SWIMMING POOL AND RECREATIONAL WATERS QUALITY REPORT - 2025

MICROBIOLOGICAL ASSESSMENT OF SWIMMING POOLS AND RECREATIONAL WATERS FOR THE NELSON MANDELA BAY METROPOLITAN AND JEFFREYS BAY AREAS

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Contents

1. Abstract

This study assessed the microbiological safety of operational public swimming pools in the Nelson Mandela Bay Metropolitan Municipality (NMBM) and Jeffreys Bay, where public recreational infrastructure is under immense pressure. During peak holiday season, samples were collected from one recreational facility in Jeffreys Bay's and in five of NMBM's nine functional public pools, this is from a total of twenty, many vandalized and nonfunctional recreational facilities. Water quality was evaluated against the World Health Organisation (WHO) Guidelines for safe recreational water environments (Volume 2: Swimming pools and similar environments) (WHO, 2006).

The results revealed an alarming health concern: four of the six NMBM pools (67%) failed to meet the criteria set by the standard. Most alarmingly, two pools, Westering and Gelvandale, tested positive for *E. coli*, indicating faecal contamination and an acute health risk.

The other two pools that failed, Malabar and Rosedale, had extremely high standard plate counts, signalling systemic failure in the disinfection or treatment of recreational water. In contrast, the sample for Jeffreys Bay and one NMBM pool (Varsvlei) were fully compliant. These findings show a significant failure in municipal water safety management in certain areas, requiring immediate public notification, and corrective maintenance to protect public health and uphold the constitutional right to a safe environment.

2. Introduction

The Nelson Mandela Bay Metropolitan Municipality is situated along the shores of Algoa Bay in the Eastern Cape province of South Africa. The region is characterized by beautiful beaches, a rich cultural heritage, and diverse wildlife attractions. Among these amenities are twenty public swimming pools, intended to provide recreation and relief from the summer heat. However, only nine of these pools are currently functional; the remainder have been vandalized and rendered unusable. This shortage forces residents to overcrowd city beaches or seek recreational options in nearby towns. One such nearby destination is Jeffreys Bay, informally known as "JBay," located just a short distance from Nelson Mandela Bay. This vibrant coastal town is world-famous as a premier surfing destination. Historically, its economy and identity were built on fishing, especially after the lucrative squid industry emerged in the late 20th century. Today, it thrives as a holiday town, blending its maritime heritage with a globally renowned surf culture centred around legendary breaks like Super Tubes, alongside thriving local crafts and commerce.

The microbiological quality of swimming pool water in South Africa is measured against the World Health Organisation (WHO) recreational water guidelines, the National Health Act No. 61 of 2003, and relevant international recreational water guidelines. The water must comply with SANS 241 as stipulated in Notice 943 of 2013 (Government Gazette, 2013), since there are no specific swimming pool water guidelines. These regulations mandate that operators of public pools and

recreational water facilities conduct regular water quality monitoring, maintain records, and utilize laboratories accredited to ISO/IEC 17025 or SANAS standards for testing.

Key microbiological requirements stipulate that the total viable bacteriological count must not exceed 100 colony-forming units (CFU) per millilitre, and all water must be sourced from an approved supply.

During peak holiday seasons, such as the present period, beaches within the Nelson Mandela Bay region experience significant overcrowding from local and international visitors. This congestion subsequently increases the reliance of municipal residents on public swimming pools for recreational use.

In response, this study aimed to assess the microbiological water quality of operational public swimming pools and recreational facilities, excluding gym, schools swimming pools, and spa Jacuzzis within the Nelson Mandela Bay Metropolitan Municipality and Jeffrey's Bay to evaluate their suitability and safety for public recreational use.

3. Objective

The primary objective of this study was to assess the microbiological quality of water at public swimming pools and other recreational water environments in the Nelson Mandela and Jeffrey's Bay area through the detection and enumeration of three key indicator pathogens:

- *Escherichia coli* (E. coli)
- Total viable count

The presence and concentration of these microorganisms serve as indicators of faecal contamination, poor site management, and help determine the potential health risks associated with recreational water use.

Proper disinfection and regular monitoring are important to prevent pools from becoming reservoirs of harmful microorganisms, including *E. coli*. These pathogens can lead to severe infections of the skin, eyes, ears, and gastrointestinal tract.

Routine water testing, ensures that the chemical balance and filtration system are functioning correctly, maintaining water that is safe for all users.

4. Rationale of the Study

Many individuals visit swimming pools for relaxation, sports, recreation, or therapeutic purposes. In these settings, groups such as older adults, pregnant people, infants, individuals with disabilities or mobility challenges, and athletes may be more susceptible to infections.

A few opportunistic micro or pathogenic microorganisms can be found in this environment through infected individuals or contaminated water and can lead to quite severe illnesses.

For a number of years there have been growing concerns about the safety and quality of the public swimming pools within the Nelson Mandela Bay Metropolitan Municipality (NMBM). The latter area, Jeffrey's Bay was included in this study as there has been a growing trend of residents from NMBM migrating to nearby towns to have access to good quality public recreational facilities. For instance,

- St George's photo blunder mars opening of pools https://www.theherald.co.za/news/2025-12-11-st-georges-photo-blunder-mars-opening-of-pools/
- Nelson Mandela Bay | NMB swimming pools in a state of disrepair https://www.enca.com/news-top-stories/nelson-mandela-bay-nmb-swimming-pools-state-disrepair
- DA to submit motion for fair fund allocation and safety for NMB pools https://ec.da.org.za/2025/05/da-to-submit-motion-for-fair-fund-allocation-and-safety-for-nmb-pools
- Malabar Pool in derelict state, ward tired of 'neglect' https://peexpress.co.za/malabar-pool-in-derelict-state-ward-tired-of-neglect-20221219/

In response to these growing concerns, ASC Food Safety and Public Health consultants initiated this study to evaluate the suitability and safety of these recreational areas within these two municipalities.

5. Legislative Context

South Africa's Constitution guarantees everyone the right to sufficient food and water, Section 27(1)(b)) and a healthy environment (Section 24), making clean water a fundamental human right, enforced through legislation like the Water Services Act 1997 and the National Water Act 1998, obligating the state to progressively realize this right through reasonable measures like providing basic water and sanitation services and managing resources sustainably.

In South Africa, public swimming pools and similar recreational water facilities must comply with health regulations outlined in the National Norms and Standards for Environmental Health (Government Gazette Notice 943 of 2013). Additionally, the potable water used to fill these pools must meet the recreational swimming pool water requirements set out by the World Health Organization (WHO).

Environmental Health Practitioners, also referred to as municipal inspectors, are legally mandated under the Environmental Health Practitioners Health Professions Act 56 of 1974 to monitor these facilities. Their role includes verifying that the water is safe by assessing microbiological, physical, and chemical parameters.

To ensure consistent safety and compliance, there is a need to harmonize and streamline these regulatory standards and enforcement efforts across provincial and municipal levels.

6. Sampling

6.1 Sampling Methodology

The specific sampled public swimming pools were:

- New Brighton.
- Rosedale, Kariega.
- Gelvandale.
- Malabar.
- James Kleinhans Swimming Pool, Westering.
- Varsvlei Swimming Pool, Bethelsdorp.
- Dolphin Beach Entertainment, Jeffrey's Bay.

6.2 Sampling Method

6.2.1 Equipment Validated by ASC

- ASC used factory-sealed sample bottles pre-dosed with sodium thiosulfate $Na\_2S\_2O\_3$ in a quantity sufficient to neutralize up to 50 mg/L of chlorine.
- Samples were stored in a calibrated cooler maintained between $2°C$ and $8°C$ using frozen gel packs.
- A calibrated digital photometer was used for concurrent chemical testing.

6.2.2 Procedure Followed by ASC Personnel

Phase I: Site assessment and baseline chemistry

Before microbiological sampling, ASC personnel completed the following:

- Recorded the current ambient weather conditions.
- Measured free chlorine and pH at the sampling location to provide context for the microbiological results.

Phase II: Aseptic sample collection

To protect sample integrity, ASC followed a strict aseptic "deep sweep" protocol:

- Sampling personnel made fresh, powder-free nitrile gloves immediately before handling sterile bottles.
- The bottle was held at the base. The cap was removed and held facing downward to reduce airborne contamination. The rim and internal threads were not touched.

- The bottle was submerged mouth-down to a depth of **30 cm** to bypass the surface microlayer, which may contain oils and debris that are not representative of bulk water.
- The bottle was tilted to fill and swept forward in a horizontal arc away from the sampler's body, ensuring the sample did not contact the sampler's equipment or skin.
- Bottles were filled to **90–95%**, leaving headspace for laboratory mixing/homogenization.
- Caps were secured immediately, and the bottle was inverted to mix and activate the sodium thiosulfate.

6.3 Preservation and Chain of Custody

- Samples were placed in the ASC cooler within 5 minutes of collection.
- Samples were protected from UV exposure to reduce degradation or die-off of organisms.
- A formal chain of custody (CoC) record was initiated, including the exact time of the "plunge," to support compliance with the 24-hour laboratory processing window.

6.4 Sample Transport

Immediately following collection, samples were transferred into a sterile transport cooler box. Samples were maintained under controlled temperature conditions, specifically targeting a temperature of 4°C(±2°C). All samples were delivered to an ISO 17025 accredited laboratory and processing commenced within a maximum holding time of 6 hours from the time of collection to minimise potential for microbial growth or die-off.

6.5 Laboratory Analysis

Microbiological analysis was conducted to quantify the concentration of two key indicator organisms: *Escherichia coli* (E. coli) and Total coliform.

Total Coliform and *E. coli* were enumerated using methods compliant with **SANS 5221**. The enumerated results (CFU/100ml) are consistent with the Membrane Filtration technique. The laboratory is also accredited for the Colilert® **(IDEXX) MPN** method, which uses a substrate technology for detection.

7. South African Water Quality Guidelines and Risk Criteria

The microbiological quality of the sampled waters was evaluated against the WHO Guidelines for Safe Recreational Water Environments (Vol. 2) and SANS 10134: Code of Practice for the Operation of Swimming Pools and Spas. These standards employ a risk-based management framework that utilizes primary faecal indicator organisms (FIOs), specifically *Escherichia coli* (E. coli), to identify potential health risks and define acceptable safety thresholds for drinking and recreational water use.

8. Discussion and Analysis

The microbiological quality of recreational waters in the Nelson Mandela Bay Metropolitan Municipality (NMBM) and Kouga Municipality was assessed in this study, with results interpreted against one of the criteria set by the World Health Organisation (WHO) Guidelines for Safe Recreational Water Environments, alongside other relevant recreational water parameters.

According to these guidelines, the maximum allowable number of concentrations are 250 CFU/100 mL for *Escherichia coli* (*E. coli*) or other faecal coliform bacteria must be absent in 100 mL of water.

This study showed a high number of waters contaminated by *E. coli* and exceeded the thresholds listed by the World Health Organization (WHO) in their guidelines. *Escherichia coli*. are an indication of faecal contamination and a great health risk to the bathers. On the other hand, a detection of total viable count serves as an indicator of insufficient disinfection, a key risk factor highlighted in WHO Chapter four for microbial hazards.

The World Health Organization (WHO) guidelines also requires that *Pseudomonas aeruginosa* be assessed as they have an ability to interact with other microorganisms to form biofilms that then make it difficult to control contamination. To identify the appropriate control strategies for the prevention or the reduction of *P. aeruginosa* contamination, a global risk analysis of pool water is fundamental. In this study, analysis for *P. aeruginosa* could not be performed due limitations of time and budget.

This study revealed a stark contrast between in water quality across all the sampled facilities. Only two of the seven sampled facilities had excellent microbiological quality, Dolphin Beach Entertainment Water Park in Jeffrey's Bay and Varsvlei community swimming pool in Betherlsdorp. For instance, these facilities both recorded an absence *E. coli* and total coliform count. These results indicate safe recreational waters for the bathers that utilise these facilities and could also indicate effective management systems and disinfection procedures, likely indicate a significant low number of bathers at the time of sampling, and that compliance with the guidelines is achievable.

In contrast, the remaining facilities had a high varying degree of non-compliance and failure. The Gelvandale swimming pool had a borderline case with recorded low-level for *E. coli,* well within the WHO guidelines. While this reading was within the limits, 1 CFU/100mL, its existence signalled faecal contamination, requiring immediate corrective action to prevent escalation.

Westering recorded a minor level of *E. coli* at 51 CFU/100mL and violating the WHO guideline of 0 CFU/100mL. This minor exceedance still and significantly exceeds safe limits for swimming. For an example, the Malabar swimming pool analysis came back with high levels of total coliform count, greater than 3000 CFU/100 mL and recorded *E. coli* at 56 CFU/100mL respectively. Also, a result of this exceedance, this a major non-compliance as the total coliform count is higher than acceptable standard requirements.

Additionally, the Rosedale community swimming pool had a nuanced water quality assessment. Amid the absence of *E. coli* in the analysis, the facility was also non-compliant as there was a concentration of 37 CFU/100mL of total coliform. The presence of these is completely unacceptable and it points out that either the disinfection is insufficient, there is a bacteria growing in the filtration system, or could indicate that there is developing contamination that could also harbour non-faecal microorganisms such as *Pseudomonas aeruginosa*, which can cause conditions like "swimmer's ear" and skin rashes.

The systemic nature of this issue in South Africa is further evidenced by studies in other municipalities. For instance, research in the Johannesburg area has consistently found high rates of microbial non-compliance in public swimming pools, linking them to inadequate maintenance, overcrowding, and insufficient operator training (Motsoeneng,2022). This suggests the problems identified in Nelson Mandela Bay may be symptomatic of broader infrastructural and management challenges in the country's public recreational water sector.

The findings of this study have important management implications. Persistent public health risks are associated with the use of non-compliant swimming pools, particularly for vulnerable population groups such as children, the elderly, and those with compromised immune systems. The data demand urgent and targeted intervention, with a focus on addressing infrastructure degradation to prevent catastrophic episodic failures. Additionally, the municipality must maintain regular monitoring in Westering and Gelvandale. The high variability among all sampled necessitates frequent sampling, to provide timely public safety warnings rather than relying on monthly data that may miss acute contamination events.

In summary, the findings of this study can be used to justify the importance of regular monitoring and management of recreational water facilities. Furthermore, addressing infrastructure challenges would help to safeguard the health of the public, particularly the young, elderly people, and would add value to the region's recreational facilities.

8.1 Target Water Quality Ranges (TWQR)

The World Health Organization (WHO) offers broad guidelines for recreational water including swimming pools, focusing on risk management. However, the South African drinking water standard can be used in conjunction with the WHO guidelines.

Parameter	Target Water Quality Range (TWQR)	Minimum Requirement
Heterotrophic Plate Count (HPC)	< 100 CFU/mL	> 1,000 CFU/mL
Turbidity	< 0.1 NTU	< 1 NTU (at point of disinfection)
Free Chlorine Residual (Disinfected supplies)	0.2 - 0.6 mg/L (system dependent)	≥ 0.2 mg/L (at point of use)
pH (for chlorinated supplies)	6.5 - 8.0	6.5 - 9.5
Total Coliform Bacteria	≤ 1 per 100 mL (Not Detected)	≤ 10 per 100 mL
Escherichia coli (E. coli)	0 per 100 mL (Not Detected)	0 per 100 mL (Not Detected)

8.2 Images and Analysis

Figure 1: ASC Consultants at the Bethelsdorp - Sanctor Public Swimming Pool.

Figure 2: A municipal water saving campaign poster observed at the Bethelsdorp - Sanctor pool.

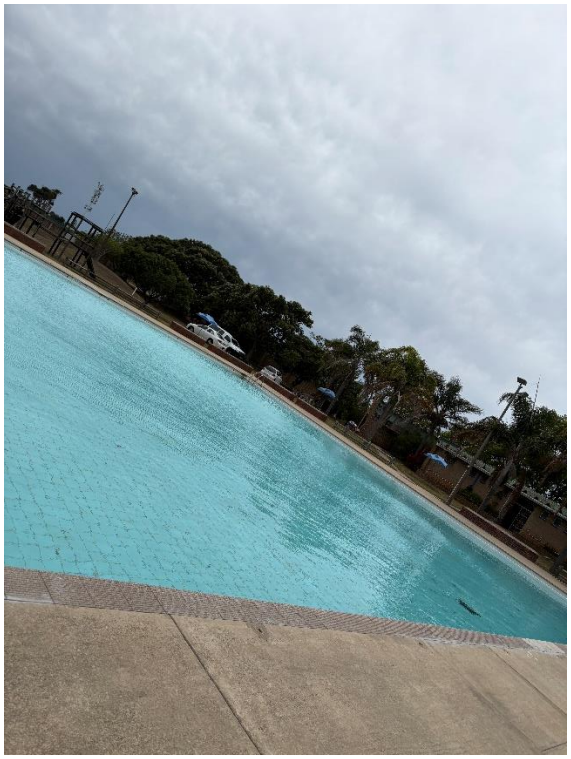

Figure 3: Party goers observed at the James Kleinhans pool in Westering.

Figure 4: Ground works being completed.

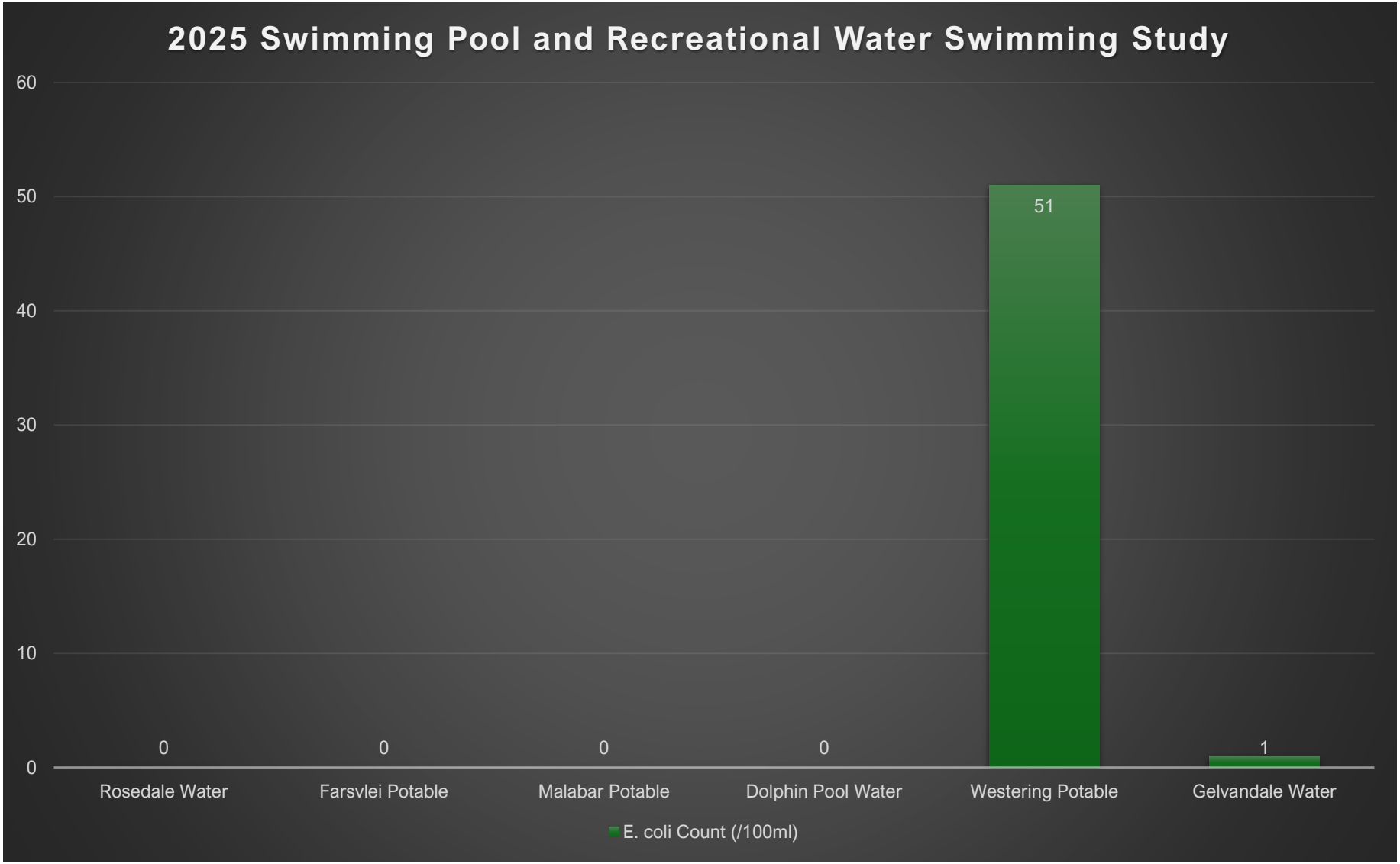

Figure 5: *Clustered column graph analysis for E. coli.*

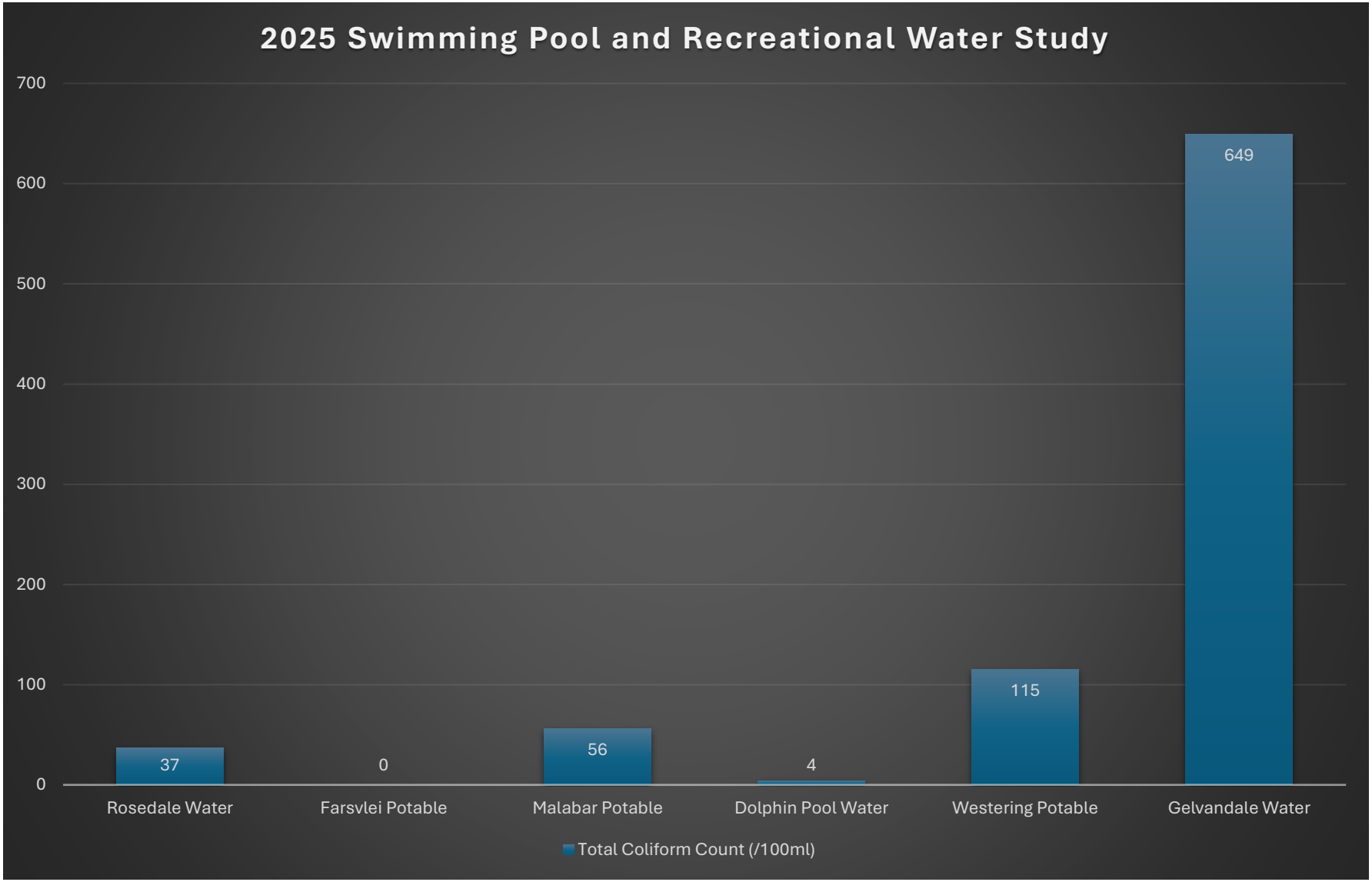

Figure 6: *Clustered column graph analysis for Total Coliform Count.*

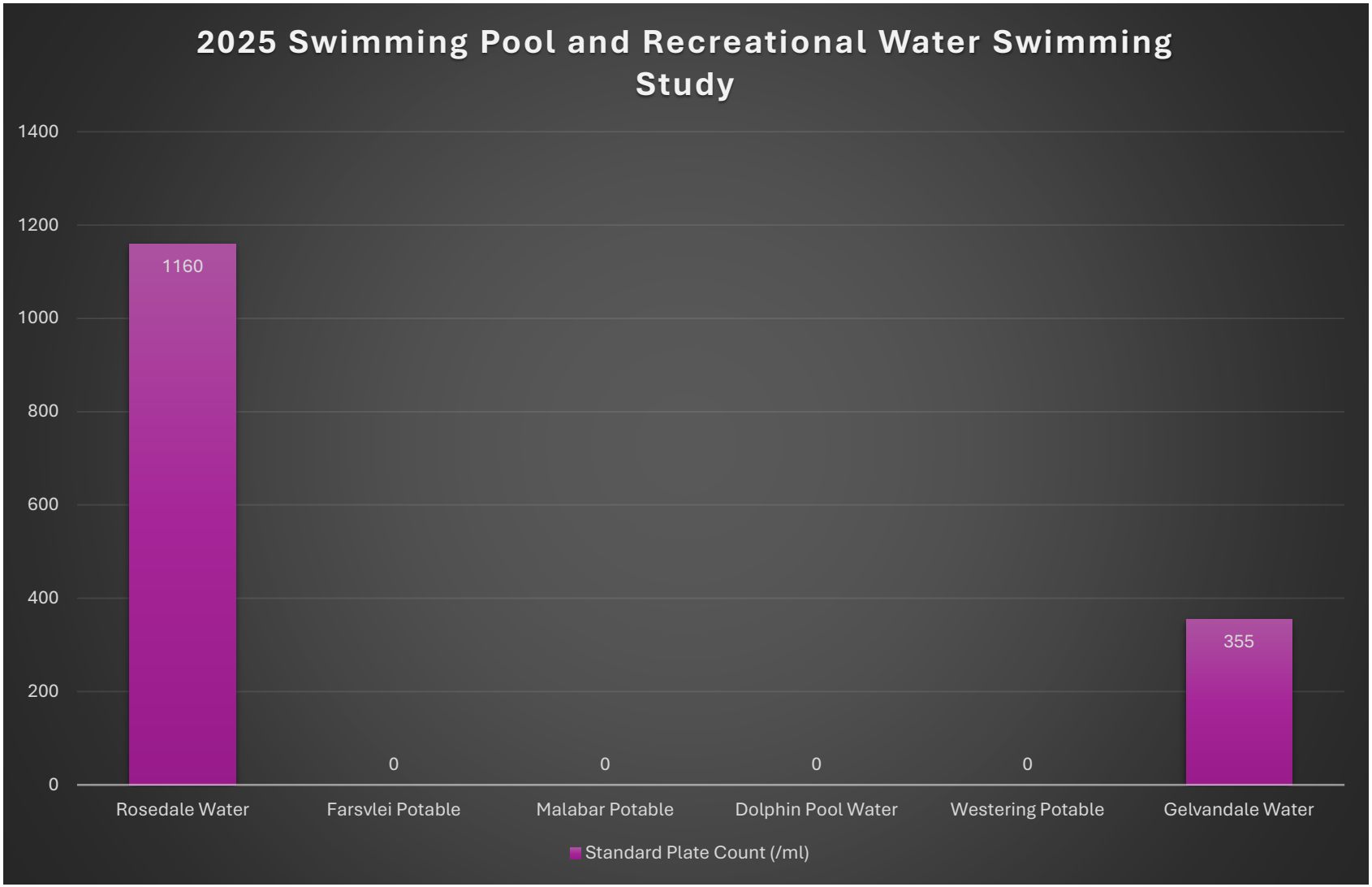

Figure 7: *Standard Plate Count clustered graph analysis.*

9. Results

9.1 New Brighton

Access to this facility for sampling was not possible on either occasion.

9.2 Rosedale, Kariega

The findings of this recreational facility exceeded the limits for total coliforms and standard plate count. Total coliform concentrations measured 37 CFU/100mL, far greater than the SANS standard requirement of absence or less than 1 CFU/100mL, while standard plate count reached 1 160 CFU/mL, surpassing the limit of ≤ 1 000 CFU/mL. These results clearly indicate that the swimming pool is currently not suitable for recreational use, as the water quality is compromised.

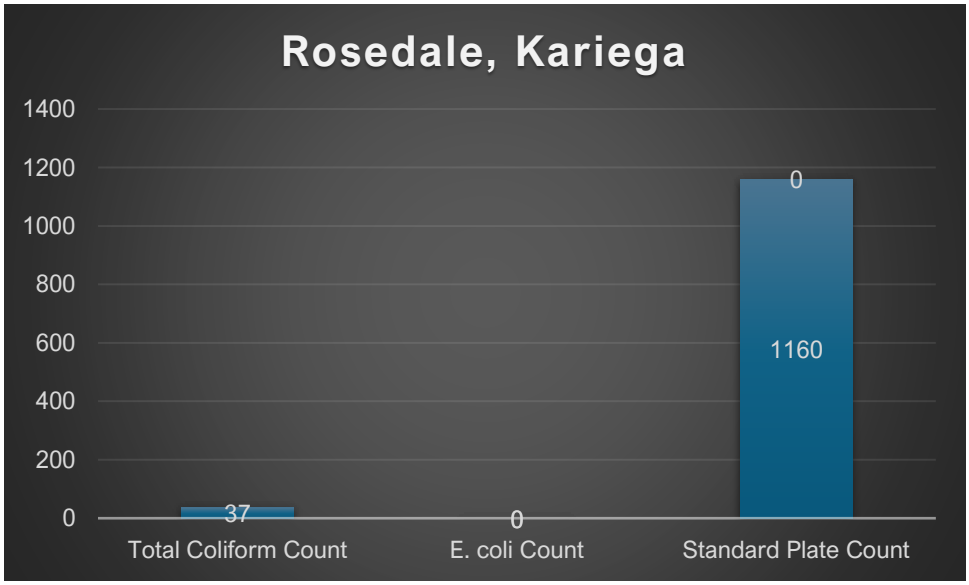

Figure 8: *Rosedale, Kariega results.*

The absence of *E. coli* is positive but does not mitigate the risk, as other pathogens could be present. Urgent corrective measures are needed.

9.3 Gelvandale

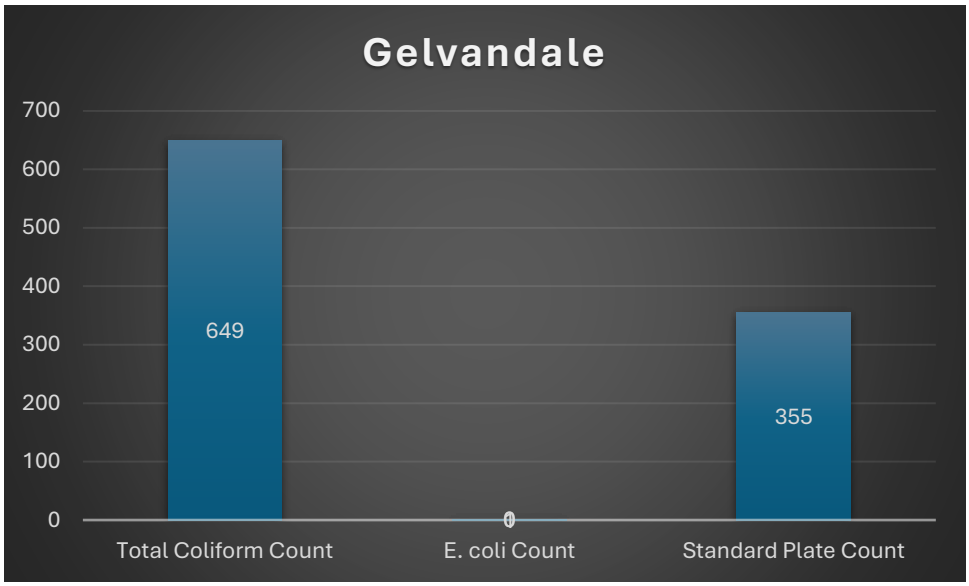

Figure 9: *Gelvandale results.*

The extremely high total coliform count combined with the confirmed presence of *E. coli* indicates gross contamination and a serious health risk. The fact that the Standard Plate Count is only moderately elevated suggests the contamination may be recent, as these general bacteria have not yet had time to multiply.

9.4 Varsvlei – Sanctor, Betherlsdorp

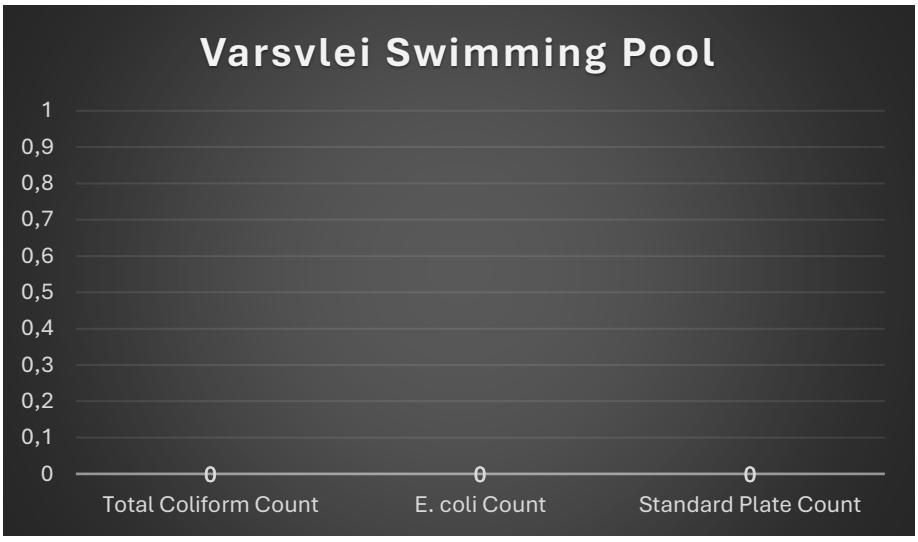

Figure 10: *Fully compliant analysis for Varsvlei swimming pool.*

This sample met the Target Water Quality Range (TWQR) for all microbiological parameters tested against. The water quality is excellent, indicating effective treatment and a protected distribution system. It poses no detected microbiological health risk and is suitable for its intended use.

9.5 Malabar

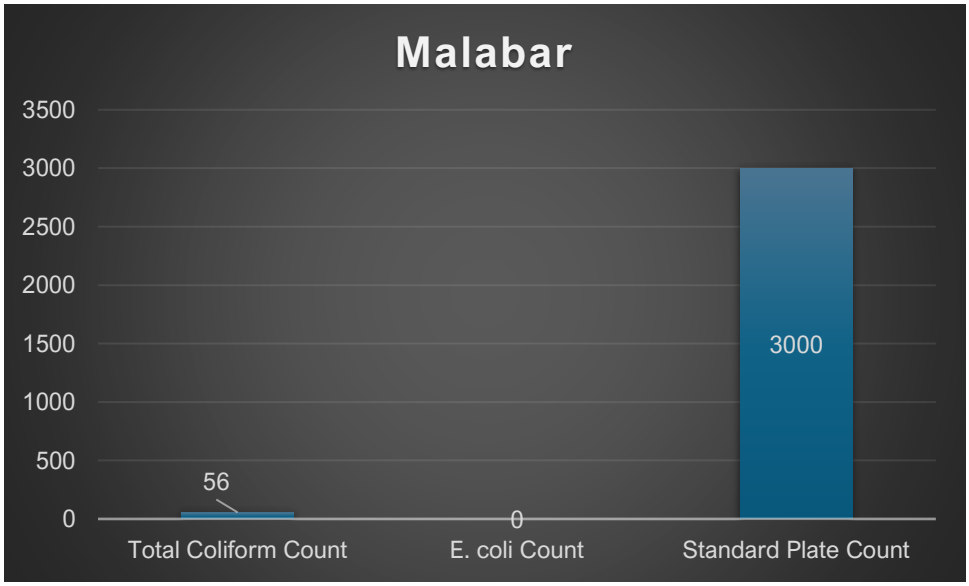

Figure 11: *Malabar public swimming pool results.*

The presence of a high total coliform count alongside an extremely elevated Standard Plate Count indicates significant general microbiological contamination. While the absence of *E. coli* suggests the contamination is not directly of faecal origin, it signals a major breach in system integrity.

9.6 Westering Public Swimming Pool / James Kleinhas Swimming Pool

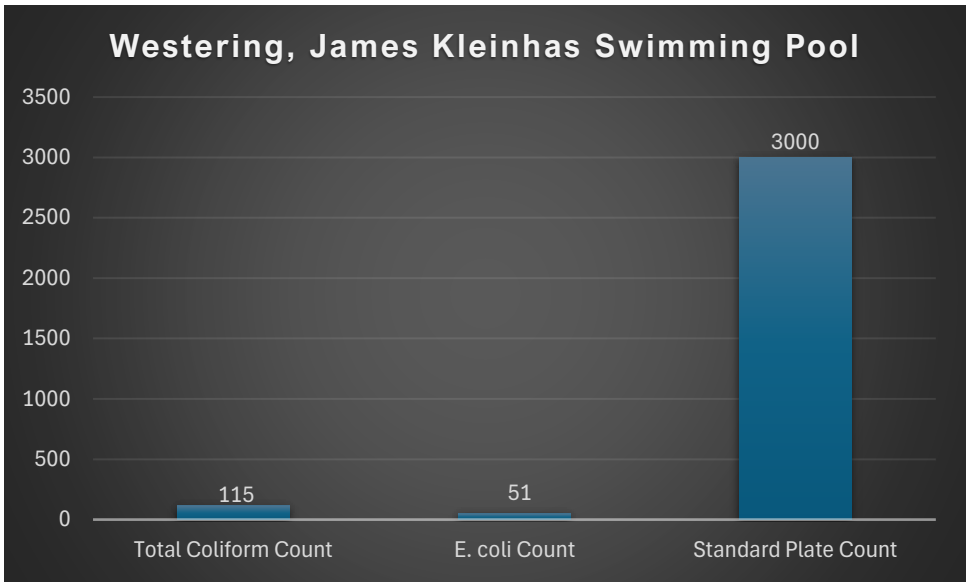

Figure 12: *Westering swimming pool water analysis.*

This is the most serious result. The confirmed presence of *E. coli* constitutes definitive evidence of recent faecal contamination and an unacceptable acute public health risk. The water must be considered unsafe for any recreational use.

9.7 Dolphin Beach Entertainment – Jeffrey's Bay.

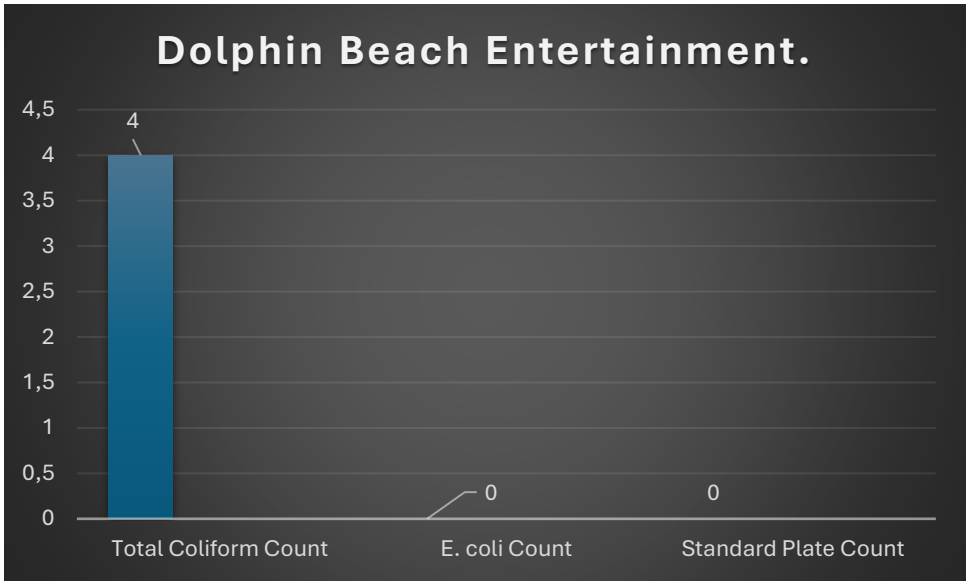

Figure 13: *Dolphin Beach Entertainment Water Park.*

Dolphin Beach Entertainment is one of the Eastern Cape's most popular Outdoor Fun Parks. The park features a Raging Waterslide a Mini-Golf Course and a Snack Shack. Situated a few meters from one of the country's Blue Flag beaches, this pool water sample met all microbiological standards. The low-level detection of total coliforms at 4 CFU/100ml is within the acceptable compliance range and is common in recreational water.

10. Analysis of Possible Influencing Factors

We have listed below our possible analysis of the possible influencing factors that could explain the critical microbiological failures identified in the Gelvandale, Westering, Malabar, and Rosedale water samples.

Factor Category.	Specific Possible Influence.	Evidence and Rationale from Results.	Likelihood.
1. Source Water and Infrastructure Failure.	Faecal contamination of the source (e.g., sewage ingress into rivers/dams) or distribution system breaches (pipe bursts, leaks).	Directly explains the presence of *E. coli* in Gelvandale (1 CFU) and Westering (51 CFU). A major breach could introduce soil and environmental bacteria, accounting for very high total coliforms (649, 115 CFU).	VERY HIGH
	Loss of disinfectant residual (e.g., chlorine). This can be due to inadequate dosing, long retention times in tanks, or high organic load consuming the chlorine.	Explains the proliferation of all bacterium types in all non-compliant samples. Without a disinfectant, bacteria regrow in biofilms and the water column. This is a primary cause of elevated SPC (>1000 CFU/ml).	VERY HIGH
2. Treatment Process Failure.	Malfunction or bypass of filtration/disinfection systems within the pools pumping station.	Would lead to a systemic failure affecting multiple areas, consistent with several sites failing simultaneously. Could allow pathogens and coliforms to pass into the distribution network.	HIGH
	Inadequate treatment for high-turbidity or contaminated raw water following rain events.	High turbidity protects microbes from disinfection. Could cause a temporary spike in contamination across the network if the treatment process was not adjusted.	MODERATE

3. System Integrity and Maintenance.	Biofilm sloughing within old or poorly maintained pipes. Biofilms host bacteria which can be released in large clumps.	Explains spikes in total coliforms and SPC without *E. coli* (Malabar, Rosedale). Sudden changes in flow or pressure can dislodge biofilms.	HIGH
	Cross-connections between potable and non-potable water lines (e.g., with irrigation or industrial water).	A potential direct pathway for faecal contamination (*E. coli*) if non-potable water is sourced from polluted streams. A serious but localized fault.	MODERATE
4. Sampling and Localized Issues.	Localized contamination at the sampling point (e.g., dirty tap, non-potable backyard connection).	Could theoretically cause a single anomalous result. However, the pattern of multiple, geographically distinct failures strongly points to a systemic issue rather than isolated sampling error.	LOW
	Post-sample contamination during handling/transport.	Considered unlikely as samples were handled aseptically and paired with compliant control samples (Varsvlei, Dolphin Pool) processed identically, which showed no contamination.	VERY LOW

11. Summary of the Study

This study analysed the microbiological aspect of a selected swimming pool and recreational facilities within the NMBM and Jeffrey's Bay areas. The analysis focused on *Escherichia coli* (*E. coli*), standard plate count, and total coliform count as indicators of contamination and potential growth of other harmful microorganisms, in accordance with national water quality guidelines.

12. Risks Associated with Using Contaminated Recreational Swimming Pool Water

Exposure to recreational water contaminated presents several public health risks.

- Health impacts may include gastroenteritis, skin and ear infections, respiratory illnesses, and eye infections, particularly in children and immunocompromised individuals.
- Mild skin infections to life-threatening necrotizing fasciitis, especially in compromised wounds.

13. Vulnerable Population Groups

Certain population groups exhibit heightened susceptibility to waterborne infections due to physiological, immunological, or health-related factors.

These include:

- Young children: immature immune responses and increased likelihood of accidental ingestion.
- Elderly individuals: age-related immune system degradation increases risk of severe outcomes.
- Pregnant women: heightened vulnerability to dehydration, systemic infections, and complications.
- Individuals with open wounds or pre-existing skin conditions: increased risk of dermal infection and septic complications.
- Persons with chronic respiratory illnesses: potential exacerbation of symptoms following aerosol or waterborne pathogen exposure.

These groups should avoid high-risk swimming pools, particularly during documented contamination events.

14. Recommendations

In accordance with the National Health Act (No. 61 of 2003) and municipal responsibility for water services, it is urgently recommended that the Nelson Mandela Bay Metropolitan Municipality:

1. Formally notify residents in the affected areas (Gelvandale, Westering, Malabar, and Rosedale) that the water is microbiologically unsafe and advise against recreational use until further notice.

2. Immediately inspect and service all the water infrastructure supplying of these areas to identify sources of contamination.

3. Implement regular inspections and maintenance of pump stations, and stormwater outlets.

4. Flush, disinfect, and re-sample the affected systems. Isolate the contaminated sections if necessary.

5. Perform rigorous daily sampling and analysis in the affected zones until consistent compliance with South African recreational water guidelines and WHO guidelines is restored over a minimum period.

6. Audit the maintenance, disinfection, and monitoring protocols for the entire water supply network to prevent recurrence.

15. Conclusion

The results of this study revealed a significant and immediate public health concern in parts of the municipal water supply. Swift, transparent, and decisive action by the responsible authorities is required to mitigate the risk of waterborne illness and restore public confidence in the safety of municipal water and recreational spaces. The compliant pools, Varsvlei and Jeffreys Bay, demonstrate that effective management is achievable with proper resources and oversight.

Best Regards

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