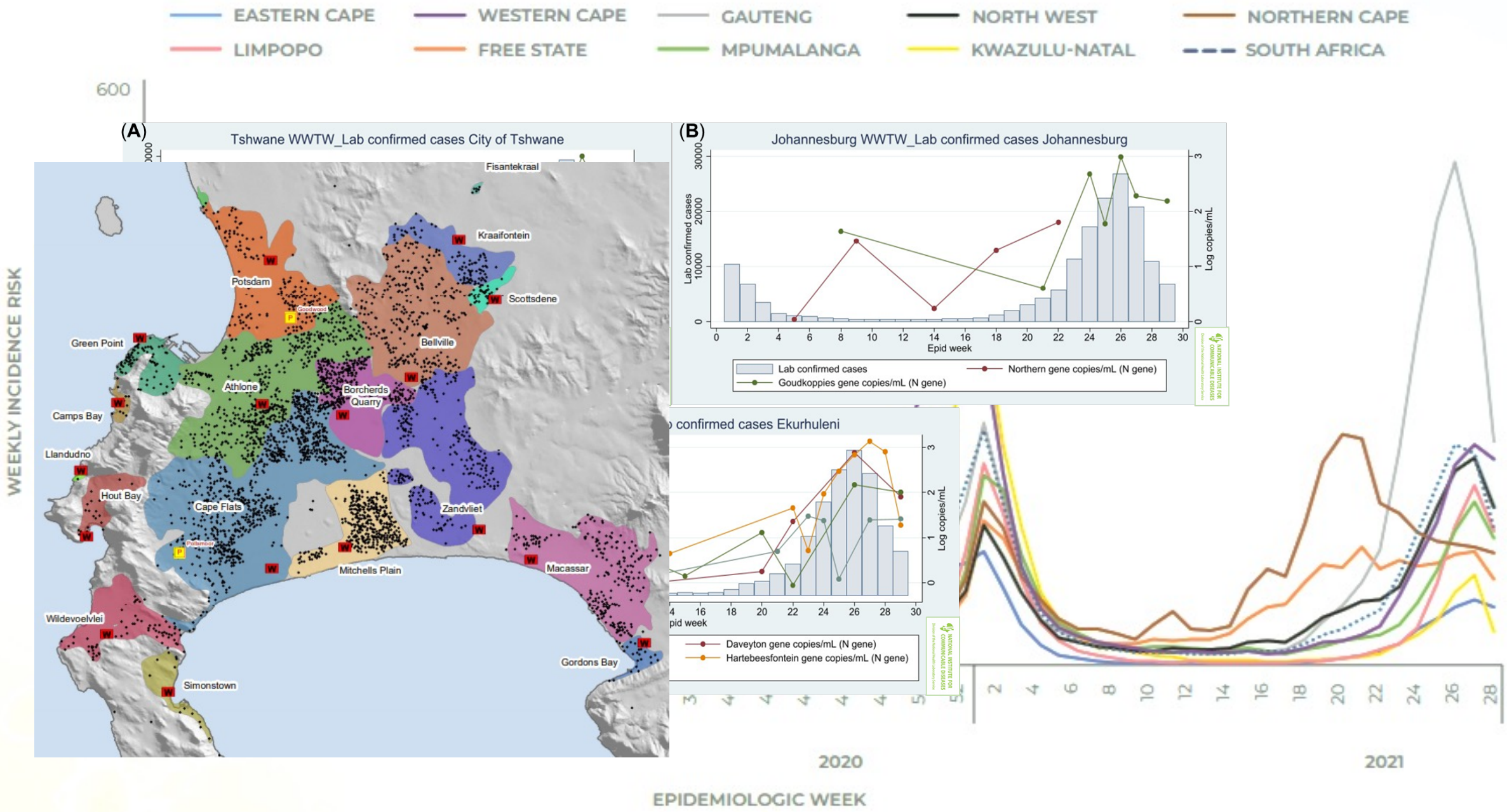
1	2	3	4	5
Not scheduled	Pending	Negative	Positive	Invalid

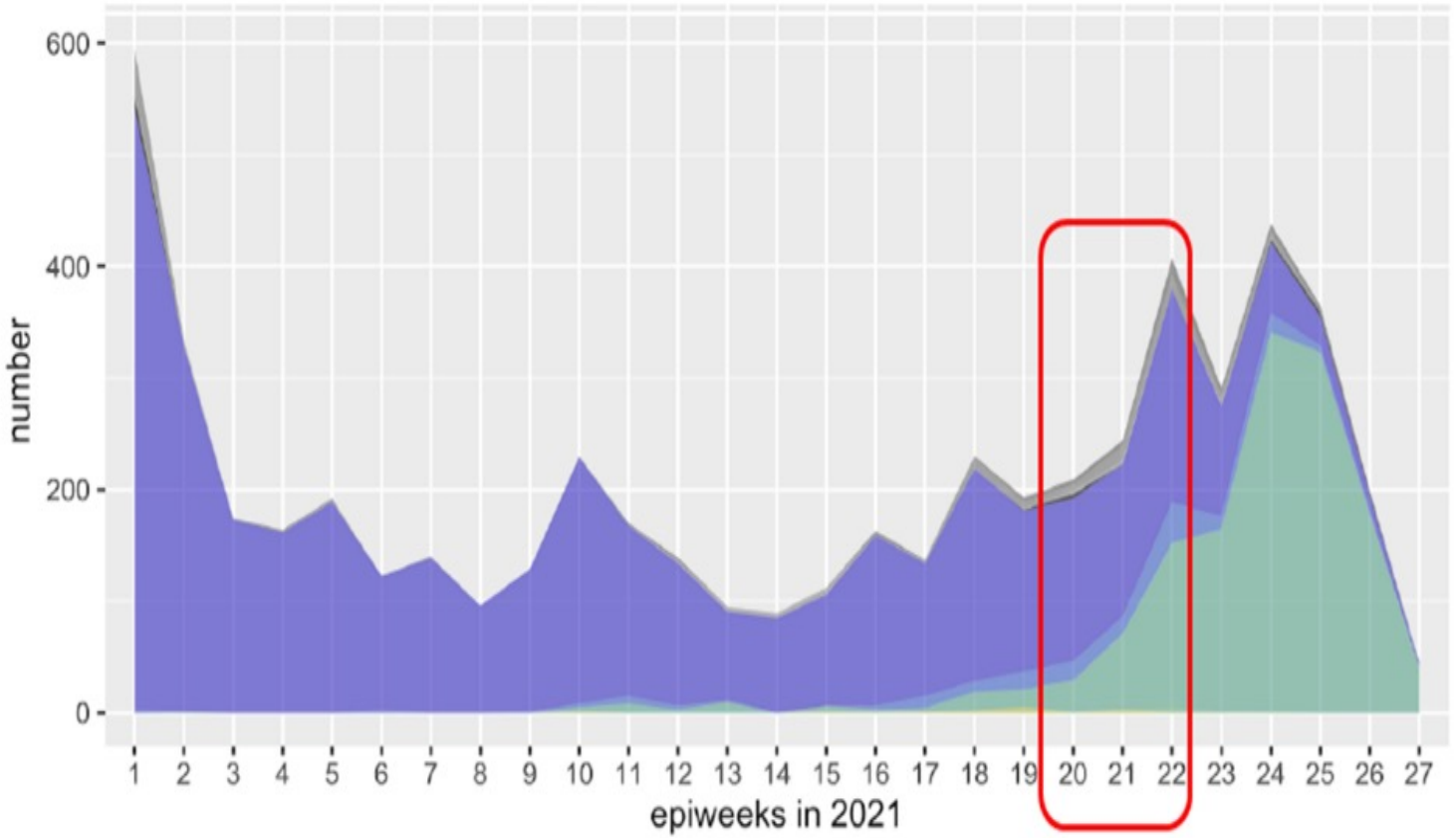
Interpretation	
Positive:	at least one gene target must be positive
Negative:	none of the gene targets must be positive except for the internal control
Invalid	internal control as well as all gene targets negative on 2 attempts

Site Name	District Code	Laboratory	Epidemiological Week 2021
Province - Gauteng			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
Rooiwal Wastewater Treatment Works	TSH	NICD	
Daspoort Wastewater Treatment Works	TSH	NICD	
Babelegi	TSH	NIOH	
Baviaanspoort	TSH	NIOH	
Sunderland Ridge	TSH	NIOH	
Sandspruit	TSH	Waterlab/UP	
Temba	TSH	Waterlab/UP	
Rayton	TSH	MRC-TB	
Refilwe	TSH	MRC-TB	
Rietgat	TSH	MRC-TB	
Daveyton WasteWater Treatment Works	EKH	CSIR	
Olifantsfontein WasteWater Treatment Works	EKH	CSIR	
Hartebeestfontein	EKH	Waterlab/UP	
Dekema	EKH	Waterlab/UP	
Hartbeesfontein WasteWater Treatment Works	EKH	NICD	
Vlakplaats WasteWater Treatment Works	EKH	NICD	
Olifantsfontein WasteWater Treatment Works	EKH	NICD	
Daveyton WasteWater Treatment Works	EKH	NICD	
Northern Wastewater Treatment Works	JBM	NICD	
GOUDKOPPIES Wastewater Treatment Works	JBM	NICD	
Olifantsvlei	JBM	Waterlab/UP	
Flip Human	WR	Waterlab/UP	

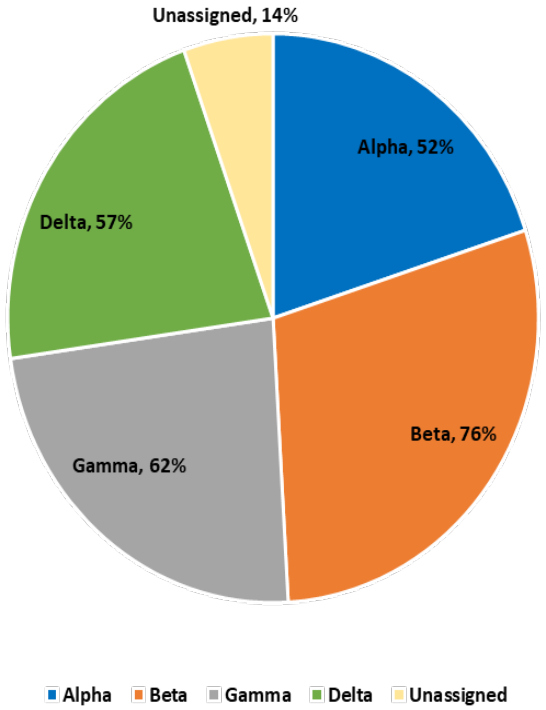
Site Name	District Code	Laboratory	Epidemiological Week 2021
Province - Western Cape			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
Borcheds Quarry Wastewater Treatment Works	CAT	NICD	
Zandvleit Wastewater Wastewater Treatment Works	CAT	NICD	
Bellvile	CAT	MRC-BRIP	
Cape Flats	CAT	MRC-BRIP	
Stellenbosch	CAT	MRC-BRIP	

Site Name	District Code	Laboratory	Epidemiological Week 2021
Province - Free State			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
Bloemspruit Wastewater Treatment Works	MAN	NICD	
Sterkwater Wastewater Treatment Works	MAN	NICD	


EASTERN CAPE
WESTERN CAPE
GAUTENG
NORTH WEST
NORTHERN CAPE
LIMPOPO
FREE STATE
MPUMALANGA
KWAZULU-NATAL
SOUTH AFRICA
600
WEEKLY INCIDENCE RISK
(A)
Tshwane WWTW_Lab confirmed cases City of Tshwane
Fisantekraal
Kraaifontein
Potsdam
Scottsdene
Green Point
Bellville
Athlone
Borcherds Quarry
Camps Bay
Llandudno
Hout Bay
Cape Flats
Zandvliet
Mitchells Plain
Macassar
Wildevoelvlei
Gordons Bay
Simonstown
(B)
Johannesburg WWTW_Lab confirmed cases Johannesburg
Lab confirmed cases
Log copies/mL
Epid week
Lab confirmed cases
Northern gene copies/mL (N gene)
Goudkoppies gene copies/mL (N gene)
confirmed cases Ekurhuleni
Log copies/mL
Epid week
Daveyton gene copies/mL (N gene)
Hartebeesfontein gene copies/mL (N gene)
2020
2021
EPIDEMIOLOGIC WEEK



Clinical samples



Sewerage

Opportunities to learn on cold storage supply chain from hotels

HOTELS AND RESORTS

International Resorts Step Up Testing Options In Response to New CDC Rules

Hotels in the Caribbean, Central America, and beyond are now offering pre-flight rapid COVID testing to guests.

BY MEREDITH CAREY
January 27, 2021

On January 12, the CDC announced it would be requiring all international travelers, including U.S. citizens, to show proof of a negative COVID-19 test from within 72 hours of departure in order to board a flight to the States. Many Caribbean and Central American hotels and resorts—two of the few areas accepting American travelers amid the ongoing pandemic—were surprisingly well-prepared.

"We've been offering testing since before Christmas," says Wendy Eardley, resident manager at Curtain Bluff in Antigua. "We have many guests from the Northeast who were asking for tests before they headed back so they could test out of quarantine or guests who were going to another island that required them."

Before the COVID testing order, which goes into effect on January 26, was announced, Curtain Bluff's on-call resort doctor was swabbing guests who asked for rapid antigen or PCR tests in their rooms. Now, to keep up with the heightened demand, the doctor will begin holding office hours three days a week in a hotel room set aside specifically for testing. The tests, whether PCR or rapid, cost $250 ($200 is the government-set price, with $50 added for the doctor's fee) and the resort's concierge helps set up the appropriate appointment time based on your destination's timing requirements.

Like Curtain Bluff, Nayara Gardens in the lush Arenal region of Costa Rica repurposed its on-site doctor and nurse for testing guests, with one difference. "All of our rooms have oversized decks or balconies so our doctor and nurse will come and actually do the test

Panel Discussion and Q&A

Marlene Hsu

Thank you.