



# Outcomes of the Water Research Commission's independent investigation on the recent Cholera outbreak in Hammanskraal

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National Press Club Media Briefing  
26 July 2023

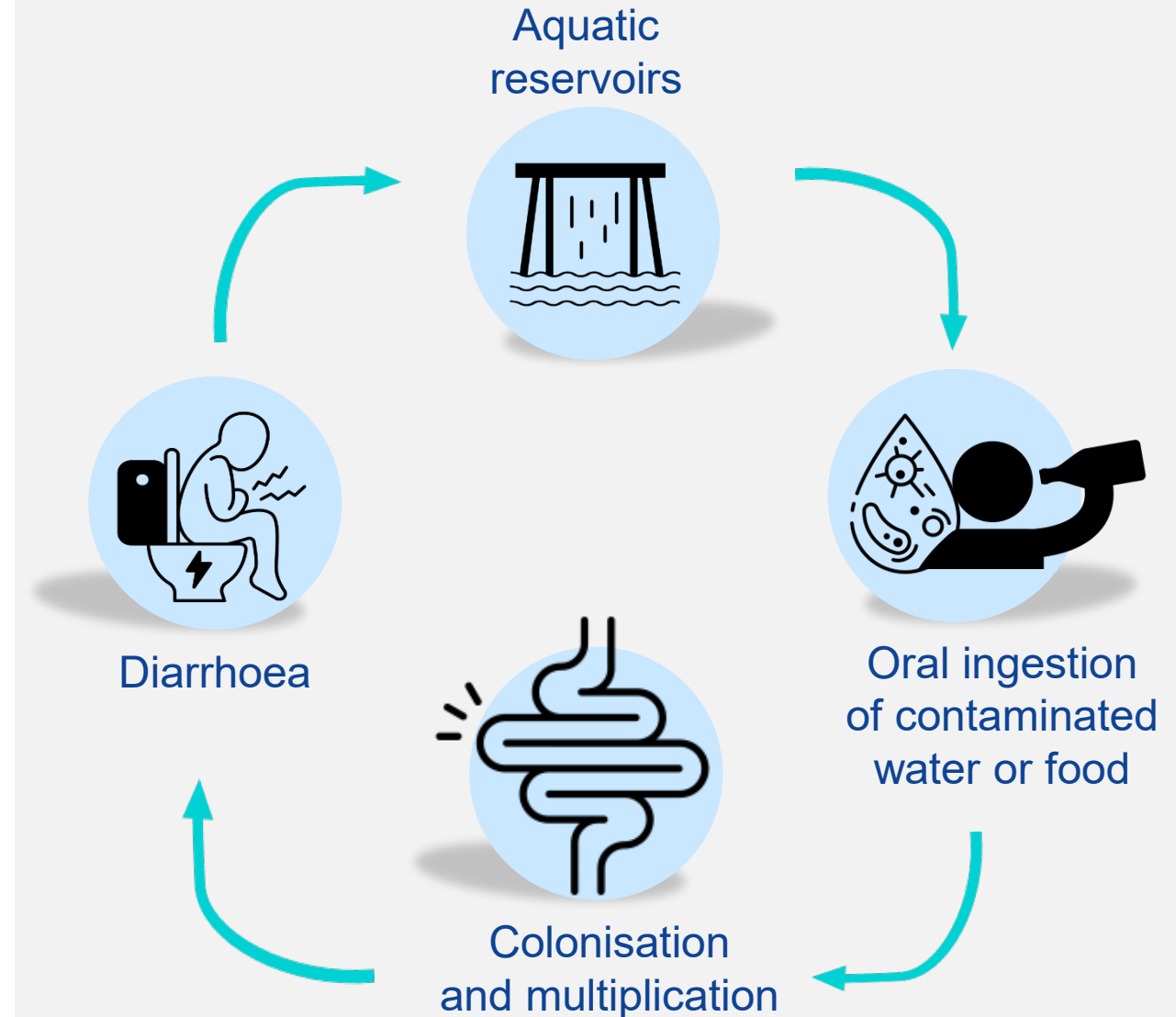


# WHAT IS CHOLERA?

CHOLERA is a diarrhoeal disease caused by ingesting water or food **contaminated with faecal matter containing the bacteria *Vibrio Cholerae***

- Severe dehydration from vomiting and large volumes of watery diarrhea in a very short space of time and as a result **can kill very quickly**.
- Not all people infected with *V. cholera* show symptoms, but they **will continue to shed bacteria** in stool samples.
- To confirm Cholera, the **toxigenic strain of *V. cholerae*** must be detected in stool samples.
- In aquatic samples, the presence of ***Escherichia coli (E. coli)***, indicates contamination with faecal matter and is used as an indication of water quality.

## *Vibrio Cholerae* lifecycle



# BACKGROUND ON RECENT CHOLERA OUTBREAKS



26 Oct 2022

- Risk of Cholera globally is very high; remains a **global public health threat** – WHO
- Outbreaks in 13 countries with no reported Cholera cases in 2021
  - Some had not reported any Cholera outbreaks for many years (between 3 and 30)
  - Several are not considered Cholera-endemic



20 Mar 2023

- Several countries in south-eastern Africa, particularly Malawi and Mozambique experienced outbreaks in March 2023
  - **Outbreaks spread regionally** - Tanzania, Zambia, Zimbabwe, and South Africa
  - Largest active Cholera outbreak on the continent in Malawi



28 Feb 2023 →

- 6 Cholera cases in SA laboratory confirmed by Centre for Enteric Diseases
  - Cases 1–3 imported/import-related cases; Cases 4–6 acquired infection locally
- DOH informed of **cases of people presenting with gastrointestinal symptoms** in *Hammanskraal* (50 receiving medical care at Jubilee Hospital; 6 patients died)
- SA not considered endemic for Cholera – previous outbreaks are importation events
- NICD results show new Cholera strain from South Asia

20 May 2023 →

# PREVENTING AND MANAGING CHOLERA



## Improving access to a continuous supply of safe drinking water and sanitation infrastructure

- Sanitation infrastructure must be maintained
- Wastewater – needs to be treated at wastewater treatment plants
- Water for drinking and other use is considered safe when it meets the Drinking Water Quality Standards – SANS 241 (*Zero Escherichia coli*)
- Ensure sufficient quantities of water for drinking and hygiene



## Monitoring of climate variables

- Heavy rainfall increases exposure to contaminated water
- Drought leads to minimized water use for hygiene purposes



## Improving access to ORS (Oral Rehydration Solution) and other treatments

Timely access to treatment prevents death



## Improving infection prevention and control

in healthcare facilities



## Effective risk communication and community engagement strategies

to encourage behavioural change

# INVESTIGATION WORKFLOW



Directive to WRC to commence independent investigation.

Developed *Terms of Reference* to respond to the DWS directive.

3

## Advisory panel

Microbiologists, epidemiologists constituted by the WRC – ensure appropriate methodology, conclusions/ recommendations based on data and verified.

4

## Cholera case info

Public health info on the outbreak sourced from DOH media releases and NICD publicly available information.

5

## Cubic M Africa

Document historical meteorological data and environmental conditions, document sources of water in use, WASH facilities; risk mapping based on WASH services.

6

## Virtual Consulting Engineers

Assess functionality of waste mgmt. systems; functionality and compliance of drinking and wastewater treatment facilities; collect samples; conduct lab tests for *V. cholerae* and other waterborne disease pathogens.

7

## University of Pretoria

Assess irrigation sources and risk of transmission; assess fresh produce value chains and contamination points.

8

## SANAS accredited laboratories

Testing samples for toxigenic *Vibrio Cholerae* and other bacteria (*E. coli*).



# INDEPENDENT INVESTIGATION QUESTIONS



What is the status of the provision of safe water, sanitation, hygiene and solid waste collection services in the area and its likely contribution to the spread of Cholera?



What is general level of public awareness on importance of (WASH practices and their role in the spread of oral, faecal-oral (person to person) diseases?



Were the climatic conditions in Hammanskraal around the outbreak period favourable for the survival of toxigenic *Vibrio cholerae* in environmental waters?



At the time of the study, could the toxigenic *Vibrio cholerae* strain be detected in water sources in uses in the area? *And if so*, what are the implications for disease transmission linked to the use of water for irrigation, drinking and other uses?



What is the functional status of the wastewater and drinking water treatment plants within the Hammanskraal area? Are they treating water to the acceptable standard to ensure *Vibrio cholerae* does not spread into environmental waters or drinking water?



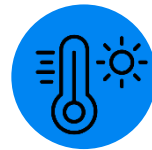
# Results

# CLIMATE VARIABLES AND WATER QUALITY CONDITIONS OF DAMS IN THE HAMMANSKRAAL AREA



## Above-average rainfall

Feb 2023 experiencing **almost threefold** the monthly average rainfall.



## Air temperature

Range of 19°C to 28°C between November 2022 and May 2023.



## Optimum weather conditions for *V. cholerae*

Both rainfall and temperature conditions favourable for the survival of toxigenic *V. cholerae* if present.



## Blue-green algae and water hyacinth

present in the Leeukraal Dam and Pienaars river have been shown to be carriers of *V. cholerae* bacteria.





# ASSESSMENT OF RUNOFFS FROM SOLID WASTE DUMP SITES AND SEWAGE OVERFLOWS



- Numerous illegal dumping sites and sewer overflow**  
Some sites had nappies - high possibility for faecal contamination.
- High levels of *E. coli* found in samples analysed.**  
Some samples also positive for *Salmonella* and *Shigella* which can cause gastrointestinal illnesses.
- No *V. cholerae***  
found at any of the respective monitoring points.

# ASSESSMENT OF WATER SOURCES & STORAGE FACILITIES



- **Temba Water Treatment Plant (Township/RDP)**  
Use directly from tap without storage
- **Klipdrift Water Treatment Plant (Informal)**  
Use directly from tap without storage
- **Tankers from Rand Water pipeline (Township/RDP/Informal/Rural)**  
Buckets & Polycan Drums; 'JoJo' tanks for emergency
- **Bottled water from retail stores (Township/RDP/Informal)**
- **Groundwater through private boreholes (Rural)**  
Buckets & Polycan Drums; 'JoJo' tanks for emergency



# ASSESSMENT OF SANITATION AND HYGIENE FACILITIES



- **Flush toilets inside the main house (Township)**

Wash Basin in toilet room for the main dwelling

- **Outside flush toilets for outside rooms (Township)**

Wash Basin in toilet room for the main dwelling

- **Flush toilets outside dwelling (RDP/Informal)**

Wash Basin mounted outside toilet wall; most are detached

- **Pit latrine (Informal/Rural)**

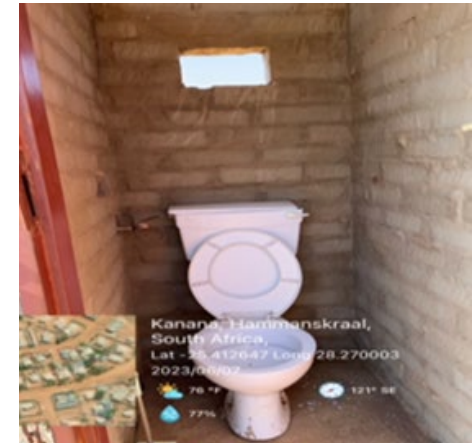
No hand washing facilities for most households or far away from toilet

- **Chemical toilets (Informal)**

No hand washing facilities for most households

- **Flush toilets inside dwelling connected to septic tank (Rural)**

Limited indoor washbasins



# PRESENCE OF BACTERIA IN THE APIES RIVER



River water foaming downstream of Rooiwal WWTW effluent discharge point



Light brown passive sampler material from immediately upstream of the Rooiwal discharge



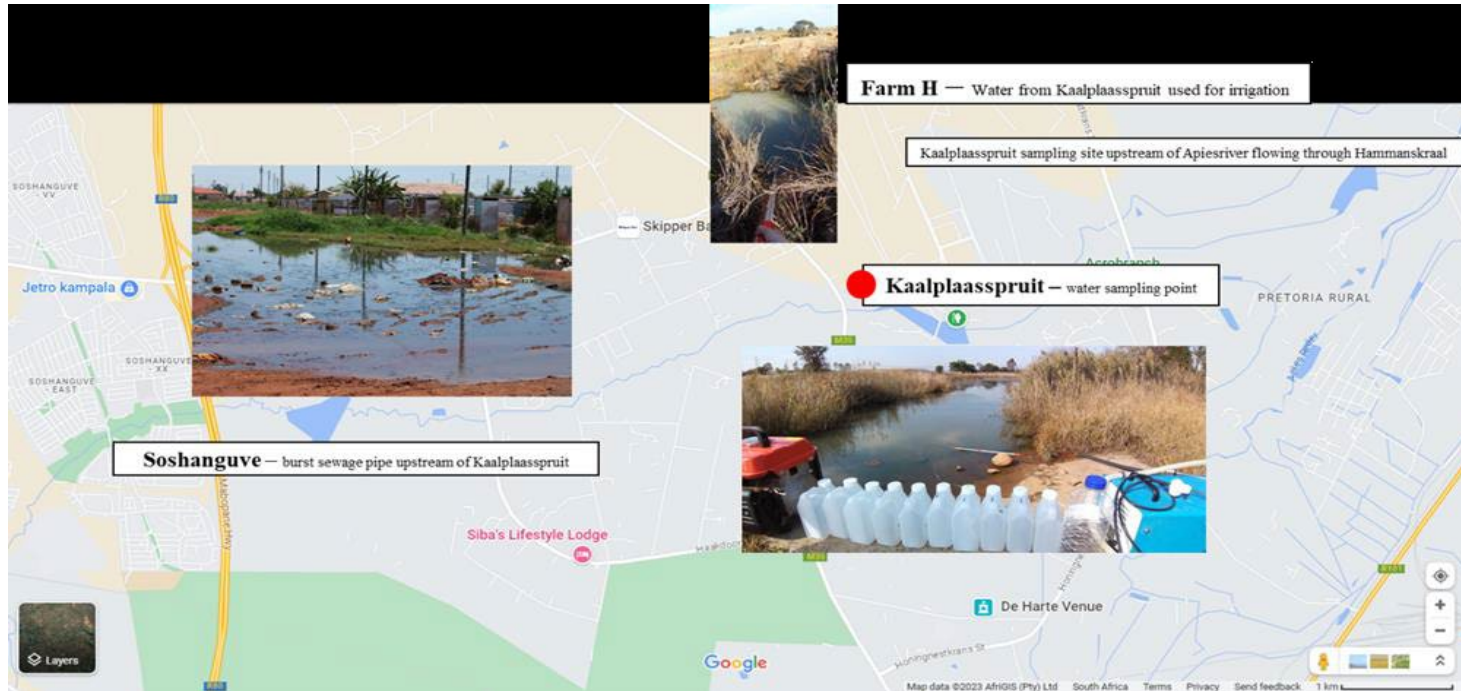
Dark grey passive sampler material from immediately downstream of the Rooiwal discharge.



River water foaming with washing powder, soap, detergents, etc. indicating poor treatment.

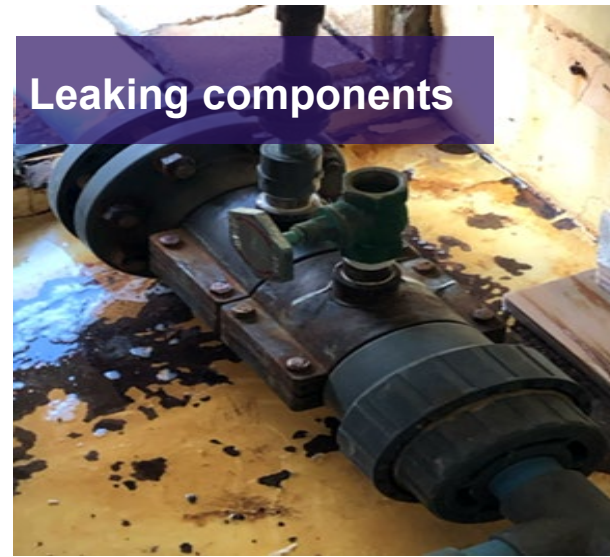
- ***V. cholerae* detected only once** in the first grab sampling, downstream of Hammanskraal
- ***V. cholerae* was not detected from upstream of the Rooiwal WWTW down to the Leeukraal Dam.**
- Downstream of Rooiwal, the presence of *Salmonella* and *Shigella* and **extremely high concentrations of *E. coli*** detected in the Apies River exceeded the South African water quality guidelines target range for **direct contact recreational/cultural/religious use of the water - presents health risks** to communities engaged in any contact with this water.

# ASSESSMENT OF IRRIGATION WATER



- ***V. cholerae* (still to be confirmed as toxin producing) found in water sample** obtained from the Kaalplaasspruit irrigation water point.
- A **burst sewer pipe** was located upstream of the spruit.
- Water is **used to irrigate** a pea farm.
- Spruit flows into the Apies River further **downstream in the Hammanaskraal area.**

# ASSESSMENT OF TEMBA DRINKING WATER TREATMENT PLANT



PLANT	FUNCTIONALITY	COMPLIANCE	VIBRIO CHOLERAЕ	CRITICAL ISSUE(S)
Temba Water Treatment	Operating below capacity	Water does not meet the SANS 241 Drinking water Standards	Negative ( <i>in raw water and water after chlorination</i> )	Breaks in chlorine disinfection  Chemical dosing is not optimised  Lack of proper process control and operation

# ASSESSMENT OF TEMBA WASTEWATER TREATMENT PLANT



PLANT	FUNCTIONALITY	COMPLIANCE	<i>VIBRIO CHOLERAE</i>	CRITICAL ISSUE
Temba Wastewater	Partially	Effluent does not meet standards for release	Negative	Lack of maintenance  Partial construction of some components of the plant

# ASSESSMENT OF ROOIWAL WASTEWATER TREATMENT PLANTS



PLANT	FUNCTIONALITY	COMPLIANCE	VIBRIO CHOLERAЕ	CRITICAL ISSUE
<p>Rooiwaal Wastewater</p> <p><i>(Made up of Rooiwal Northern Works, Rooiwal Eastern Works and Rooiwal Western Works)</i></p>	Dysfunctional	<p>Effluent does not meet standards for release</p> <p>Green Drop Watch Report – classified Northern Works as “high risk”</p>	Negative	<p>Operating above design capacity</p> <p>Plant needs to be overhauled</p> <p>Different process units do not work well together – masterplan required</p>

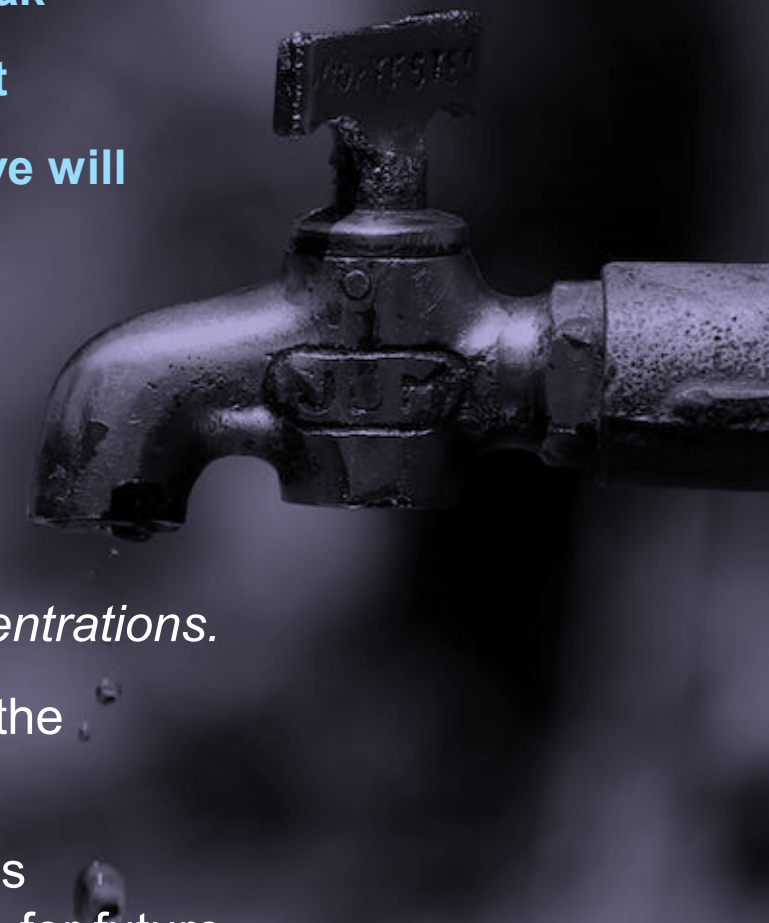


# CONCLUSIONS

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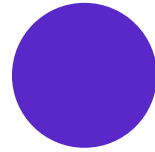


1. It remains unknown whether water was a source of the Cholera outbreak
2. At the time of the outbreak, Cholera was circulating in the environment
3. The current conditions from a water, sanitation and hygiene perspective will enable its quick spread
  - Operational inefficiencies of the Rooiwal wastewater and Temba water treatment plants in treating the wastewater and water, respectively, to acceptable standards.
  - Illegal dumping and poor solid waste management.
  - High level of faecal contamination in the rivers; high *E. coli* concentrations.
  - Inadequate sanitation and hygiene infrastructure particularly in the informal and rural settlements.
  - General lack of awareness (on WASH) poses risks and serves as pathways for potential oral, faecal-oral (person to person) pathways for future waterborne disease outbreaks.



# RECOMMENDATIONS

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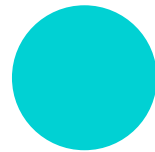
## **A proper waste collection system**

should be implemented to avoid illegal dumping of municipal solid waste.



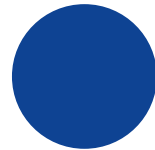
## **Sewage infrastructure must be maintained**

to prevent overflow into the surrounding environment – bearing in mind heavy rainfall patterns.



## **Sanitation and hygiene facilities and infrastructure**

should be available and safely maintained and managed.



## **Effective source water protection measures**

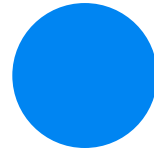
necessary to improve the quality of raw water abstracted for drinking water plants.

# RECOMMENDATIONS

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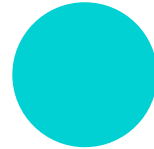


Image: Pexels/Nitin Sharma



## **Temba drinking water treatment plant**

must operate according to standard procedure; ensuring that chemicals are available for correct dosing – blue drop requirements



## **Rooiwal and Temba wastewater treatment works**

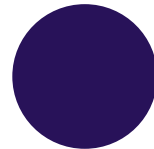
(1) **refurbished and recommissioned urgently**, to achieve at least sanitation of wastewater;

(2) **upgraded, ultimately, to achieve best environmental practice**, including reclamation of final effluent to drinking water standard – green drop requirements



## **Quick response from a multi-sectoral team when outbreaks occur**

include water resource managers, water treatment plant operators/managers, clinicians, epidemiologists, public health experts, WASH experts, communication specialists.



## **Risk communication to the public**

ensure that people at risk for cholera are informed about risk reduction, personal protective and preventive measures, and how to proceed if someone gets sick; understand local knowledge and behaviour which might lead to further spread of Cholera.

# ACKNOWLEDGEMENTS

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- Cubic M Africa, Virtual Consulting Engineers and the University of Pretoria
- The Advisory Panel (present today, Ms Leanne Coetzee and Prof Fanus Venter)
- Personnel at the various plants who provided information and data
- The Community of Hammanskraal



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