

Contaminated Evidence? A Study of Data Regarding Cape Town's Marine Effluent Outfalls

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A [minor] dissertation submitted in [*partial*] fulfillment of the requirements for the award of the degree of Master of Philosophy in Environmental Humanities South.

Faculty of the Humanities

University of Cape Town

2020

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Abstract

The effects on seawater quality from Cape Town's marine outfalls and their use for sewage disposal has been a concern for local residents for over a century. This dissertation explores the production of scientific evidence that contrasts public experience and independent science. Beginning with the 2015 application by the City of Cape Town (CoCT) for a permit renewal to continue discharging 38 million cubic meters of sewage daily off the city's Atlantic coast, the study considers the arguments of concerned citizens, photographers and independent scientists who warned that the outfalls are responsible for poor seawater quality. This dissertation begins by tracing the contemporary experiences of concerned citizens as they discovered that the outfall was polluting the ocean and then considers the evidence utilised by the CoCT in their responses to these concerns and in their permit application. The study finds that the CoCT's commissioned CSIR report and the use of tourism-orientated Blue Flag criteria are not compatible with the public interest and independent findings, and further finds that a managerialist approach to scientific data has confused the fulfilment of departmental mandates with the public interest, though they are not the same thing. Through the signing of international treaties, its constitution and various legislations, South Africa prescribes to the precautionary principle, but the author argues that this principle has not been applied in this scenario and that retrospective attitudes towards beach management and seawater quality concerns have been applied instead. Consequently, the implementation of a proactive and forward-looking procedure is recommended, and transparency, ocean modelling and the precautionary principle should be applied to the management of Cape Town's marine outfalls and to concerns over its water quality and attendant data.

Acknowledgements

This work would not have been possible without the financial help of the Humanities Faculty Completion Grant at UCT. Thank you to Masnoenah Kamalie, for helping make this grant possible for me. A special thank you to the Environmental Humanities South group for the inspiring discussions and thinking that took place inside and outside the classroom, which has profoundly and deeply impacted me over the last two years.

I would like to thank my advisor, Professor Lesley Green, for her insight, engagements and support for this work. Thank you for helping me expand my thinking and teaching me the art of creating connections. A heartfelt thank you to my co-supervisor Professor Leslie Petrik, whose assistance, guidance and ability to make seemingly incomprehensible science understandable and relatable made this paper possible. Thank you for being a consistent source of support and always being available to help or listen to me throughout this entire process. To Dr Jo Barnes, your spirit, energy and dedication to your fight against the contamination of water in South Africa is incomparable. Thank you for being an inspiration and for always making time to help me whenever I asked.

A special mention must be made of Byron Herbert, Claire Taylor, Jean Tresfon and Mark Jackson, whose dedication, concern and advocacy on these issues and whose desire to selflessly share their knowledge, expertise and time with myself and others is remarkable. Gratitude must also go to ViVienne Toleni for truly keeping the wheels of the machine going – I would have been completely lost without you over the past two years, thank you for everything and for always being a ray of sunshine. Thank you to Thomas Cartwright for helping me assemble my thoughts so eloquently and for his patience and for editing this into the final product. I must express my utmost gratitude to Jess Tyrell, Amy Beukes, Izzy and the rest of my study group for the countless hours of discussion and support and thinking. Thank you for coming on this journey with me, for keeping me grounded and sane... without all of you this would not have been possible.

Finally, I must thank my family, my bobba, dad, mom, my boyfriend Harry and, of course, Sam. All of your unconditional love, support and guidance, especially at this extremely stressful time, has not gone unnoticed or unappreciated, so thank you! I feel that this is as much yours as it is mine.

Table of Contents

Abstract.....	ii
Acknowledgements.....	iv
Table of Figures.....	vii
Acronyms.....	viii
Introduction.....	1
Cape Town’s Marine Outfalls: A Historical Overview.....	3
Environmental Law in South Africa.....	7
The Research Problem: Evidencing Contamination.....	9
Chapter 1: Effluent of the Affluent.....	12
Unlikely Activists.....	12
Marine Conservation Photographer Jean Tresfon.....	14
Public Health Researcher Edda Weimann.....	19
The CoCT’s Call for Public Comment.....	21
Dr. Jo Barnes.....	24
Professor Leslie Petrik.....	28
The Documentary.....	30
Desalination Warning.....	33
CSIR Report.....	33
Chapter 2: Questioning data.....	35
Introduction: A Summary of the CSIR Report Data.....	35
Purposes of the Report.....	36
A Brief Outline of the CSIR Findings.....	36
Analytical Questions.....	38
Raw Data and Citizen Science.....	41
Blue Flag: Science or Branding?.....	42
Urban Runoff.....	44
Human Health Risk Assessment in the Report.....	45
Independent Science.....	47
The CoCT’s Media Statement.....	49
Chapter 3: Filtering Sewage: Whose Responsibility Is it, Actually?.....	53
Introduction.....	53
A City in Crisis.....	53
Dialogue Organised by the Water Research Council.....	56
CoCT Response to QFS.....	58

Conclusion: Sea-ing through transparent(sea).....	60
Finding 1. The Precautionary Principle, Blue Flag and Prospective Modelling	60
Finding 2. Science for the Market or Science for the Public?	62
Annexure A: CSIR incomplete field notes	67
Annexure B: CoCT media release	69
Image references	72
Bibliography:	73

Table of Figures

Figure 1: A definitive farce (<i>Cape Times</i> , 1979).	5
Figure 2: The Mayor takes a dip (<i>Sunday Times</i> , 1990).	6
Figure 3: Jean Tresfon’s photo, captioned “Another shit day in Cape Town” on Facebook... ..	15
Figure 4: Outfall diffuser mechanism (Layton, 1977: 2920).....	16
Figure 5: A magnified photograph of the Green Point plume (Tresfon, 2015).	17
Figure 6: Sewage plume off the coast of Hout Bay (Tresfon, 2015).	18
Figure 7: Sewage in Camps Bay making its way to the surface (Tresfon, 2015).....	25
Figure 8: Schematic representation of submarine outfall (Beder, 1989: 260).	25
Figure 9: Differences in beach pollution-monitoring calculations (Beder, 1991: 237).	27

Acronyms

CoCT: City of Cape Town

CWDP: Coastal Waters Discharge Permit

TMNMPA: Table Mountain National Marine Protected Area

DWAF: Department of Water Affairs and Forestry

DEA: Department of Environmental Affairs

CFU: Colony-forming units

E. coli: Escherichia coli

WESSA: Wildlife and Environment Society of South Africa

WRC: Water Research Commission

PoP: Persistent organic pollutants

QFS: Quality Filtration Systems

Introduction

Whether or not to eat a piece of food that has fallen on the floor is a subject of much debate. For some, it is still edible if picked up within five seconds, but others disagree. For others yet it is a matter of context: for example, which floor, what else is on it, whether or not the food is sticky and whether the dirt is visible.

Contamination, dirt and filth are undesirable characteristics that few want present in their environments, and that which is understood as contaminated may profoundly affect our decisions. However, there is seldom agreement on what we consider contaminated in everyday life.

In the social sciences, anthropologist Mary Douglas (2001) defines dirt as “matter out of place”, so the specific aspects of a desire for cleanliness define dirt. However, when and how contamination is determined may be decided on the basis of a myriad factors ranging from social norms to scientific methods. Will a microscope that reveals microbes be the deciding factor or a chemical test for toxins? How can we know whether clean household surfaces are harmful after they have been cleaned with toxic cleaning products? Who do we trust? And what suffices as the level of acceptable research and outcomes that we are willing to believe?

The focus of this study is on how we understand whether something is contaminated and on what it means to have sufficient proof to determine whether or not the City of Cape Town's (CoCT) marine effluent outfalls are contaminating the ocean. For where the CoCT argues that sewage from the outfalls causes no harm, many citizens and independent scientists hold that it does. The nature of evidence, its creation and interpretation, is at issue here.

In 2015, the CoCT began their application for a new Coastal Waters Discharge Permit (CWDP) to bring their three marine effluent outfalls in line with the current legislation of the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008), also known as the ICMA. The act, which took effect in 2009, stated that all current marine outfalls required a new permit under the act's new permitting scheme. The CoCT disposes of about 38 million cubic meters worth of preliminarily treated sewage into Cape Town's oceans daily (a few Olympic-sized swimming pools worth (Herbig & Meissner, 2019:5). The

Camps Bay outfall lies 700 m away from Maiden's Cove Beach and is located about 1.4 km from Camps Bay Beach, despite the latter having internationally recognised Blue Flag status, a symbol of beach and seawater quality excellence. The outfall is also situated within the Table Mountain National Marine Protected Area (TMNMPA) (City of Cape Town (CoCT), 2018a: 41; South African National Parks (SAN Parks), 2020). The TMNMPA is also the receiving area for the sewage from the other two marine outfalls. The Hout Bay outfall is located within the marine protected area and the Green Point outfall, which is the largest of the three, sits 1.7 km into the ocean and is on its edge, so contaminated water flows directly into the MPA (CoCT, 2018a:41; SAN Parks, 2020). Controversy over the effects of the outfalls has a long and complex history, as Overy (forthcoming) has demonstrated in "Pollute the Bay and Poison the People": A Short History of the Green Point Marine Sewage Outfall 1882-1992.

This dissertation focuses on the issue of evidence: whose evidence is given validation, the process by which evidence is constituted as valid and on what basis this occurs. Nigerian novelist and literary scholar Chimamanda Adichie (2009) describes "the danger of a single story", in which one part of a complex situation is regarded as the whole story. In a powerful TED Talk, Adichie (2009) emphasises the role of power relations in creating a narrative, stating that "Power is the ability not just to tell the story of another person, but to make it the definitive story of that person". Adichie reminds us to think about *who* is telling *what* story and *how* it is being told. This dissertation examines the multiplicity of stories about the marine outfalls in Cape Town: the stories of evidence and the question of whose evidence is given a voice and whose is not; why certain stories have been left out, silenced or declared obsolete while others are taken as gospel and accepted as truth. By considering the seen as well as the unseen in this struggle over knowledge, this study considers how a global turn to "post-truth" (McIntyre, 2018; Chatterjee, 2017) has helped shape how this narrative has been told. In recent scholarly literature about the problem of market-driven science, the term "post-truth" has gained currency. In addition, the term "post-truthism" has made its way into public discourse, particularly with regards to Brexit and US President Trump's citing as fact claims that have been shown to be clearly untrue: both of which are situations linked to the forms of political marketing adopted by the discredited Cambridge Analytica. The Oxford Dictionary went so far as to declare "post-truth" their word of the year for 2016, defining it as "relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief".

Referring to Bruno Latour's *Enquiries into Modes of Existence* (2015), this study will show that post-truthism has enabled a managerialist approach to science and fact, which has created a very specific situation with specific but avoidable consequences whereby science and data have not been democratised and, contrary to South Africa's laws, they have been utilised to serve specific arguments. The story of the V&A Waterfront's desalination plant is used as an example of the consequences of this approach

Cape Town's Marine Outfalls: A Historical Overview

The concept of contamination holds both a literal and figurative meaning. According to the Oxford dictionary (online), to contaminate is "To make a substance or place dirty or no longer pure by adding a substance that is dangerous or carries disease", and the figurative meaning is defined as to "influence people's ideas or attitudes in a bad way."

During the late 1800s and early 1900s, the Cape was plagued by various outbreaks of disease, such as the bubonic plague, smallpox, typhoid fever, measles and more, causing panic as well as a desperate need to deal with sewage, filth and dirt and highlighting the dearth of clean water. The high death rate in the Cape in 1877 was attributed by the medical fraternity to sanitation issues, dirty personal habits, overcrowding, an absence of building regulations and a lack of control by the town council (Whittingdale, 1996). Whittingdale (1996:137) notes that in the mid-19th century,

The means of removing and disposing of domestic refuse and night soil were primitive, inefficient and inadequate. Consequently, large quantities of filth were permitted to accumulate in the streets, public places and the backyards of the houses, while a pungent smell emanated from the town drains and sewers.

As part of the Cape's sanitation scheme, most sewage was diverted into the ocean. The Green Point outfall was completed in 1905 after alternatives had been deemed too expensive and impractical (Overy, forthcoming: 5). Over subsequent years, Green Point residents voiced concerns about the smell and effects of the outfall. The city council installed ventilation shafts in 1913 after complaints about the odour, but this seemed to make the situation worse, and the shafts were removed three years later (Overy, forthcoming: 5). In 1927, a petition was sent to the mayor citing the residents of Green Point's frustration that "the whole of the foreshore is polluted with sewage and the stench from the sewage is at times intolerable and unbearable" (Overy, forthcoming: 8). One of the local residents, Mr J Yolland, went so far as to bring legal action against the council on this basis, but the judge refused to grant the interdict

because there was no ready alternative (Overy, forthcoming: 8). At the time, the City's Medical Officer of Health (MOH) compiled a report showing a correlation between enteric fever in Mouille Point and the outfall and raised concerns about addressing the issue (Overy, forthcoming: 4). Despite these concerns, the City council continued to extend the outfall pipeline, admitting that there were no financially viable or feasible alternative solutions (Overy, forthcoming: 14).

Until the mid-1900s, it was widely accepted that "sea water rapidly kills all germs", and issues relating to dumping sewage or any other matter into the sea were largely attributed to aesthetic concerns (Brown, 1987: 244). It was only in the 1950s that researchers understood otherwise, when inorganic mercury from a plastics factory was released into the water in a small town in Japan, poisoning Minamata Bay and killing not just people and wildlife but destroying the fishing community as well (Brown, 1987: 244). After this incident and others around the world, people realised that the sea could not magically treat or kill everything that was dumped into it (Roberts et al., 2008).

By 1986, a new outfall and pipeline had been installed in Green Point due to the leaks and corrosion of the original outfall (Overy, forthcoming: 9). During this time the National Institute for Water Research (NIWR) had determined there were no viable alternatives and that the outfall was still the best mechanism with which to deal with sewage, recommending that it be extended to 2 700 m and include macerators (Overy, forthcoming: 10). The Department of Water Affairs granted a permit for this discharge, but according to the permitting conditions, the City council had to ensure the outfall met the specified conditions or the permit could be revoked (Gross, 1979). Despite an oceanographic survey, known as the Atkins report,¹ news clippings from 1979 from the *Cape Times* show that residents remained unhappy with the outfalls as a water disposal mechanism and listed technical, ecological, health and fauna concerns (Gross, 1979). With regards to ecological concerns, the newspaper stated that "Best current practice in most civilised countries expressly prohibits the discharge of raw sewage, whether macerated or not, into the sea" (Gross, 1979), while another article (Fig. 1) questioned the scientific basis of the outfall ("A definitive farce", 1979: 10).

¹ The Atkins report was a marine survey conducted by the UCT Institute of Oceanography, authored by Mr G R Atkins. The report was "used by the Cape Town municipality as a basis for deciding on a shorter, cheaper sewer outfall at Green Point" ("Test figures 'outdated'", 1979: 3). Local newspapers regarded it as an "obsolete collection of estimates, assumptions and averages based on incomplete information from lost and damaged survey equipment" ("Test figures 'outdated'", 1979: 3).

A definitive farce

IF the Atkins report, on which the city engineer's department based its recommendations for a 1,7-kilometre sewage outfall pipe at Green Point and which itself was based on a survey which lost 80 percent of its floats in one area, abandoned the use of test buoys after they had been run down by fishing vessels, carried out bacteria contamination tests in summer only, tracked the effect of wind on currents by day only, assumed that bacteria in South African seawater would die off in half the time they die off in American seawater, rested its conclusions on a discharge rate less

than half that expected in 1983, gave results from only six of its eight sketched float zones, measured bottom currents to within only one kilometre from the shore and decided that no current direction could be predicted, is — in the words of the city engineer, Mr Brand — “the definitive investigation”, then heaven help the ratepayers of Cape Town when the expenditure of millions of rands is based on less-well defined research. A survey like that makes thumb-sucking, the expression used by Councillor Emil Riese to describe the work of a subsequent committee of experts, a respectable alternative.

TREFWOORDE

- 1 Redaksioneel.....
- 2 Atkins.....
- 3 Jimmy.....
- 4 Groenpunt.....
- 5 Verslae.....

Figure 1: A definitive farce (Cape Times, 1979).

Another clipping discusses the findings of the Coogan committee, described as “a group of environmental, marine and medical experts headed by the City’s Medical Officer of Health, Dr R J Coogan” (“Sewer: Appeal to...”, 1979: 15). The committee requested an investigation into alternative methods of sewage disposal on the grounds that the outfalls were an environmental and health hazard. The committee was dismissed and their concerns labelled as a “thumbsick in a council debate” (Sewer: Appeal to...”, 1979: 15).

In 1990, a radio reporter claimed that the stain in Green Point’s ocean was attributable to sewage and pollution from the outfall (Nevill, 1990), but the Mayor at the time, Frank van der Velde, “proved” the claim false by swimming in the discoloured water and challenging the reporter to prove his claim (Nevill, 1990).

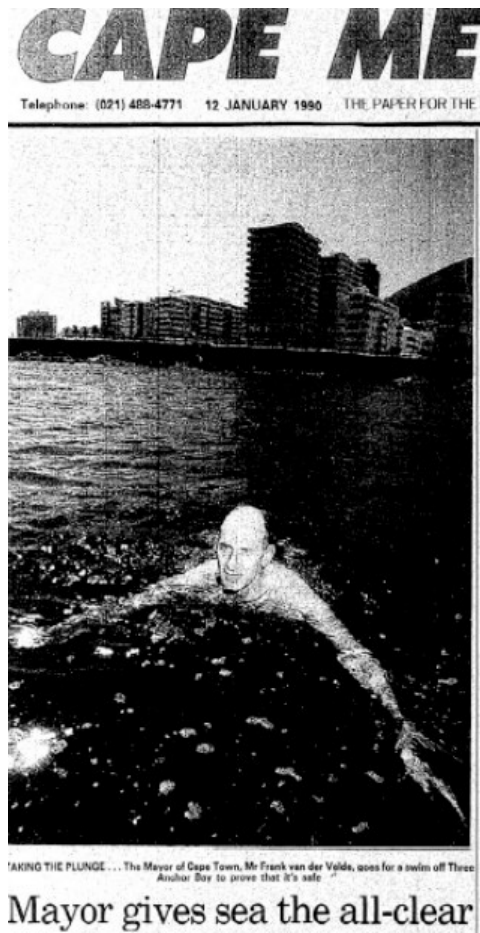


Figure 2: The Mayor takes a dip (*Sunday Times*, 1990).

The outfall was completed in 1993, despite the *Sunday Times*' reports of residents' concerns about ecological damage and suggestion that not enough scientific enquiry had been conducted to deem it a suitable and viable option (Howa, 1993).

Camps Bay has not always been considered the prime real estate it is today and was known as a picnic spot in the early 1900s (Strydom, 2018), and its sewage concerns were not considered as grave as the rest of the city's. The Camps Bay outfall was commissioned in 1974 and completed in 1977, replacing and enlarging a previously existing sewer (Mazure, 1977: 342). The Hout Bay outfall was constructed in 1991 but only became operational in 1993 after completion of a pre-treatment works (a maceration mechanism) (CoCT, 2018a: 41).

This idea of moving the dirt out of one's immediate environment has translated and evolved from when the first outfalls were established and has followed us into the 21st century. The City council's initial reaction to public outcry and concern was to extend the outfall and move the sewage further away from people, claiming there was no feasible alternative and sometimes simply ignoring or condemning the outcry, and these arguments and issues have persisted into the present. Unfortunately, the issue of trust and mistrust between authorities, scientists and civilians has a long and rich history, both in Cape Town and across the globe, from Rachel Carson's discovery of the effects of DDT, where chemical industries called her crazy and many did not believe her, to more recent examples of concerns about asbestos (Unesco, 2005: 10) and critics of the chemical PFOA who were silenced by the chemical industry (Rich, 2016). These examples have in common a contest over who has the power to create and validate evidence; issues of transparency in respect of how research is done; and questions about the effects of toxicity, given that the absence of research on an effect does not equate to the absence of that effect.

Questions of evidence in environmental governance in South Africa are the subject of several levels of law in South Africa. These are briefly described in the next section and are followed by a reflection on the trend towards the precautionary principle in international environmental jurisprudence. I argue that this principle has not been invoked and applied to the case of the Cape Town marine effluent outfalls as is legally required.

Environmental Law in South Africa

The South African constitution has been the nation's supreme law since 1994 and covers rights and duties, and any issue in contravention of the constitution is deemed invalid. The South African legal system is based on a dynamic mixed system, in which statutory and common laws guide constitutional elements and effectively govern the country. These laws are implemented by national, provincial and local levels of government, which "all have legislative and executive authority in their own sphere, and are defined in the constitution as distinctive, independent and interrelated" (South African Government, 2020). The South African politic is run under the principles of "co-operative governance", which discourages litigation between the various governing spheres (Herbig & Meissner, 2019: 4). According to S74 of the National Water Act (No. 36 of 1998), ministers have the power to issue directives against water management institutions (local government and municipalities) and issue fines

(Herbig & Meissner, 2019: 4), but it has been argued that local governments are often tasked with monitoring themselves, a case of the fox guarding the hen house (Herbig & Meissner, 2019: 4).

South Africa's overarching environmental laws are the National Environmental Management Act (No. 107 of 1998) (NEMA), the Promotion of Access to Information Act (No. 2 of 2000) (PAIA) and the Promotion of Administrative Justice Act (No. 3 of 2000) (PAJA), which are supported by various land use management planning laws, resource conservation laws and water management and pollution control laws. According to the Constitution (South African Government, 1996: part A schedule 4), the national and provincial government are concurrently responsible for pollution control. However, in part B of the same schedule, local government is stated as being responsible for water sanitation services (Herbig & Meissner, 2019: 4), so local government is essentially responsible for the day-to-day management of pollution disposal, while provincial and national government are responsible for "steering, oversight and monitoring" (Herbig & Meissner, 2019: 4). Local governments, also known as municipalities, must adhere to specific regulations, for example S20 of the Health Act (No. 63 of 1977), in which is stated:

- (1) Every local authority shall take all lawful, necessary and reasonable practicable measures:*
- (a) To maintain its district at all times in a hygienic and clean condition;*
 - (b) To prevent the occurrence within its district of—*
 - (i) Any nuisance;*
 - (ii) Any unhygienic condition;*
 - (iii) Any offensive condition; or*
 - (iv) Any other condition which will or could be harmful or dangerous to the health of any person within its district or the district of any other local authority, or, where a nuisance or condition referred to in subparagraphs (i) to (iv), inclusive, has so occurred, to abate, or cause to be abated, such nuisance, or remedy, or cause to be remedied, such condition, as the case may be;*
 - (c) To prevent the pollution of any water intended for the use of the inhabitants of its district, irrespective of whether such water is obtained from sources within or outside its district, or to purify such water which has become so polluted.*

The seen and unseen politics and narratives that govern and assess water quality have serious consequences, and the precautionary approach is an international paradigm that advocates that caution be exercised in cases of scientific uncertainty. This approach is largely applied to environmental issues and has been proven not only to be best practice and legally binding but has also been demonstrated through countless local and global crises that have manifested when a precautionary approach has not been adhered to.

Local governments have a duty to incorporate and adhere to this principle through the signing of international treaties. The precautionary principle was first introduced in the World Charter for Nature (United Nations General Assembly, 1982) whereby all member nation states of the United Nations¹ adopted its five principles of conservation in terms of which “all human conduct affecting nature is to be guided and judged” (United Nations General Assembly, 1982). The precautionary principle is further inscribed, albeit in a weaker form² in principle 15 of the Rio Convention (United Nations, 1992), of which South Africa is a signatory. The precautionary principle has been further developed in international law in a more stringent manner through the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping Wastes and other matter, also known to as the London Protocol Environmental Protection Agency (EPA), to which South Africa is also a signatory.³

South Africa is bound to the implementation of the precautionary principle, not only through the signing of the above-mentioned treaties and conventions but also its own legislation. Chapter 2 of the Constitution (South African Government, 1996), the Bill of Rights enshrines the country's environmental rights and states:

(24). Everyone has the right

(a) to an environment that is not harmful to their health or wellbeing; and

¹ South Africa has belonged to the United Nations since its inception in 1945 (Sahistory.org.za, n.d).

² The strong version of the principle is implemented whereby costs are not considered in preventative actions and the strict enforcement of any actions which could cause harm to the environment in the case of scientific uncertainty is harshly denied and the polluter pays principle is enforced (Morodi, 2016: 2). Alternatively, the weak version of the principle places the burden of proof on those who are advocating for the precautionary principle, therefore the need to justify that the actions could potentially cause significant harm to the environment fall on those who claim to be affected (Morodi, 2016: 2).

³ The London Protocol indicates that a precautionary approach is to be taken however it further provides stricter enforcements of its application through the creation of a reverse listing of activities. This means that all dumping or potential harmful activities are prohibited unless the specific activity is listed. It states that this approach is a strict obligation (Glazewski & Plit, 2015: 198).

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that— (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

The term sustainable development as described in Section 24(b)(iii), has been defined through guiding principles by the legislature in NEMA (National Environmental Management Act No. 107 of 1998). NEMA is South Africa's over-arching environmental legislation, in which Section 2(4)(a)(vii) requires that the precautionary principle be implemented through the principles of sustainable development. It states “Sustainable development requires the consideration of all relevant factors including the following: ...that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions”. Furthermore, NEMA specifies that this application must “apply throughout the Republic to the actions of all organs of state that may significantly affect the environment” (S2(1)).

The precautionary principle is further emphasised in the *National Guideline for the Discharge of Effluent from Land-Based Sources into the Environment* (2014), which includes Principle 1, “The pollution prevention, waste minimisation and precautionary approach”; Principle 4, “The polluter pays principle”; and Principle 5, “The participatory approach” (Anchor Environmental, 2015: 40). These principles are supported by various ground rules, including rule 24, which provides that a holistic process be followed and that potential impacts on the environment be “investigated in both near and far field, taking into account other atherogenic activities” (Anchor Environmental, 2015: 43) and rule 26, whereby “recognised numerical modelling techniques must be applied in the scientific and engineering assessment and design of a coastal disposal system” (Anchor Environmental, 2015: 44). Based on these guidelines, local laws and frameworks and the international treaties that South Africa is a party to, it is evident that the precautionary approach, duty of care and polluter pays principles must be considered when assessing water quality, the impact of marine outfalls, the intake of desalination plants and in the broader picture of ecosystems health.

The Research Problem: Evidencing Contamination

It is presumed that science and law work together, but this dissertation will show that there is a gap in the application of law, science and politics in respect of the management of the marine effluent outfalls in Cape Town. This dissertation therefore investigates how evidence and knowledge are collected and validated with regards to the outfalls, as well as how well these mechanisms of knowing and the

implementation of these facts are in line with South African and international policies of decision making and risk-aversion environmental concerns.

In Chapter One I discuss the multiple stories and lived experiences of some of the Cape Town citizens concerned about the effects of the marine effluent outfalls. These accounts constitute an evidentiary body that has sought to contest the CoCT's denial that the marine outfalls are cause for any concern. In the second chapter, I interrogate the assumptions supported by the CoCT-commissioned CSIR (2017) report that the City claims as their proof that there is no cause for concern. In Chapter Three, I argue that the political ideology of post-truthism and managerial science and politics have played a role in the creation of our current standards of validating truth, and I show how this has facilitated the desalination plant at the V&A Waterfront's failure to secure water during Cape Town's drought. Finally, in the conclusion I consider how the precautionary principle, as invoked nationally and internationally, is a legal tool that should have been utilised to avoid the scenarios that have unfolded, and. I ask whether science and politics can be done differently, in a more holistic way in which evidence and truth are validated on more equal terms. It would be in the public's best interest for a risk-averse, forward-thinking approach were to be implemented, as legally prescribed through the precautionary principle and through the use of predictive modelling as international best practice for beach and ocean water management. Finally, given the excessive costs and ultimate failure of Cape Town's desalination plants because of urban ocean pollution, it is in the interests of the city, and the global community, that the marine sewer outfalls be replaced with tertiary water treatment facilities in which persistent organic pollutants are broken down and waste water is recovered for re-use.

In this dissertation I have used a mixed methods approach to the research, including both qualitative as well as quantitative research. I have made use of previous in-depth interviews which I compiled for my honours dissertation in 2018, and I conducted follow-up interviews and discussions with the respondents over the course of 2019 and 2020. I subsequently had in-depth discussions with certain respondents, including frequent water users, concerned citizens and Quality Filtration Systems employees to gain a deeper understanding of their concerns and the issues they had expressed in the media. I also made extensive use of grey literature through the analysis and discussions of various reports, focusing on the report commissioned by the City of Cape Town and conducted by the CSIR (2017), as well as other government and independent reports. Finally I made use of journal articles, newspapers and

online sources to gather information and create a holistic array of information. Ethical clearance was granted on 12 November 2018.

Chapter 1: Effluent of the Affluent

This notion that “Science” is something that belongs in a separate compartment of its own, apart from everyday life, is one that I should like to challenge. We live in a scientific age; yet we assume that knowledge of science is the prerogative of only a small number of human beings, isolated and priest-like in their laboratories. This is not true. It cannot be true. The materials of science are the materials of life itself. Science is part of the reality of living; it is the what, the how, and the why of everything in our experience. It is impossible to understand man without understanding his environment and the forces that have moulded him physically and mentally. Rachel Carson (in Lear, 1997: 218)

In 2015 the City of Cape Town began their permit application for a new Coastal Waters Discharge Permit under the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) (ICMA). If granted, the permit would allow the CoCT to continue discharging preliminarily treated effluent along Cape Town’s coastline. In the preliminary treatment that takes place at the three marine outfalls, the sewage is sieved through a series of mesh grids and macerated, then released at depth through a diffuser mechanism into the ocean (CoCT, 2018a: 40). Concern, mistrust and questions over data validity have been ongoing for over a century in the debates about whether or not the CoCT should be allowed to discharge effluent into the marine environment, and that mistrust has come to characterise the relationship between the CoCT and the public in terms of whether or not the environment is being responsibly and scientifically managed.

Unlikely Activists

In this chapter, I trace the more recent stories of some of the Cape Town citizens who have drawn public attention to their concerns about the outfalls. These citizens are diverse in their backgrounds, and their causes for concern and proof thereof are correspondingly diverse. None of them set out to be activists, however, and it was only through their own evidence that they found cause to be troubled by the outfalls.

Jean Tresfon is a marine conservation photographer and avid scuba diver whose underwater photographs and photographs from his gyrocopter have seen him win awards such as the

Getaway gallery photographer of the year in 2007 (Segar, 2020b). Tresfon's concerns began when he dived the Sea Point outfall and found himself swimming through sewage; he later flew his gyrocopter over the same area and photographed what he called a "pollution plume" (Tresfon, 2015: online) along the edge of the Cape Peninsula. His personal experiences and photographs of the plume led him to speak out about his concerns.

Professor Edda Weimann, a professor of pediatrics and a public health specialist at UCT, began her study of the water quality at Clifton Beach two years before Tresfon shot his photographs. After visiting the beach and noting something "odd" about the water quality, she consulted the Blue Flag water quality display board on the beach and found that the information displayed had not been updated. Using a citizen research approach, she assessed the *E. coli* levels and interrogated the usefulness of the Blue Flag paradigm as a means of assessing water quality in the area (Weimann, 2014). Weimann's study was "in the interest of the public", conducted to educate herself and others about what and how the Blue Flag paradigm works and to highlight the pitfalls she found within it and the trouble she discovered with the outfall (Banderker, 2014).

Dr Jo Barnes is an epidemiologist and senior lecturer in Community Health at the University of Stellenbosch's faculty of Health Science. Her expertise has in the past been called upon by the CoCT to assist with stormwater outfalls, and she was granted the Order of the Disa of the Western Cape Province (Segar, 2020a). Throughout her career she has focused on the crisis of sewage, water pollution and sanitation and their attendant public health risks (Segar, 2020a). Barnes has conveyed her professional insights and concerns about marine sewage outfalls in radio interviews with SAFM (Greater Cape Town Civic Alliance, 2015) and EWN (Harrison, 2015) and in presentations to the Camps Bay Ratepayers Association at their AGM in September 2015 (Barnes, pers. comm., 27 June 2017). She contributed to the public participation process, submitting a letter detailing the issues that she found worrisome about the proposed renewal of the outfalls, and participated in the *Bay of Sewage* documentary (Jackson, 2016).

Professor Leslie Petrik, currently the outgoing head of the Environmental and Nano Science Research Group at the University of the Western Cape (UWC), has also spoken widely about the potentially damaging effects of the outfalls. She was recognised as the UWC Vice-Chancellor's Annual Distinguished Researcher in the Natural and Medical Sciences in 2012,

and as a Distinguished Woman Scientist in the Physical and Engineering Sciences by the Department of Science and Technology in 2012 (NanoTechnology Public Engagement, n.d.). Petrik's insights and inputs have highlighted important considerations with regards to the outfalls, many of which the general public might have been unaware of, and her active contribution has made her insights invaluable to this discussion.

The Camps Bay Ratepayers Association (CBRA) has been vocal and active in their concerns about the consequences and effects of the outfalls, and in 2016 they commissioned filmmaker Mark Jackson to make a short documentary about the marine effluent outfalls. Despite their obvious focus on the issues pertaining to the Camps Bay outfall, their concerns were extended to all three outfalls. The documentary interviewed Jean Tresfon, Dr Jo Barnes and Professor Leslie Petrik and investigated their insights to create an insightful and holistic understanding of the outfalls and the issues that surround them.

This chapter investigates the stories of these unlikely activists and how the knowledge they gained has been received by the public and the CoCT. It highlights the different mechanisms and ways of knowing which bring these citizens to conclude that the outfalls are polluting the ocean. It also creates a framework and timeline of the events that unfolded in Cape Town around the current outfall controversies, specifically dealing with events and concerns from the time of the CoCT's application for a new Coastal Waters Discharge Permit.

[Marine Conservation Photographer Jean Tresfon](#)

On 28 April 2015, marine conservation photographer Jean Tresfon uploaded to Facebook what has become an iconic photograph, captioned "Another shit day in Cape Town". The photograph was taken from his gyrocopter, showing the beautiful landscape of Cape Town, with Table Mountain, Lion's Head and the famous stadium in the background and the glistening coastline and ocean outlining the City. The blue ocean at centre stage of the photograph, however, shows a dramatic plume of lighter-coloured water in the vicinity of the Green Point marine outfall. Tresfon's photograph appeared on the front page of the *Cape Argus* with the headline "Blue Flag Effluent Raises Big Stink" (Lewis, 2015:1). It also appeared in *The Weekend Argus* (Polley, 2015) and other newspapers and print media (Harrison, 2015; "Something Stinks...", 2015; Feiter, 2015; Spike, 2015), forcing people to give more thought to what happens when they flush a toilet or let water out of their sinks.



Figure 3: Jean Tresfon’s photo, captioned “Another shit day in Cape Town” on Facebook.

This was not the first photograph of the plume that Tresfon had shared online, having previously uploaded a similar picture without the famous mountain, world-renowned beaches or other visual cues as to the size, proximity and context of the “pollution plume”, but the earlier photograph received little attention. This time, however, his photo received over 392 shares on Facebook and was used on other platforms as well, as it brought into focus a usually invisible issue that many locals had not previously considered. Part of the shock factor, for many, was that they had not considered that swimming at the beach might mean contact with sewage, which horrified those who believed they were living clean, sterile lives. Users commented that “It’s disgusting” (Hewitt, 2015), and “It’s so unnecessary they have great systems that would clean this sewage to the point of it being drinkable water” (Loftus, 2015), while one user asked “What is screened sewage?” (Rohm, 2015) and commended Tresfon for sharing the image and raising the issue. One of the comments posted under his photograph was from avid kayaker Eddie Bisset (2015: online), who wrote:

I’m a regular kayaker out of 3 anchor bay and got sick on Sunday afternoon from practicing Eskimo rolls in the bay. The water on Sunday afternoon was discoloured and smelt ‘sharp’. I kept my mouth tightly shut, but the rolling action forces water up

the sinuses. Within about 2 hours of that I had diarrhoea, cramps, headaches and fever. It lasted 24 hours. Tx for the pic Jean.

Bisset's comment is similar to the sentiments of many surfers and frequent water users who have reported ear and eye infections after inshore winds. Surfer Greg Bertish (Gosling, 2015: online) reported that:

In winter, the westerlies often blow it back, or a big swell. You see it floating around, a mass of stuff all congealed with a bad smell. I put it at the back of my mind because I like to surf there, but some guys won't. I have had a bacterial infection which attacked a heart valve, and other surfers have got hepatitis.

Despite these comments, however, it is often difficult to directly link illness and symptoms to dirty beach water, as they may only be experienced hours after leaving the water.

The CoCT's response was swift, defending itself with an outright denial. The photograph was not capturing an effluent plume, they argued: "Despite this, we will continue to assist in establishing what the cause of the plume was (for example, surface discharge from passing ships)" (Spike, 2015). The second argument the CoCT made was that it could not be an effluent plume, because the diffusion mechanisms of the outfall dissipated sewage before it reached the surface (Spike, 2015). In Cape Town, the outfalls run along the ocean floor and the sewage is dispersed via a series of diffusers (Fig. 4), so the effluent should be trapped below the thermocline and dissipate within the water column, below the thermocline.

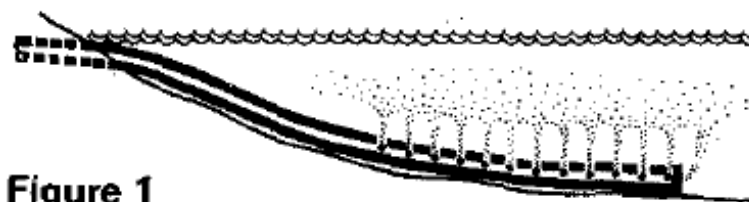


Figure 1
Outfall Diffuser

Figure 4: Outfall diffuser mechanism (Layton, 1977: 2920).

Thirdly, they argued, this could not be caused by the outfall, because if it were, seagulls would be present, and none were visible in the photograph (Ramphele, 2015).

Tresfon (2015: online) responded that “This ‘plume’ is 1.7km from the shore at Green Point as marked on my GPS, probably a co-incidence then that the actual sewage outlet is supposed to be at this exact spot.” He also released magnified versions of the photograph in which seagulls can clearly be seen flying above the plume (Fig. 5) (Spike, 2015).



Figure 5: A magnified photograph of the Green Point plume (Tresfon, 2015).

Tresfon is also an avid scuba diver who has dived at the Green Point outfall several times. He recalled diving with a *National Geographic* photographer to capture footage of a pod of southern right whales on the Green Point coastline:

There was a massive proliferation of krill, and the whales were feeding in amongst the vessels. Unfortunately, they were in the area of the Green Point outlet. We could smell it. We could see the outlet. There were turds drifting by our boat. It was highly embarrassing for me trying to show off my city to world famous wildlife photographers. (Spike, 2015:online)

Although the CoCT did not immediately respond to Tresfon’s magnified photograph, they referenced it in a legal letter, adamant that the magnified version did not serve as any sort of proof. They also wrote that “The City suspects that the image shown may have been digitally enhanced and its rights in this regard are expressly reserved” (personal communication between CoCT and J. Tresfon, M. Jackson, C. Willemse & B. Herbert, 21 December 2016).

Tresfon released another series of photographs on 21 May 2015, this time taken over the marine sewer outfall in Hout Bay, a residential area on Cape Town’s Atlantic seaboard (“Cape Town Poo...”, 2015). The photograph showed another plume, this one close to the Hout Bay diffusion point (Fig. 6). Clearly, the issue of ocean pollution from sewer outfalls was not as easily dismissed as the CoCT’s official responses would have it be.



Figure 6: Sewage plume off the coast of Hout Bay (Tresfon, 2015).

Some of Cape Town’s biggest media, both online and print, gave Tresfon’s photographs detailed coverage and noted that the CoCT was in the process of applying for permits to continue discharging effluent into the marine environment via the three outfalls at Green Point, Camps Bay and Hout Bay.

The marine effluent outfalls in Cape Town, as with other outfalls across South Africa, were previously granted authorisation through a water use license from the Department of Water and Sanitation (previously known as the Department of Water Affairs and Forestry). This license included specific conditions and restraints applicable to each outfall. In 2009 the ICMA came into effect, whereby licencing powers shifted to the Department of Environmental Affairs (DEA). The new legislation determined that anyone currently discharging or wanting to discharge effluent into the marine environment must apply for a new Coastal Waters Discharge Permit (CWDP) from the DEA in terms of S69 of the ICMA. The permit application includes a mandatory public participation process that had not been required under the previous permitting scheme. The act came into effect in 2009, during which time 121 existing national effluent discharges needed to be brought in line with the new permit regulations, but the CoCT only began their permit application process in 2015, a full five years later.

Public Health Researcher Edda Weimann

The fact that the outfalls required new permits did not make its way into discussions between concerned citizens, scientists and officials until 2015, although Professor of Public Health Edda Weimann had raised concerns about ocean water quality in 2013 and published *Blue Flag Beaches: Bathers at Risk for Thalassogenic Diseases* in 2014.

The Blue Flag programme is an international organisation that grants its Blue Flag status award to beaches and marinas to symbolise beach and water quality excellence (Wildlife and Environment Society of South Africa (WESSA), n.d.). To achieve this status, beaches must meet strict criteria set out by the European Foundation for Environmental Education (WESSA, n.d.). Thalassogenic diseases are infectious diseases caused by the sea or as a result of polluted coastal water (Shuval, 2003), and Weimann's study questioned the validity of the Blue Flag designation as an indicator of scientific validity of beach and seawater quality excellence. She focused on Clifton's Fourth Beach, one of Cape Town's most renowned Blue Flag beaches, located a few hundred meters away from Camps Bay Beach and the Camps Bay outfall. In her paper, she describes how and why the Blue Flag paradigm is used primarily as a marketing tool rather than as a reflection of environmental and marine excellence. Weimann found several managerial issues, such as dogs playing on the beach, which is prohibited by Blue Flag standards, and a lack of water quality data displayed on the

required notice boards (Weimann, 2014: 41). She sampled the ocean water there for *E. coli* and compared her findings to the Blue Flag parameters and requirements; five of her six samples did not meet the prescribed Blue Flag standards. Her study is an important local reflection and contribution to international criticism and concern about the validity of the Blue Flag program as a whole.

Weimann concludes with the harmful effects that the Camps Bay outfall could have on the beaches, especially due to its close proximity to Clifton's Blue Flag beaches. Her study highlights the issues of the Blue Flag paradigm as a reliable indicator for beach and seawater quality and her concerns about the effects of the outfalls on sea water quality, specifically in respect of the Camps Bay outfall, were widely covered in the press and on social media. On 24 December 2014, the *Cape Times* published concerns that stemmed from Weimann's work, under the headline "E. coli Warning for Clifton Beach" (Isaacs, 2014). The article quotes Weimann as saying, "The water quality is deteriorating and this seems to be completely ignored. The sewage ends up there every day. It will affect people and the environment" (Isaacs, 2014: online). Other news outlets also took up the story, with *TimesLIVE* (2014) running the story as "E. coli Alert Raises Big Stink at Clifton" (Davids & Mthethwa, 2014), and Traveller24 ("E. coli Threatens Popular...", 2014), Voice of the Cape (Banderker, 2014) and others also raising the issue.

Councillor Benedicta van Minnen, the Cape Town Mayco Member for Health, responded on behalf of the CoCT with a statement that Clifton's beaches were not polluted, that the water quality was not negatively impacted by the outfalls and that, "As the City with the highest number of Blue Flag beaches in the country, we trust that the facts will speak for themselves" (Van Minnen, 2015). The Wildlife and Environment Society of South Africa (WESSA) works in partnership with local authorities to manage the Blue Flag program in South Africa (WESSA, n.d.), and Morgan Griffiths of WESSA responded to Weimann's paper, stating that "The public does not need to be stressed that they are swimming in sewage water. They are swimming in some of the cleanest and independently tested seawater" ("E.coli Threatens Blue Flag...", 2014).

The fact that the outfalls had not been brought into line with the new legislation, and thus did not yet have their updated permits, had not been mentioned by CoCT officials and was only brought to the public's attention by Tresfon's photographs almost a year later. One of the first

big investigative stories to be published on the outfalls was released online by Wavescape (Spike, 2015) and quoted the CoCT as having

...referred [Tresfon's] photographs to the Department of Environmental Affairs, as they are responsible for monitoring the quality of the marine zones. The City is assisting where possible to resolve the matter. From the City's side, specialist diving teams inspected the outfalls in March and May 2015 and found no irregularities. (Spike, 2015: online)

The CoCT's Call for Public Comment

On 1 June 2015 the CoCT's public participation period was opened to allow for comments, suggestions and recommendations with regards to the application to renew the permit to discharge effluent via the marine outfalls, with Spike (2015: online) writing, "You may recall a small advert in the *Weekend Argus* newspaper 13 days ago. The process runs from 1 June to 10 July." The public and stakeholders were invited to submit their comments through an online form on the CoCT's website or to e-mail Kevin Sampson (Manager for the Wastewater, Water, and Sanitation Department) directly.

Handwritten in the application, Sampson provided cut and dry answers of "no" and "none" to questions such as: "Do alternatives exist other than to discharge the effluent into the coastal environment?" (Spike, 2015: online) and "If alternatives to discharge exist, please provide details" (Spike, 2015: online). The CoCT was quoted as saying that "no feasibility reports have been commissioned to explore other options" and that alternative technology would "likely cost tens of millions of rands" (Harrison, 2015: online). It was apparent that the CoCT had not explored any alternatives and was unable to show proof of due diligence with regards to research and costing alternatives, apparently choosing the cheap and easy option over considerations of public and environmental safety. A recent paper by Overy (forthcoming) investigates the history of the Green Point outfall and shows that, despite City planners and engineers consistently choosing the outfalls as the most affordable method of sewage disposal, this is not necessarily the case.

As Spike (2015) notes in his article, "Public comment has been fierce. People are angry." Among those who commented and were troubled that the DEA would renew the permits was

the Greater Cape Town Civic Alliance, “an umbrella body of 160 civic, environmental, ratepayer and resident groups” (Gosling, 2015:online). According to reports, the CoCT received 507 comments, 115 emails and a petition with 2 051 signatures but stated they did not include the petition in their initial count as they were waiting on advice from the DEA on how it “should be considered and weighted” (“How we Are Soiling...”, 2016). A full year later, no announcement had yet been made by the City about either the permit application or what had become of the public participation process.

The Blue Flag program and its awards have come under scrutiny in the past few years, with several studies describing it as “greenwashing” and researchers critiquing it as a marketing tool for beaches rather than a reliable indicator of beach and water quality (Dimitrova 2013; Lucrezi, Saayman & Van der Merwe 2015).² One of the most important shortcomings of the Blue Flag methodology that these studies have brought to light is the infrequency of beach water sampling, which is required only weekly or fortnightly and allows for selective sampling in the context of the daily changes, fluctuations and flows of the ocean in relation to the weather.

Despite the controversy and concern surrounding the Blue Flag program, its capacity to promote tourism makes it valuable to beach managers, politicians and governments. The South African government and local municipalities in particular place a great deal of importance on the retention and expansion of Blue Flag beaches, and officials often commend the program for helping to promote tourism, with the DEA, for example, announcing in 2008 that “Research has shown that the commitment of municipalities to Blue Flag results in sound economic success”(Department of Environmental Affairs, 2008: online). Tourism in the Western Cape accounts for 9.8% of the provincial gross domestic product (the total value of goods and services produced) (Griffiths, pers. comm., 10 July 2015). Cape Town’s top tourist attractions are also often proclaimed to be its Blue Flag beaches, which are marketed as clean beaches with excellent sea water quality. The DEA, Ministry of Tourism and local governments have all consistently advocated their support for the Blue Flag program, which they believe has helped achieve economic success and increase

² Dimitrova (2013) studied the Bulgarian Black Sea, while Lucrezi, Saayman and Van der Merwe (2015: 212) investigated the standards and requirements for bathing water quality that the Blue Flag program requires.

tourism and “as an environmental program has significant benefits in terms of improved environmental management of our coastline” (Department of Environmental Affairs, 2008).

On 10 July 2015, Morgan Griffiths, the WESSA Environmental Governance Programme Manager, responded to the call for public input on the permit renewal, writing that “WESSA is deeply concerned about the continuing impact of the discharge of this effluent, particularly its potential impacts on the CoCT’s Blue Flag status beaches” (Griffiths, pers. comm., 10 July 2015). Griffiths highlighted three Blue Flag criteria he feared could harm the CoCT’s ability to retain its Blue Flag status for beaches in close proximity to the outfalls.

The first of his concerns was that “The growth of the urban catchment areas that funnel into these outfalls are growing steadily, and the marine environment will not be able to continue to accept increasing volumes of sewage without leading to significant marine pollution” (Griffiths, pers. comm., 10 July 2015). He acknowledged Tresfon’s photographs and related anecdotal evidence suggesting that the outfalls were reaching the tipping point and should be seen as a warning by the CoCT that a much greater problem would arise should things remain unchecked. He continued that “The numerous testimonials of water users in the areas around these outfalls noting smells, floating sewage-related solids/wastes and that of infections resulting from this pollution is cause for alarm” (Griffiths, pers. comm., 10 July 2015).

He also warned the CoCT of national legislation, notably the precautionary principle as prescribed in NEMA, which states that in cases of scientific uncertainty, caution must be exercised. Griffiths noted the particular need to apply this principle, as “these outfalls were commissioned in the decades previous, it could not be expected of the engineers to anticipate the sheer number, complexity and toxicity of chemicals that are now readily disposed, both legally and illegally, into these sewerage systems” (pers. comm., 10 July 2015). Griffiths highlighted the feminisation of fish and the advances and changes in society that could potentially reflect new and worrisome impacts, such as the increased use of various household chemicals that would not have been present when outfalls were first put into place. Treating the renewal of the permit as a mere technicality does not adequately address the advancements and changes of recent years.

Finally, Griffiths drew attention to the first-hand experience of various water users as proof that the filters are working insufficiently and that the efficacy and appropriateness of the

outfalls must be reconsidered, describing the issues relating to perceived contamination of the environment and the effects on Durban's beaches and tourism industry in 2009. In conclusion, the letter encouraged the CoCT to reconsider its bid to continue to discharge inadequately treated sewage from the three outfalls "because it is simply cheap and convenient to do so" (Griffiths, pers. comm., 10 July 2015).

Dr. Jo Barnes

Dr. Jo Barnes is another concerned citizen who has spoken out about the sewage outfalls and responded in writing to the public participation process. Barnes has a rich history of working on issues related to water quality, sewage and sewage plants (Sagar, 2020a). While her letter addresses many of her scientific concerns, they are expressed simply and can be understood by the layperson and general public.

Barnes' letter details five important concerns. Firstly, she addresses the fact that the outfalls are utilised under the assumption that "The solution to pollution is dilution" (Barnes, pers. comm., 5 July 2015). This approach, says Barnes, is archaic and unscientific, and she notes that "The heavy reliance on dilution ignores the fact that continuous discharge will have an accumulative effect on a semi-restricted body of water such as Table Bay" (Barnes, pers. comm., 5 July 2015). In a visual presentation to the Camps Bay Ratepayers Association (CBRA) at their 2015 AGM, Barnes showed why this assumption does not always hold true, using one of Jean Tresfon's photographs to show the effluent plume bubbling to the surface (Fig. 7). She also showed how the outfall should work with the usage of a schematic representation from Sharon Beder's work titled *The "Science" and the "Metaphysics" of Submarine Outfalls* (1989:260). The pictures depict the sewage trapped below a thermocline, but also showed that the effluent can make its way through the water column to the surface, thus not diluting (Fig. 8).



Figure 7: Sewage in Camps Bay making its way to the surface (Tresfon, 2015).

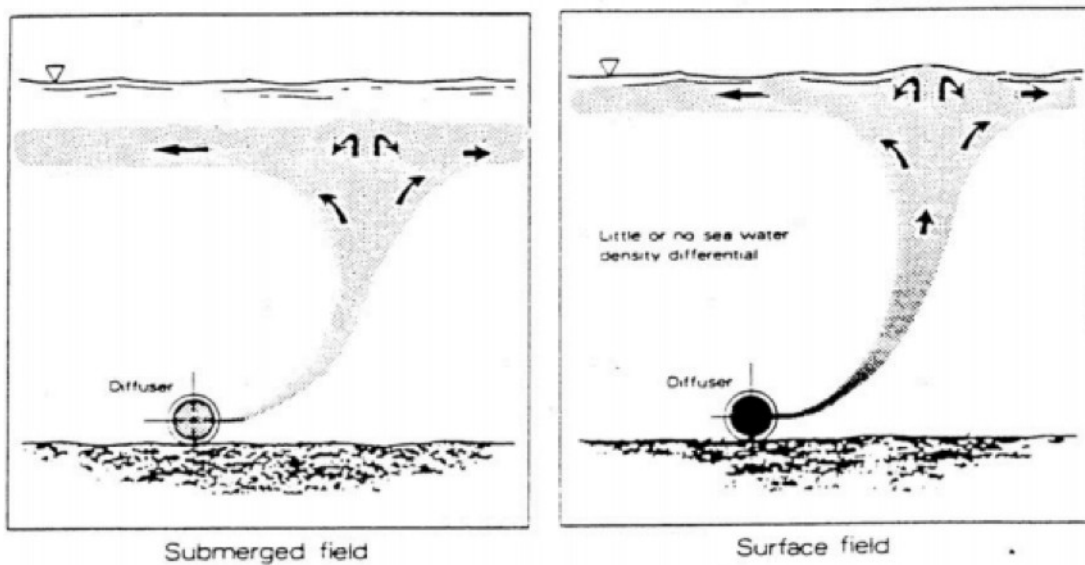


Figure 8: Schematic representation of submarine outfall (Beder, 1989: 260).

Secondly, Barnes explains the difference between and issues of relying on *E. coli* and *Enterococcus* as indicator organisms to test for microbial pollution. Barnes points out that “The reliance on *E. coli* and *Enterococcus* to assess ineffective potential of contaminated seawater is thus guaranteed to severely underestimate the health risks “ (Barnes, pers. comm., 5 July 2015), explaining that “pathogens do not occur homogeneously in a water body but

clump together on other particles such as fat globules where they are somewhat protected. This clumping may make the ingestion of an infectious dose much easier to occur” (Barnes, pers. comm., 5 July 2015). Barnes urges the DEA to carefully consider the standards and limits they set should they grant the permit, because “The only water quality guidelines (please note – not enforceable limits) in force in South Africa have been under revision by the Department of Water and Sanitation since the 1990s” (pers. comm., 5 July 2015). Barnes elaborates her concern about the effects of the components of the sewage, writing, “There are numerous compounds present in sewage that were not of concern two decades ago when these outfall sewers were designed and built”, further noting that “these are often generally referred to as ‘contaminates of emerging concern’ (CECs), because of the risk to human health and the environment associated with their presence” (pers. comm., 5 July 2015). These compounds are found in “caffeine, hormones, over the counter medicine” (Barnes, pers. comm., 5 July 2015), and contaminants can be linked to the development of antibiotic resistance, thus impacting local hospitals and clinics. Barnes urges that careful attention be paid to how the chemical components in sewage have changed and how this could impact communities and people, quoting the World Water Council’s 2012 *Wastewater Management: A UN Analytical Brief*, which states that “dirty water is a key factor in the rise of de-oxygenated dead zones that have been emerging in the seas and oceans across the globe” (in Barnes, pers. comm., 5 July 2015).

Barnes also draws attention to the current method of detailing and tallying up the results of the mandated tests to determine the pollution levels of the ocean and sewage outfalls, which she has elaborated on in presentations and at press events. The current method leads to what Barnes explains as “smoothed mean values”, because the CoCT records the values of their results through the use of a geometric mean, and Barnes notes that “The risk lies at the peak values, and smoothing them out (as the City of Cape Town regularly does when releasing test results) presents a serious underestimation of the risks” (Barnes, pers. comm., 5 July 2015). Unlike finding the regular mean or average of a data set, which sums up the data and divides it by the number of entries, the average mean is calculated by multiplying each value and then calculating the root value of the respective total.

The mathematical equation is represented as $(\sqrt[4]{\#x\#x\#x\#})$, where x represents the data point for each variable and the number 4 represents the total number of variable data points. This difference in calculating the average can dramatically impact the outcome and analysis of a situation by normalising differently ranged values. Barnes used the example from Sharon Beder's work (1991) of Sydney's outfall pollution data. Barnes explains this method at the CBRA AGM in 2015, showing the difference between calculating the geometric mean versus the actual mean of the samples collected (Fig. 9). In the example from Sydney, the difference is that of failing or passing the allowable water quality measurement.

Beach pollution monitoring results

Differences between the Water Board and Department of Health—summer 1988-89

	Department of Health			Sydney Water Board		
Months	Bondi	Tamarama	Bronte	Bondi	Tamarama	Bronte
Oct-Nov 88	37.5% fail	25% fail	25% fail	all pass	all pass	all pass
Dec 88	67.5% fail	100% fail	67.5% fail	all pass	all pass	all pass
Jan 89	25% fail	50% fail	25% fail	all pass	all pass	all pass
Feb 89	50% fail	50% fail	50% fail	all pass	all pass	all pass

Information from: Memo to Town Clerk from Municipal Health Surveyor. Waverley Municipal officer, 20/3/89.

Figure 9: Differences in beach pollution-monitoring calculations (Beder, 1991: 237).

Barnes also used the smoothed means to draw attention to the shortcomings of relying on the limited recorded cases of people getting sick as a result of the outfall, noting that “the symptoms may only appear hours or even days after infection” (Barnes, pers. comm., 5 July 2015). A lack of reports of illness attributed to polluted water should thus not be a factor when deciding whether it is appropriate to continue discharging sewage in this manner.

Barnes also finds issue with the data supplied to the public by the CoCT in terms of their lack of information about day-to-day monitoring operations of the marine outfalls and the overall validity of this monitoring. Barnes had previously been asked by the CoCT to measure *E.coli* levels in the stormwater outfalls, which she measured in the millions per 100 ml (Barnes,

pers. comm., 5 July 2015). When compared to the maximum anticipated discharged concentrations listed in the permit application – 2 150 organisms per 100 ml for Green Point and 3 000 organisms per 100 ml for Camps Bay – the anticipated raw sewage was set to be orders of magnitude lower than that in most rivers in the Cape Town metropolitan area (Barnes, pers. comm., 5 July 2015). While it is entirely likely that Cape Town’s rivers are polluted, Barnes found it hardly credible that the accumulation of almost half the City’s raw sewage should show a significantly lower amount of contamination than the rivers (Barnes, pers. comm., 5 July 2015).

Finally, Barnes calls into question the real value of the public participation process, citing her own experiences with municipal engineers and staff, who showed little concern or regard for consequences should minimum required standards not be met (Barnes, pers. comm., 5 July 2015). Barnes calls into question the efficacy of the public participation process, because there is no alternative plan to deal with the City’s sewage should the permits not be granted.

Professor Leslie Petrik

Professor Leslie Petrik has been another vocal critic of the marine effluent outfalls, responding in writing to the call for public input on the permit application and conducting research on the impact of the outfalls, such as testing her collections of various marine species in 2015, 2017 and 2019 for different collections of chemicals (Petrik et al., 2017; Ojemaye & Petrik, 2019). Petrik has also been quoted in the media, including *EWN* (Harrison, 2015), *TimesLIVE* (Chambers, 2017) and the *Cape Argus* (Lewis, 2015). In a front-page article in the *Cape Argus*, Petrik explains that “we’re at a situation where we’ve got 87 000 different chemical compounds that have not been tested for endocrine disruptions ... They are potent carcinogens and could cause birth defects and genetic abnormalities” (in Lewis, 2015: online). She has elaborated on these concerns in other media as well: in radio interviews with Cape Talk (Ramphela, 2019), giving presentations at the CBRA AGM in 2019 and in the *Bay of Sewage* documentary (2016).

Petrik has been vocal about her concerns about persistent organic pollutants (PoPs) and their harmful effects, particularly in the case of marine effluent outfalls. PoPs are defined by the World Health Organisation (2020: online) as “chemicals of global concern due to their potential for long-range transport, persistence in the environment, ability to bio-magnify and

bio-accumulate in ecosystems, as well as their significant negative effects on human health and the environment.” Petrik is concerned that there are “87 000 chemical compounds being used routinely in modern life which have not been monitored for nor tested for their endocrine disrupting or carcinogenic capacity” (Petrik, pers. comm., n.d.), most commonly found in “detergents, disinfectants, antiseptics, shampoo, toothpaste, deodorants, dyes, pesticides like poison or flea shampoo, paint, medications...” (Petrik, pers. comm., n.d.).

Petrik and her team conducted a study in 2015 in which she collected various marine organisms and tested for some of the most common PoPs, finding every compound they tested for at “concentrations many times higher than the background level in the organism’s tissue” (Petrik, pers. comm., n.d.). In her response to the public participation process, Petrik raised her concerns about the increased use of toxic chemicals, medications, pesticides, detergents, etc. and the number of people using them. Through her previous research and her rich expertise in the field, Petrik has shared her knowledge and concerns about the possible effects of these PoPs on the environment, writing:

The City is not even monitoring or measuring what chemical compounds are in the untreated sewage being pumped into the ocean. The only PoP compound on the permit application is phenol and it is marked as N/A (not applicable). The permit application also does not have an environmental impact assessment attached to it. (Petrik, pers. comm., n.d.)

The lack of knowledge about whether or not PoPs were considered or studied before the permit application was thus unknown to those commenting on the permit application, but greater transparency on the inclusion of such chemicals could have drastically changed, guided and informed public response.

After months of silence from the CoCT about their permit application and the results of the public participation process, people began to grow concerned. In 2015, the CoCT appointed the CSIR to conduct a long-term study of the situation (Hirsch, 2017), reasoning in part that the responses and inputs of the participation process were not considered to be scientific enough or to have adequate scientific grounding (Etheridge, 2016). Although some responses, such as the petition, did not include a full scientific analysis of their concerns, many were written by concerned professionals who included their causes for concern. Many

of these people were and are advocates on this issue and some even shared their professional insights and relevant scientific data with the public to encourage educated, informed decisions and to contribute to the public participation process.

While the CSIR was conducting their study, the CBRA commissioned a documentary to disseminate local expert knowledge and concern about the outfall to the public. Various professionals explained their concerns in the documentary *Bay of Sewage*, which was posted to YouTube on 30 November 2016 .

The Documentary

Directed by Cape Town resident Mark Jackson, the *Bay of Sewage* documentary (2016) was funded by the CBRA to raise concerns about the sewage outfalls. The film begins with aerial footage of Green Point from November 2016, with the distinctly different-coloured cloud of water not far from the shoreline circled, as the distinctive sounds of a toilet flushing is heard in the background. The opening lines of the film are “The problem: We are pumping millions of litres of untreated effluent into our sea daily. It is killing our coastline and starting to harm us.”

The film provides interviews and discussions with the three specialists in their respective fields, with each providing insights into the issues they detailed in their submissions to the public participation process and providing insight from their personal experiences and previous research pertaining to the outfalls and their possible effects. The documentary also references a revolutionary study from Sydney (1992) that Barnes refers to, which determined that viruses can survive in seawater for up to six months and can travel up to 5 km when attached to grease (Jackson, 2016). The documentary also uses images and data from the CoCT to reinforce the professional insights of the experts.

On 7 December 2016, the CoCT publicly denounced the documentary as being factually incorrect and harmful to the public referendum. Mark Jackson, Jean Tresfon (considered a presenter by the CoCT in the film) and the heads of the CBRA were served in their personal capacity with a cease and desist letter on 21 December on behalf of the City’s Utilities and Environmental Directorate. The letter begins, “The said film contains numerous allegations pertaining to the marine wastewater outfall pipe at Camps Bay which is owned and operated

by the City of Cape Town, many of which are false, misleading and inaccurate” (CoCT, pers.comm. with Tresfon et al., 21 December 2016). The letter lists points in the film deemed to be inaccurate or false and demands that the documentary be taken down.

Some of the arguments expressed in the letter include, but are not limited to, references to Tresfon’s footage of the effluent plume, stating, for example, that “at 1:20 in the video Mr Tresfon alleges that he saw the plume from the outfall extending all the way to the beach. This is misleading and unfounded. What is shown in the film is not a sewage plume. The City suspects that the image shown may have been digitally enhanced and its rights in this regard are reserved” (CoCT, pers. comm. with Tresfon et al., 21 December 2016).

Tresfon steadfastly denies digitally enhancing his photos beyond zooming in on them and has offered the CoCT and other doubters a copy of his raw image files (Spike, 2015). Asserting that Tresfon may have altered his photograph instead of expressing concern that his images may be indicative of a serious issue set the tone for the CoCT’s response to the film as a whole. The CoCT also denounced the professional insights provided by Dr Barnes and Professor Petrik, commenting that many of their statements were “false and misleading, which is not scientifically substantiated anywhere in the film” (CoCT, pers. comm. with Tresfon et al., 21 December 2016). They are criticised for not producing their research in the video, thereby invalidating their claims in the eyes of the CoCT, making them misleading and harmful. For example, the CoCT found Barnes’ statement about a saturation point problematic, misleading and inaccurate, responding that “bacteria and viruses do not accumulate indefinitely in seawater but die in a short period of time. Accumulation is furthermore inhibited by the vastness of the ocean and the fact that it is not stagnant” (CoCT, pers. comm. with Tresfon et al., 21 December 2016).

There are a few issues here. Firstly, that the CoCT reprimands those in the documentary for not providing scientific data yet does the same in the letter served to the respondents. Furthermore, the interviewees did not discuss specific studies in the documentary but responded to questions as experts in their fields to offer insights based on years of accumulated research.

The CoCT itself admits that the ocean is not stagnant, which is a fact that Tresfon, Dr Barnes and Prof. Petrik agree on. The issues the documentary brings to light are based on this

characteristic of the ocean as not stagnant: when effluent is released into the ocean, it mixes with and moves in the environment and can be windswept towards shore, causing harmful effects to water users, beachgoers and marine life in general.

In the public statement the CoCT released about the film, they state that the video “provides no substantive data or measurable science to support its extensive claims” (CoCT, 2016), and they denounce the experts’ conclusions and concerns, because the CoCT has been monitoring the outfalls: “Camps Bay and Clifton, both beaches have successfully retained Blue Flag status over many years. This would not be possible were the outfalls having any substantial impact on our inshore water quality” (CoCT, 2016). According to Blue Flag requirements, however, beaches only have to be tested bimonthly for *E.coli* and *Enterococcus* microbial testing (Blue Flag, 2020: 8). The CoCT also state that they conduct their own testing and that “in accordance with international and national practice, water samples are collected and measured for *E. coli* and enterococci” (CoCT, 2016).

The CoCT further states that “The City is confident that this CSIR analysis will demonstrate once and for all that the marine outfalls are not impacting on Camps Bay in any manner to the extent as suggested by Mr Jean Tresfon in the documentary” (CoCT, 2016). An issue here is that the CSIR study (which sought to determine if the outfalls were responsible for any negative impact on the seawater quality and whether they posed a risk to human health or not) that the CoCT is referring to is based on a study that had not been completed at the time. The CoCT’s primary issue with the *Bay of Sewage* documentary seems to be that the featured experts did not provide proof for their statements, but the CoCT in turn offered no proof for their own statements. The way in which the CoCT responded to the documentary well illustrates the critiques of scholars of post-truthism. Lee McIntyre, author of the book *Post Truth* (2018), explains that post truthism is a tool used to create doubt. Through manufacturing doubt for example on the validity of Jean Tresfon's footage, or of independent and respected scientists, facts can then be questioned, and the lines of truth and fact become blurred. Evidence, proof and the validity of both when presented by different people or sectors must be carefully considered.

Controversy over the issue, through the documentary as well as the adamant denial of the CoCT, only fueled the public’s desire to establish the facts, and many were eager to finally see the results of the extensive CSIR report, which was expected to establish some definitive answers and settle the

controversy for good. Byron Herbert, head of the CBRA, noted in the *Atlantic Sun* in August 2017 that the CoCT had still not released the much-anticipated report to the public, despite stating it would be released “soon” since December of the previous year and having had it since January.

Desalination Warning

In August 2017, I conducted a study with Leslie Petrik and her team to test for some of the most prevalent PoPs in various marine organisms in the Three Anchor Bay area. This study was intended to determine whether the outfalls were the cause of pollution in the bay and whether the forthcoming proposals for a desalination plant in the area should be affected by the water quality. Cape Town’s drought and water crisis peaked in mid-2017 and continued to be a critical concern throughout the first half of the following year. The government’s proposal for a desalination plant, originally near Three Anchor Bay and later relocated to the V&A Waterfront, caused much concern for those questioning the effects of the marine effluent outfalls and the ability of the desalination plant to produce clean drinking water for residents, particularly because of the chemical and microbial load and make-up of the effluent. Our research determined that all fourteen of the different commonly used PoPs we tested for were present in the six marine species we tested. We concluded that the outfalls were polluting the environment, as they were the only route by which the chemicals found in pharmaceuticals, household detergents, etc. could have entered the marine environment.

We published our research at the end of November 2017 in the highly accredited *South African Journal of Science*. In our paper, we also determined that the desalination plant should not be placed near Three Anchor Bay or any of the outfalls given the receiving water quality and the desalination plant’s inability to monitor and remove the chemicals we found, as well as any others we had not tested for.

CSIR Report

The 24-month-long CSIR study, initially intended as a year-long study, was finally released around the same time that we released our study. The Council for Scientific and Industrial Research was established in 1945 and is overseen by the Department of Science and Technology, which funds 30% of the council’s budget. It “plays a key role in supporting public and private sectors through directed research that is aligned with the country’s priorities, the organisation’s mandate and its science, engineering and technology competences” (Council for Scientific and Industrial Research (CSIR), 2015: online). The CSIR report was some 250 pages long and was accompanied by a

media summary used to disseminate the information and research gathered to the public. The official media summary, presented by Councillor Xanthea Limberg, Mayoral Committee Member for Informal Settlements, Water and Waste Services, claimed that:

A study by the Centre for Scientific and Industrial Research (CSIR) into the City's sea marine outfalls has confirmed that they pose no significant risk to human health and do not measurably affect inshore water quality or the wider environment ... Given the often negative and sensationalist coverage around these outfalls, we are happy to have conclusive proof that disposing of waste in this way is not posing significant risks to bathers or the marine environment. (CoCT, 2017b: online)

Contrary to the CoCT's claim that the CSIR (2017) report would alleviate concerns about the outfall, the long-anticipated report did little to deter speculation and worry, and, in combination with our published study, heightened concerns about Cape Town's water and the effects of the outfall on desalination (discussed in more detail in Chapter 3), as well as legitimate concerns about various issues with the CSIR report as a whole. Questions about the validity of the report only fuelled tensions over evidence and proof of what the actual impact and effects of the outfall are.

The official response from the CoCT remained that "sewage outfalls' contribution was not discernible from background pollution" (Kotze, 2019: online). Despite evidence provided by Petrik and her team, such as research into various chemical compounds found in fish off Fish Hoek Beach (Ojemaye & Petrik, 2019), and the issues that the desalination plant had in Cape Town, the CoCT maintained their denial of any issues and their support of the CSIR report. The issue is not the problematic nature of the CSIR report as a whole that people, academics, researchers and experts were beginning to question, but rather the question of what constitutes valid evidence. What role do concerned citizens and independent scientists have in understanding their environment, and how do we decide whose forms of knowing or understanding a problem or a lack thereof, are reliable and valid? Questions surrounding the CSIR report, independent scientists' own work, and visual as well as lived experiences are all discussed in the following chapter. Issues about what is credible and issues around the politicisation and managerial aspects of science must still be fully understood to determine why controversy persists: whose science is correct, and how we decide what proof is sufficient to make use of going forward, in a lived reality as well as in the eyes of the law.

Chapter 2: Questioning data

Introduction: A Summary of the CSIR Report Data

The much anticipated CSIR report was released to the public in November 2017, accompanied by a three-page media release by the CoCT (2017a) whose headline proclaimed “CSIR Confirms Sewage Outfalls Pose No Significant Risks”. Although it had been the subject of a Public Access to Information Act request by the Camps Bay Ratepayers Association since May 2017, the report was only made public the week prior to publication of Petrik et al.’s (2017) independent study on 21 November 2017 in the *South African Journal of Science (SAJS)*. Significantly, around the same time filmmaker Mark Jackson had met and interviewed the then Premier of the Western Cape, Helen Zille, about these issues and raised concerns about why the CSIR report had still not been released, noting that the Petrik et al. study was forthcoming in the *SAJS*. The report was finally released shortly after this meeting, although the cover date stated “JUNE 2017”. Over time, the CSIR report became the single most important source of evidence used by the CoCT to contest and dismiss adverse journalism and independent academic research about the Cape Town marine outfalls. Despite carefully calibrated statements about its frame of reference and the adverse findings, how it was presented to the public constitutes an important moment in the history of Cape Town’s historical struggles over the outfalls. In this chapter, I argue that it reflects the broader global moment known as “post-truthism”, in which scientific research is manipulated to suit a particular argument made by a political incumbent.

In what follows, I interrogate how the CoCT has used the CSIR report to create a specific narrative about the marine outfalls. In-depth analysis of the report and comparison with the CoCT’s media statement reveals a disjuncture between what is being said, reported and presented to the public, made more apparent when read in relation to additional concerns and problematic factors about the report and how it was presented. The biggest issue is that the CoCT’s media release (CoCT, 2017a) summarises the findings, concerns and conclusions of the report’s 250-odd pages in only three pages, but the report itself also contains issues that bear further investigation.

To begin, I provide an overview of the summary of the report and the issues, comments and limitations expressed in the Lwandle Technologies peer review of the report, which is

discussed in conjunction with the information, data and limitations of the CSIR report. Lwandle Technologies, who provide project management solutions and marine environmental consultancy services, were appointed by the CoCT after a tender process to peer review the CSIR report. The key findings and concerns are discussed in terms of their correlation to the CoCT's media summary, and issues with how the science was conducted, disseminated and politicised are also addressed.

Purposes of the Report

In order to fully understand the issues, it is necessary to understand the purpose and aims of the CSIR report. The CoCT cites four different purposes the research aimed to fulfil. Firstly, the objective was for the CoCT to provide the Department of Environmental Affairs (DEA) with a comprehensive report that would allow the DEA to make a final decision about the CoCT's application for a new coastal use discharge permit. Secondly, the study helped the CoCT fulfil its current permit requirement to assess the impact of the discharge on the ecology of the marine receiving environment. Thirdly, the report was conducted to help managers of the Green Point, Camps Bay and Hout Bay wastewater works by providing insight and information to manage the discharges. Finally, the report was commissioned "to inform the public of the status (or health) of the marine receiving environment" (CSIR, 2017: 9). In the forthcoming section, I explore and briefly outline some of the key findings discussed in the CSIR report.

A Brief Outline of the CSIR Findings

The CSIR report is comprised of seven chapters: General Introduction (Chapter 1); Effluent Characteristics (Chapter 2); Effluent Toxicity (Chapter 3); Seawater Quality (Chapter 4); Sediment Quality (Chapter 5); Concentrations and Human Health Risks Posed by Chemicals in the Tissue of Black Mussels and West Coast Rock Lobsters (Chapter 6); and a Conclusion (Chapter 7).

The conclusion states that the CSIR scientists are "of the opinion that no immediate ecological disaster is imminent as a result of effluent discharge through Cape Town's marine effluent outfalls" (CSIR, 2017: 224), but they remain concerned about the possible effects of this practice, noting that it is "illogical and indeed irresponsible to imply that the effluent discharged through the outfalls is not impacting on the marine receiving environments or

posing a potential human health risk” (CSIR, 2017: 224). The conclusion also summarises five of the main research findings.

The first conclusive finding of the report is that “it would appear most effluent constituents are likely to be diluted in the marine receiving environments to concentrations protective of direct plume effects to marine fauna and flora shortly after discharge (i.e. within a small distance of points of effluent discharge)” (CSIR, 2017: 224).

However, they also found that this is not necessarily the case for ammonia and total suspended solids, which:

require much greater dilution to meet water quality targets than other effluent constituents, and under calm conditions and high concentrations, the effluents might not be effectively diluted in the marine receiving environments such that water quality targets are met at the margin of the zone of initial dilution. (CSIR, 2017: 224)

After collecting seawater samples in the effluent plume at the sea surface and conducting toxicity testing on the water, the CSIR also concluded that only one incidence returned a low magnitude of toxicity, from a sample drawn from the greater vicinity of the outfalls (CSIR, 2017: 224). The report thus concludes that “most contaminants in the effluent are likely to be sufficiently diluted shortly after discharge to limit the incidence of acute toxicity” (CSIR, 2017: 225).

The third conclusion of the study is that “there also appears to be no significant acute toxic risk posed by chemical concentrations in sediment in the Table Bay, Camps Bay and Hout Bay area ... There has been no significant accumulation of effluent-derived contaminant in sediment with time” (CSIR, 2017: 225).

Fourth, the report did not find an accumulation of “effluent-derived contaminants in their tissue, at least not to concentrations that could be discriminated from concentrations in mussels and rock lobsters collected at ‘clean’ sites” (CSIR, 2017: 225).

Finally, the report concludes that

The measurement of faecal indicator bacteria in surface seawater samples collected in the greater vicinity of the outfalls provided clear evidence of effluent reaching the sea surface in some surveys, but there was no clear evidence the bacteria (and thus presumably other effluent constituents) were reaching the shoreline. (CSIR, 2017: 225)

The report does note, however that “effluent is possibly, even if infrequently, reaching the shoreline” (CSIR, 2017: 225), with uncertainty about the source of the faecal indicator bacteria at the shoreline a result of the researchers’ inability to definitively conclude whether it was a result of urban runoff or the sewage outfalls. The report thus concludes that

These uncertainties make it difficult to estimate the risk posed by effluent discharge to the health of recreational users of nearshore and shoreline waters and represents perhaps the most important uncertainty that should be addressed through further research and monitoring. Regardless of the source of the bacteria, their counts in the shoreline water samples at many sites were at varying frequencies depending on the site, high enough to suggest a significant periodic risk to humans recreationally using nearshore and shoreline waters. (CSIR, 2017: 225)

In the section that follows, I discuss the above-mentioned findings, as well as the data, findings and other conclusions of the CSIR report, in relation to the findings and limitations of the Lwandle peer-reviewed report, arranged by the main themes. When applicable, I also include observations from independent academics and the public. Finally, I compare these findings and limitations to the CoCT’s media summary of the CSIR report, looking at the methodology, issues relating to urban runoff and discussions about human health. I also consider the limitations of the CSIR study, which include the human-centric viewpoint that disregards frequent water users and their concerns and a lack of consideration for the future effects of a new water use discharge permit and desalination. Finally, I compare these findings to the CoCT’s media summary and consider how my findings relate to the information and overall intention of that summary.

Analytical Questions

A significant concern raised by the Lwandle review of the CSIR report is “the lack of specification of who conducted effluent samples analysis and accreditation” (Lwandle

Technologies, 2017: 5). This is of concern because the report was paid for by the CoCT to support their own application to the DEA and the Blue Flag beach ratings upon which much of the local tourism industry depends. It is therefore troubling that there is no transparency about the methods and laboratories used nor details about the transportation of the samples to the laboratories.

A term of reference sets out how research will be conducted and includes a definition and description of the roles and responsibilities of the various consultants in the team to provide a clear outline of how the evaluation will be conducted. It is an essential tool for any scientific study, and in this instance should have specified the level of the CoCT's involvement with the report to establish that there was no undue interference in its findings. However, there are no terms of reference in the CSIR report, and their absence makes it difficult to assess whether this really was an independent study or not. Their absence calls into question *who* conducted the sample analysis, *how* the sampling was conducted and *why* there was no sampling plan.

The Lwandle report also questions why the CSIR report did not adequately reference the analytical methods used or their accreditation, using as an example the lack of information about the laboratories that conducted the analysis, which would include whether or not the laboratory was accredited in terms of the South African National Accreditation System (SANS) and other details of the laboratories (Lwandle Technologies, 2017: 3). After Lwandle Technologies reviewed the report, it is evident that the report was amended and a revised version of the report was released to the public. The CSIR addressed this methodological gap in the revised version of the report under the section "Laboratory Analysis" (CSIR, 2017: 11), which reported that some of the samples were analysed at the CSIR laboratories in Stellenbosch and Durban, while other samples were analysed by the Eurofins/Omegam laboratory in the Netherlands. No explanation is offered as to why a laboratory in the Netherlands was used, which is problematic considering how long it takes to fly samples there. Petrik (pers. comm., 25 May 2020) notes that it would be a poor reflection of CSIR's capabilities if they were not able to develop their own testing protocols and also raises concern that the methodology for extraction and analysis of the chemical samples was not specified. Petrik further observes that:

[An] interesting point here is that the city sent samples to the Netherlands to detect and quantify the chemical compounds in the sewage that was sampled at the pump station, but then never quantified those same compounds in the seawater to calculate dilution factors, nor in the marine biota to determine bioaccumulation potential. (Petrik, pers. comm., 25 May 2020)

In a letter to Anton Bredell, provincial Minister of Local Government, Environmental Affairs and Development Planning, Leslie Petrik, Lesley Green and Jo Barnes raised their concerns about the CSIR report, noting that the “CSIR also seem to have measured or reported wet weight of tissues, which would significantly reduce the concentration of contaminants measured in tissue, since tissue is >80% water. A dry weight sample would have much higher values of a contaminant” (Petrik, pers. comm., 25 June 2020). Wet weight recording arguably creates “a degree of bias” that is biased low (Environmental Chemistry Consulting Services, 2011).

The Lwandle review also questions the assumptions made by the CSIR about the “initial dilutions used for determining probable compliance/non-compliance with water quality guidelines in the receiving environment”, as assumptions made in this case will ultimately affect choices about effluent dilution rates and their consequences (Lwandle Technologies, 2017: 3). It is critical to ensure that these dilutions were based on evidence derived from data and reliable estimates rather than speculation, as their absence allows for the possibility that the science was manipulated to suit a pre-determined outcome.

Lwandle expressed concern about the report’s first finding, writing that:

Ammonia and total suspended solids require much greater dilution to meet water quality targets than other constituents, and under calm conditions are unlikely to be effectively diluted in the receiving environments such that water quality targets are met at the margin of the zone of initial dilution. (Lwandle Technologies, 2017: 10)

The inadequacy of the dilution is a cause for concern that highlights the probability that the marine outfalls are not functioning adequately or effectively. The marine outfalls were designed to release the effluent from a pipeline onto the ocean floor via a series of diffuser points (CoCT, 2018a: 40) so that wave action and ocean energy disperse the effluent into the

marine receiving environment, dissipating below a thermocline before reaching the surface, where it should be invisible because it is diluted (CoCT, 2018a: 40).³ The issue raised by the Lwandle report, however, is that this does not apply to ammonia and total suspended solids, which require a higher rate of dilution than the outfall and its environment provide (CSIR, 2017: 39). The US Environmental Protection Agency (EPA) (n.d.b) warns that a high level of ammonia in water “causes direct toxic effects on aquatic life”, and on the Water Research Centre website online, Brian Oram (2020) writes that “ammonia toxicity is thought to be one of the main causes of unexplained losses in fish hatcheries”. There is thus conclusive evidence in the CSIR report that the outfall does not function as intended, as it does not effectively dilute the sewage to the extent that it dissipates and disappears.

Raw Data and Citizen Science

Most technical reports do not necessarily include raw data in the final report, and the CoCT’s CSIR report is no exception. To better examine and understand the report’s findings, then, the Camps Bay Ratepayers Association (CBRA) requested a copy of the raw data. On behalf of the CBRA, chemistry specialist and consultant Claire Taylor volunteered to help the CBRA go through the data and highlighted concerns about the report and its raw data, particularly methodological issues such as the absence of terms of reference or adequate sampling plans.⁴

Taylor noted that the CSIR report does not state the “depth of sampling for the water samples” (Taylor, pers. comm. with Byron Herbert, 18 March 2019), which is a concern because “there can be an accumulation of sediment from sewage which does not rise above the thermocline in the water. It would spread out like a cloud and rain solids down on the ocean floor” (Taylor, pers. comm. with Herbert, 18 March 2019). Samples taken above the thermocline may thus bear no relation to pollutants that exist at deeper levels.

Taylor also questioned the sampling plan, as the samples seemed to her to have been taken in a random way with erratic frequency and left many questions unanswered (Taylor, pers. comm. with Herbert, 18 March 2019). Taylor was also concerned that the physical

³ According to the National Ocean Service (2019), a thermocline is “a transition layer between warmer mixed water at the ocean’s surface and cooler deep water below”.

⁴ Taylor received her Master’s in Analytical Chemical at the University of Stellenbosch and completed her Doctorate in Analytical Chemistry in Singapore in 2016. She currently lends her skills to various organisations as a consultant.

characteristics of the sea water were not recorded when the sample was taken, as is typically done. In fact, Taylor notes that the sampling and analysis plan for water quality monitoring supplied with the raw data files specifies that “Observations and fieldwork records should be recorded on the field data sheet attached to this document – this should be completed for each station”, but it is evident that this did not happen (Taylor, pers. comm. with Herbert, 18 March 2019). On some occasions no weather conditions were reported, while on others the wind strength was noted but not the direction. A record of such factors is vital to the interpretation of the data, as current and wind conditions can dramatically affect the deposition of effluent (Taylor, pers. comm. with Herbert, 18 March 2019). An example of a partially completed field site record is attached in Annexure “A”.

Taylor’s observations highlight the importance of the relationship between currents and weather conditions as they effect seawater quality, as understanding the constant motion of the water is vital for the creation and use of models to determine the flow of effluent. Internationally, such modelling techniques are considered best practice for beach and ocean management techniques, as they offer more reliable and realistic readings of the current and the future conditions of the beaches and oceans. However, Cape Town’s marine management system relies on the science necessary for the retention of Blue Flag status, which is based on point-based sampling. The limitations of point-based sampling have been extensively discussed (Frick et al., 2008; Olyphant & Whitman, 2004), but it remains the preferred method for Blue Flag status.

Blue Flag: Science or Branding?

As discussed in Chapter 1, the Blue Flag program provides Blue Flag status to beaches to reward beach and sea water quality within specific parameters, such as sea water monitoring. The CoCT relies heavily on the Blue Flag rating, claiming it to be the gold standard of seawater quality and beach management, but one of the problems with Blue Flag monitoring is that samples can be taken at any time of day and month (Blue Flag, 2020:8). Point-based sampling has been shown to be less reliable, as it disregards the flow of the ocean and the impacts of weather patterns, while modelling has been described as “a basic element for well-informed decision-making and regulatory processes” (Kress, 2019). Point-based data can be influenced by where and when samples are taken and by how long it takes to get samples to a laboratory. The selection of particular conditions can significantly influence research findings

and skew results, and the major methodological flaw of the CSIR report is that no modelling was conducted, and the report instead relies on infrequent, erratic point-based sampling.

Another of the CSIR report's biggest problems is its use of the CoCT's own Blue Flag data, notably in the chapter on water quality (CSIR Chapter 4). Clearly, using data supplied by the entity that commissioned and paid for the study is not best practice, but using point-based sampling methods instead of ocean modelling is also not optimal and cannot be corrected retrospectively, as the necessary raw data was not collected as prescribed, nor were the wind and ocean currents consistently recorded.

The issue of the usefulness of the data raises questions about the sustainability of the Blue Flag paradigm for beach management and has been raised by many researchers who criticise the Blue Flag program as a marketing tool rather than an efficient and useful beach management and water quality tool (Dimitrova, 2013; Lucrezi, Saayman & Van der Merwe, 2015). Among the criticisms are that the Blue Flag programme relies on a select number of "grab samples" over a specific period of time, for example once or twice a month, with a minimum of five samples required during the Blue Flag season (Blue Flag, 2020:8).⁵ This is an ineffective and inconsistent sample when accounting for water quality flows, and they cannot reflect beach and water quality in real time (Frick, et al., 2008; Olyphant & Whitman, 2004). Edda Weimann (2014) has detailed some of the issues inherent in the Blue Flag monitoring protocol and illustrates the programme's inefficiency, concluding that the Blue Flag system can be co-opted as a greenwashing tool.

The CSIR report notes that "The City of Cape Town faecal indicator bacteria monitoring results cannot be used to refute the contention that effluent-derived constituents are persistently reaching the shoreline due to uncertainties of their actual source" (CSIR, 2017: 122). It is puzzling, then, that the CSIR chose to use and include the Blue Flag data in its report despite this acknowledgement of their pitfalls and questions having been raised about their usefulness by a public health researcher.

The report continues, however, that "if this is the case, the results suggest this is not posing a persistent risk to human health" (CSIR, 2017: 122). The usage of the term "persistent" here is

⁵ The Blue Flag season in Cape Town is from 1 December to 31 March each year (Bungalow Owners Association, 2020).

a cause for alarm. The report appears to claim that the outfalls do *not* pose a risk to residents' health, but it is actually making the more nuanced claim that the outfalls do not pose a *persistent* risk, thus conceding the evidence of risk overall.

Urban Runoff

One of the most common claims made by the CoCT in response to concerns about the outfalls is that water or beach pollution is a result of stormwater drains and their runoff (CoCT, 2018b: 44; CoCT, 2019a: 5).⁶ However, the CSIR report did not determine conclusively that nearshore pollution is definitively (or solely) a result of urban runoff. Moreover, the relative volumes of stormwater, an occasional event, to sewage, which runs into many megalitres a day, should be considered but is never addressed.

Despite having acknowledged the problematic nature of the CoCT's Blue Flag data, the CSIR report included such data from January 2008 to December 2015 to show what portion of samples exceeded Blue Flag guidelines for *E. coli* and faecal streptococci.⁷ The report then measured these in relation to the average rainfall for each month at the various sample points across Table Bay and the Cape Peninsula. The graphs are presented such that they create the impression of correlation (CSIR, 2017: 116-122), but these rainfall charts *do not* show a correlation between *E. coli* and *Enterococcus* counts with regards to urban storm water runoff (Green, 2017: 2), and upon closer inspection and on reading the detailed report it is evident that no correlation exists. The CSIR report (2017: 124) states that "there was usually no marked seasonality in exceedance apart from some sites, such as Lagoon Beach". Part of the issue is that the CoCT has on numerous occasions explained the increased levels of *E. coli* and faecal streptococci as a consequence of the urban runoff and storm water outlets that occur after heavy rainfall events.

However, the CSIR report continues:

⁶ "Incidences of substandard water quality at beaches are mainly attributable to pollution events such as blocked/overflowing sewers or stormwater ingress – especially after rainfall, where pollution from the streets is washed into the stormwater pipes and eventually out to sea. In our decades of testing, it has emerged that low water quality is strongly correlated with rain, especially the first rain of the season," said Councillor Xanthea Limberg (in Mbane, 2019).

⁷ Also known as *Enterococcus*.

At numerous sites the most frequent exceedances were usually for one or more of the months of May, June, July and August. This probably reflects, at least in part, the influence of rainfall on river flow in the case of Lagoon Beach (Diep River, and possibly also Salt River) and Hout Bay Beach (Disa River), and stormwater runoff at other sites, considering the highest average rainfall in the Cape Town area is for these months (i.e. late autumn and winter). This said, predominance of north-westerly winds in winter could also be advecting effluent-derived faecal indicator bacteria onshore. (CSIR, 2017: 124)

Cape Town experiences increased rainfall in its winter months, which could increase the likelihood and volume of stormwater runoff. However, during these same months, Cape Town also experiences strong north-westerly winds along its Atlantic seaboard, blowing the ocean and its contents onshore towards the beaches and coastline, including anything dispersed from the outfall points and effluent plumes closer to the shoreline. This makes it even harder to give credence to this set of data as reliable or useful. However, it is significant that the CSIR report cautions that “...nevertheless, there were days when full-contact recreation at Camps Bay beach posed a risk to the health of vulnerable segments of the population (e.g. those with a compromised immune system)” (CSIR, 2017: 124).

[Human Health Risk Assessment in the Report](#)

One of the core motivations for the report was to provide the DEA with sufficient information to determine whether the outfalls posed a threat to human health and marine flora and fauna, and ultimately to help the CoCT obtain the required permits to continue pumping effluent along Cape Town’s coastlines. Despite the CSIR report’s objective to determine whether the outfalls had a negative impact on human health and the marine environment, the actual report is littered with uncertainties, and these uncertainties and the accompanying commentary were ultimately used to absolve the scientists of any such determinations.

Chapter 6 of the CSIR report, Human Health Risks, should provide much-needed clarification about the outfalls controversy and the possible impact on and risk to human health. However, the Lwandle report offers no detailed commentary of Chapter 6, in stark contrast to their assessment of other chapters, instead recommending that this chapter be revised and noting that “the [CSIR] authors rely extensively on extrapolations from other

studies, mainly conducted in the USA, and assumptions. Due to the dearth of local information, these are difficult to verify, leading to questionable reliability of the conclusions reached” (Lwandle Technologies, 2017:10). The Lwandle report adds that “the authors, through an evaluation of the uncertainties in the analyses, conclude that the health risks have probably been overestimated and are unreliable” (Lwandle Technologies, 2017: 10).

These uncertainties are repeated in the CSIR’s Summary and Conclusions section, which claims that:

It is not the prerogative or the responsibility of the scientists that prepared this report to decide on what constitutes major ecological impacts and human health risks in the context of effluent discharge, since this may differ from one person to another. Nevertheless, based on the finding of the surveys documented in this report, these scientists are of the opinion no immediate ecological disaster is imminent as a result of effluent discharge through the Cape Town outfalls. This does not mean that there are no ecological impacts and human health risks associated with this practice, but rather that no major ecological impacts could be detected through the monitoring approach followed in this study. (CSIR, 2017: 224)

However, the report clearly and consistently states throughout that their conclusions are founded on probabilities and uncertainties, opinions rather than conclusive facts and evidence. The CSIR avoided taking responsibility for determining what constitutes major ecological impacts and human health risks, despite a foundational reason for the study being to provide enough information for the DEA to assess whether the outfalls should be provided with permits. They did, however, acknowledge that the public’s concerns were not unfounded:

These uncertainties make it difficult to estimate the risk posed by effluent discharge to the health of recreational users of nearshore and shoreline waters and represents perhaps the most important uncertainty that should be addressed through further research and monitoring. Regardless of the source of the bacteria, their counts in shoreline water samples at many sites were, at varying frequencies depending on the site, high enough to suggest a significant periodic risk to humans recreationally using nearshore and shoreline waters. (CSIR, 2017: 225)

Independent Science

The findings of the CSIR report are similar to those shared by concerned citizens, water users and independent scientists, whose concerns have consistently challenged the CoCT's declarations that the outfalls pose no threat and are not a cause for concern. Describing the samples taken for faecal indicator bacteria, the report states:

In the surveys when faecal indicator bacteria colony-forming unit counts at the sea surface could clearly be linked to effluent discharge, the counts were high enough to suggest pathogenic organisms in the seawater posed a risk to the health of humans if exposed. (CSIR, 2017: 125).

It further cautions that:

It is, however, not impossible that effluent-derived constituents are reaching the shoreline under favourable wind and sea states, even if only periodically in a much-diluted form. Regardless of the source, faecal indicator bacteria colony-forming unit counts in shoreline waters at most sites are periodically high enough to suggest a risk to human health through exposure to co-occurring pathogenic microorganisms. (CSIR, 2017: 125)

Samples were taken from the surface seawater to determine whether the effluent was dissipating below the thermocline after being released through the diffusers, as expected and designed, or if it was reaching the surface of the seawater. In the course of the year, the CSIR performed 12 surveys above the Green Point diffuser section and found that effluent had reached the surface 50% of the time (CSIR, 2017: 124). At Camps Bay, they found this only happened 25% of the time, and at Hout Bay this only occurred twice in the 12 surveys taken (CSIR, 2017: 125). The CSIR report acknowledges that 12 surveys are too few and too infrequent to accurately reflect the situation, but it is significant that these rudimentary preliminary studies indicate that the outfalls are not working as intended. In fact, the studies suggest that not only can effluent reach the surface, but that when it does, its bacterial levels may be well beyond harmless. The CSIR suggests that further monitoring must be done and that:

It is, however, illogical and indeed irresponsible to imply that effluent discharged through the outfalls is not impacting on the marine receiving environments or posing a potential human health risk. Indeed, the notion of no impact to a marine receiving environment in the context of effluent discharge is unfounded. (CSIR, 2017: 224).

The CSIR report clearly states that there is at least occasionally a risk to human health, noting that “regardless of the source of bacteria, their counts in shoreline water samples at many sites were at varying frequencies depending on the site, high enough to suggest a significant periodic risk to humans recreationally using nearshore and shoreline waters” (CSIR, 2017: 225).

These issues should be of concern not merely to beachgoers, local seafood eaters and fishermen but also to the many other frequent water users, such as the surfers who gather from around the world to surf South Africa’s world-renowned spots – like Thermopylae, which sits alongside the Green Point outfall – and long-distance swimmers, kayakers and divers, to name but a few. These water users have raised concerns about these issues for years, and while some concerns are acknowledged in the CSIR report, the water users’ evidence is neither used, included or considered in the report. These forms of evidence include, but are not limited to, photographs, personal testimonies and eyewitness accounts of effluent plumes and sewage in the water, as well as reports of illness contracted after contact with the water on particularly bad days. Regrettably, the absence of these first-hand accounts in the report limits what could and should have served as an additional frame of reference for the research questions.

One of the fundamental purposes of the CSIR report was to support the CoCT’s application to the DEA to continue using the outfalls for the next few years. However, a major limitation of the report is that it does not consider the future consequences and effects of the sewage outfall, which is a concern in light of the CSIR’s belief that it would be illogical to imply that there is “no impact to a marine receiving environment” (CSIR, 2017: 224). That there is no projection of the possible effects of increased urbanisation is a major concern with regards to the purpose and applicability of this study.

Frustratingly, the concluding section of the report states that:

Nevertheless, based on the finding of the surveys documented in this report, these scientists are of the opinion no immediate ecological disaster is imminent as a result of effluent discharge through the Cape Town outfalls. This does not mean that there are no ecological impacts that could be detected through the monitoring approach followed in this study. (CSIR, 2017: 224)

In this way, the writers of the CSIR report simultaneously acknowledge potential issues and absolve themselves of any responsibility for them.

The CoCT's Media Statement

The CoCT's media release summarised over 250 pages of the report into only three pages. Their statement, headlined "CSIR Confirms Sewage Outfalls Pose No Significant Risk", begins:

A study by the Centre for Scientific and Industrial Research (CSIR) into the City's sea marine outfalls has confirmed that they pose no significant risk to human health and do not measurably affect inshore water quality or the wider environment. (CoCT, 2017a: 1)

The problematic nature of this statement is immediately evident when considering the actual content of the CSIR report. The media statement (attached in full as Appendix "B") further states that the report was reviewed by *external scientists* (CoCT, 2017a: 2), which is disingenuous, as the scientists were commissioned and paid for by the CoCT. The CoCT (2017a: 2) also claims that "The findings of the study have confirmed the City's position that the outfalls are not outstripping the assimilative capacity of the ocean." This is equally disingenuous, as the report concludes with the following paragraph:

This does not mean there are no impacts associated with this practice, but that the assimilative capacity of the marine receiving environments for the Green Point, Camps Bay and Hout Bay outfalls has not, at this time, been exceeded. It is nevertheless clear the world cannot use the marine environment as a waste receptacle in perpetuity, and opportunities for improved and economically and environmentally

feasible waste-water treatment, and the feasibility of using alternative strategies for disposing of waste water to the marine environment should be investigated by the City of Cape Town (and other municipalities). (CSIR, 2017: 225)

The CoCT's media release includes more inconsistencies with the CSIR report in its claim that:

It is also found that there are no measurable risks to human health posed by the outfalls through either swimming at the beach or consumption of fish caught off our coastlines. In addition, nearshore pollution (when it occurs) is a result of urban run-off – this is typical of all urban environments. (CoCT, 2017a: 2)

In truth, however, the report found that risks to human health *were* at times present as a result of the outfalls and that the outfalls impacted not only beachgoers and seafood eaters but a host of other frequent water users as well. It is also important to note that the risk to human health could be from a variety of factors, such as viruses, ammonia, organic chemicals, etc. In claiming that there are “no measurable risks to human health”, the CoCT have neglected to specify what sort of human health impacts they are referring to, and the CSIR have inadequately synergised this array of impacts. Furthermore, for the CoCT to claim that there is no measurable risk from the consumption of fish, the report should have analysed fish catches and conducted toxicological and risk factor calculations accordingly – as Cecilia Ojemaye, and Leslie Petrik (2019) did in their study of emerging pollutants in fish samples from Kalk Bay Harbour:

Risk assessment of these pollutants on aquatic organisms suggested that higher animals and humans who consume these species of fish could be at risk of ingesting diverse compounds. In addition, a risk assessment based on the calculated risk quotient (RQ) showed that those compounds present in all the fish species could pose high ($RQ > 1$) risks to sensitive aquatic microorganisms, and humans who consume these contaminated seafoods would be at risk. Our results show that chemical compounds and drugs can remain bioavailable for aquatic organisms for long time periods (weeks to months to years) and even re-enter the food web at a later time. (Ojemaye & Petrik, 2019: 569)

Human health risks should not be our only concern, however, as this also affects marine species, particularly as two of the outfalls discharge into a marine protection area, and the third, the Green Point outfall, abuts this same MPA. As has been shown, the report offers no conclusive proof that nearshore pollution is purely a result of urban run-off.

The CoCT's Mayoral Committee Member for Informal Settlements, Water and Waste Services; and Energy, councillor Xanthea Limberg, is quoted in the media release:

Our society produces a lot of waste and it is unavoidable that this waste eventually finds its way back to the environment in one form or another. There are over 84 000 synthetic chemicals that have been made by humans and no wastewater treatment plant can remove all of these components from effluent. This study confirms, however, that at current levels this waste can be safely assimilated by the ocean. (CoCT, 2017a: 3)

In fact, the CSIR report provides no good evidence for this conclusion and it is simply speculation by the CoCT.

The media summary also emphasises the quality of Camps Bay's and Clifton's seawater quality according to the Blue Flag program:

The study also looked at whether bacteria from the outfalls were reaching the bathing areas, finding that this was nothing for bathers to worry about. Bacteria dissipated within 300 meters of the diffusers (the outfalls are 1.7 km offshore), which is echoed by the results of our coastal waters monitoring program and the continued status of Camps Bay and Clifton as Blue Flag beaches. (CoCT, 2017a: 3)

As has been discussed, the CSIR report draws no such conclusions, in fact finding bacteria close to the shoreline on several occasions. Furthermore, the Camps Bay outfall, despite being 1.7 km in length, does not stretch straight out into the ocean but instead runs across the bay, meaning that the outfall diffuser point is only 700 m away from Maiden's Cove Beach.

The media summary concludes:

Given the often negative and sensationalist coverage around these outfalls we are happy to have conclusive proof that disposing of waste in this way is not posing significant risks to bathers or the marine environment. Going forward, the City has developed an extensive monitoring program with the assistance of four external expert marine scientists. This monitoring program was submitted to the Department of Environmental Affairs and will be implemented as part of our permit to operate the outfall. (CoCT, 2017a: 3)

The lack of certainty throughout the CSIR report calls into question how the CoCT can assure the public that there is no cause for concern, particularly in light of South African best practice and implementation of the precautionary principle.

The concern about point-based marine water sampling as used for beach monitoring is a global concern, thus the CoCT's high regard for the Blue Flag program and the sampling methods used are problematic when considering the CoCT claims to have developed an extensive monitoring program. Green (2017:2) notes that the paradigm of the separation of sanitation, the environment, and water supply is not appropriate for a City that has an interest in its ecology and definitely not appropriate for a City that will be increasingly reliant on desalination (Green, 2017:2).

It is clearly shown that the differentiation between the comments made and conclusions drawn in the CSIR report, and the Lwandle report is not definitive. The conclusion of the CSIR report highlights the difficulty of operating within the given terms of reference to show conclusive evidence regarding the impact of the outfalls on human health, however the CoCT provides residents and citizens with the impression that the report reflects otherwise. The concerns that residents had regarding the potential effects of the marine outfalls were further questioned and heightened during Cape Town's 2018 drought. As part of the water reclamation plans the CoCT established desalination plants at the Waterfront, and in False Bay at Strandfontein and Monwabisi. The inability of the V and A Waterfront desalination plant to function, and its proximity to the Green Point outfall, is explored in the following chapter.

Chapter 3: Filtering Sewage: Whose Responsibility Is it, Actually?

Introduction

The CSIR Report became the “proof” used by the CoCT to claim that the marine outfalls posed no potential threat, but the issues in the report were thrown into sharp relief when, in 2018-2019, an emergency desalination plant at the Victoria and Alfred Waterfront (Waterfront) showed that the CoCT’s argument was ill-advised and misguided.

A City in Crisis

In 2017, Cape Town experienced its worst drought since 1993. Water scarcity is not a new issue to the Cape: a newspaper headline from 1990 (Streek, 1990) warned that Cape Town could run out of water within 17 years. While the city had experienced occasional droughts previously, the failure of the winter rains in 2016 and 2017 resulted in a near-catastrophic situation, and at the beginning of 2018, residents of the city were bombarded with messages of a looming Day Zero, when the city’s total dam storage would reach 13.5% and the taps would be turned off (Charlie & Dougan, 2017: 2). By mid-April 2018, it was expected that residents would collect daily rations of 25 litres of water from militarised collection points, and the CoCT enacted a three-phase disaster plan.⁸

In the first phase, implemented in October 2017, residents were urged to quickly and dramatically cut their usage, with showering in buckets and flushing toilets with the shower water quickly becoming the norm. The CoCT subsequently significantly increased water tariffs and began installing water meters in residents’ homes to control water flow and reduce water pressure where possible (Taing et al., 2019: 531; Parks et al., 2019). Residents in certain areas were supplied with 50 litres of water per person per day.

The CoCT looked into various water strategies, such as desalination, extracting groundwater from aquifers, water reuse and use of spring water (Tyrrell, 2020; Parks et al., 2019: 8). After a World Bank-funded study cautioned against small, container-based plants (Water Globe

⁸ The first phase addressed preservation and restrictions through rationing (CoCT, 2017c: 3; Petersen, 2017). In the second phase’s disaster restrictions, the CoCT would control residential and business water supplies (CoCT, 2017c: 4) and residents would only be allowed to collect 25 litres of water from controlled points daily. Phase 3 would entail a full-scale disaster plan implementation.

Consultants, 2017: 2), the initially planned nine desalination plants were reduced to only three, which were expected to produce a combined total of 16 million litres of water per day (Parks et al., 2019: 8). The plants were intended to provide a quick, timeless solution to feed additional freshwater into the city's reticulation system.

In August 2017, the CoCT proposed the Granger Bay Powerboat Club as a location for one of the three small-scale desalination plants ("Cape Town Reveals...", 2017). In response to the proposal for desalination in the Granger Bay area, Prof. Leslie Petrik wrote to the City about her concerns regarding the poor water quality and the effects of the marine outfalls on the intake water for the desalination plant. In addition, Petrik and others, including myself, conducted a study and published its findings in "Desalination and Seawater Quality at Green Point, Cape Town: A Study on the Effects of Marine Sewage Outfalls" (Petrik et al., 2017), which raised concerns about the intake water quality and the appropriateness and capability of the desalination plant to deal with the chemical contaminants.

The study found the presence of every one of the 15 pharmaceutical and household chemicals that were tested for. These chemicals are harmful, and many are persistent organic pollutants listed in the Stockholm Convention (Stockholm Convention, 2004) that produce effects such as endocrine disruption; they may also be carcinogenic and have epigenetic effects. Furthermore, how they interact with one another is unknown, and bioaccumulation and biomagnification are and will remain major causes for concern.⁹

The desalination tender called for applicants to "design, supply, deliver, install, test and commission the SWRO production plant" (CoCT, 2017b: 39) within eight weeks. A seawater reverse osmosis (SWRO) plant is a specific kind of desalination plant that "uses pressure as the driving force to push feed water through a semi-permeable membrane into a product water stream and a concentrated brine stream" (Thimmaraju et al., 2018: 342).

After the initial location of Granger Bay was withdrawn, a second tender was put out for the V&A Waterfront, in November 2017. As forewarned by Petrik et al. (2017), however, a

⁹ "Bioaccumulation" is the accumulation of a substance over time, while "biomagnification" refers to how compounds travel up the food chain through the various trophic levels in species.

desalination plant in this vicinity is not advisable because of the water quality around the Green Point outfall, which is about 2.5 km away as the crow flies.

The tender allowed potential contractors two weeks to reply, and the plant was expected to produce 2 million litres of water per day. In Annexure 8A of the tender, the City provided water quality results from grab samples from three points and profiling of four points on a single day to provide contractors with data from which to design and build the desalination plant. The tender specified that the supplied desalinated water quality must comply with South African National Standard (SANS) 241:2015, which governs municipal drinking water quality. The tender document warns:

However, it should be noted that the data provided is a grab sample do not make allowance for any seasonal variations [sic]. The Tenderer's process design should, therefore, be sufficiently robust to make allowance for variations in the raw water quality. (CoCT, 2017b: 38).

The tender clarifies that “the supplier shall be responsible for verifying and interpreting all such data. The purchaser [CoCT] shall have no responsibility for the accuracy, sufficiency, or completeness of such data” (CoCT, 2017b: 41). Furthermore, “the supplier shall be responsible for the overall process design in order to treat the raw water to potable water standards as specified within SANS 241:1:2015” (CoCT, 2017b: 43).

Finally, the tender again reiterates that responsibility for water quality rests with the supplier:

The supplier is responsible for validating and verifying the existing water quality, taking cognisance of normal variations in water quality parameters over the full delivery period and establishing a design robust enough to deal with these normal annual variations. (CoCT, 2017b: 43)

The tender document places the onus of responsibility for the determinations of intake water quality on the contractor, in this case Quality Filtration Systems (QFS). However, this was an unreasonable stipulation given the exceedingly short lead time, the need for accurate water-quality data in order to design a robust desalination plant and the wide seasonal variations of sea water quality due to seasonal algal blooms and other effects. In short, the CoCT supplied raw ocean water quality data in an emergency context such that the contractors were unable

to validate the given data and had no time to conduct their own studies. The situation began to unravel within a month of QFS being awarded the tender in February 2018.

It is puzzling, and troubling, that there was no mention in the tender documents – or through any subsequent communications to QFS – of the City’s CSIR report of June 2017, which was eventually made public in November of that year. The City paid for 24 months’ water-quality monitoring in the areas surrounding its three marine outfalls, which included the Granger Bay area, and the new location for the desalination plant. In February 2018, when QFS were able to conduct their own on-site water profiles, they found the water quality to be 40 times dirtier than recorded in the tender documents, far exceeding usual seasonal variations (Rensburg, 2018: 1).

Dialogue Organised by the Water Research Council

At this time, the Water Research Council (WRC) invited selected authors and researchers of the Petrik et al. (2017) paper, the CSIR (2017) report and various government officials to a dialogue on their findings about the marine sewage outfalls and their impact on seawater quality and desalination. The meeting was to be a closed door meeting, but individuals and media houses found out and wanted to be part of the discussion, including filmmaker Mark Jackson, who had received a cease-and-desist letter from the CoCT (discussed in Chapter 1). Their presence was not well received, and Petrik took the unusual step of writing a letter of objection to the Water Research Commission about how the meeting had been conducted, stating that “there was significant bias in this ‘scientific’ meeting fronted by WRC, but in reality it turned out to be yet another opportunity for the City to try and discredit our work”. Petrik also noted that “respected scientists such as Jo Barnes, Lesley Green (in her absence) and I were yet again exposed to the City’s belligerent intransigence in the face of verifiable evidence” (Petrik, pers. comm. with Nonhlanhla Kalebaila, 1 March 2018).

A year later, the City’s right of reply was published in *The Daily Maverick* in response to an op-ed written by Lesley Green, Nikiwe Solomon, Jo Barnes and Leslie Petrik on the need for environmental management to be democratised. The CoCT reflected on the WRC dialogue and highlighted their unhappiness with Mark Jackson’s presence, citing it as proof that Petrik had ill intentions going into the dialogue. The CoCT went so far as to mention that the venue was unable to even accommodate a single extra individual (CoCT, 2019b). The CoCT described the intention of the closed meeting as:

an opportunity for government agencies and the research community to freely share and interrogate each other's findings with a view to identifying gaps in the research around emerging contaminants and their effects, marine outfalls and waste water disposal. (CoCT, 2019b: online)

The minutes of the meeting record a need for public involvement at odds with the closed-door nature of the discussions, which were hidden from the public and from the desalinators on whom the public depend and who were being paid from the public purse. The secrecy of the meeting is also puzzling in the context of the desalination operators' critical need for accurate data at that time.

Despite the CoCT's involvement in the dialogue, they did not bring this dialogue, nor the concerns raised or papers discussed in it, to the attention of QFS. Nor did they forward QFS a copy of the Petrik et al. (2017) paper and its findings or notify QFS of its concerns about the viability of desalination in the area.

QFS was ready to begin operations at the Waterfront in March 2018, but the CoCT requested QFS to conduct additional testing to ensure the water was safe, over and above the prescribed SANS:241:1:2015 requirements (Quality Filtration Systems (Pty) Ltd v The City of Cape Town (2019)). In a court filing, QFS state that:

Subsequent to the construction and commission of the plant for specification A, Plaintiff was informed by the Defendant [CoCT] to amend the purification levels to a standard in addition to SANS:241:2015 ... The new purification standard was for the purification of water contaminated by sewage. (Quality Filtration Systems (Pty) Ltd v The City of Cape Town: 2019: 13)

In May 2018, the plant began operation, but the CoCT took only 25% of the agreed 2 million litres of water per day (Gosling, 2019). In July 2018, the plant had to shut down for maintenance, and it was only in September 2018 that the CoCT gave QFS permission to inject the full 2 million litres per day into the reticulation system. In October 2018, QFS conducted their own report on the state of the intake water quality and found that it was 400% dirtier than specified in the tender document¹⁰. In February 2019, the plant became dormant

¹⁰ QFS sent me their report titled *QFS Report on Raw Water Turbidity Trends V & A Waterfront* (24 October 2018), on the 14 May 2019.

and QFS and the City entered into a mediation process. The story was picked up by *Cape Times* environmental journalist Melanie Gosling (2019b: online):

Ndlovu [Director of QFS] said desalination plants could handle normal variation in seawater quality, which was around 10%. To be on the safe side, the company had opted to build a plant that could cope with 30% variation of the seawater quality data the City had given them.

“But 400% is abnormal. We realised the variation was caused mainly by raw sewage – which the City itself puts into the sea. They didn’t disclose that in the tender specification data, otherwise we would have designed a plant fit for that purpose,” she said. ... QFS has expertise in treating water contaminated with sewage: In 2010, it built South Africa’s first direct reclamation plant in drought-stricken Beaufort West, producing 2.3 million litres of drinking water from sewage effluent every day.

CoCT Response to QFS

The desalination plant has lain dormant since January 2019, with QFS and the CoCT having entered into a mediation process in which they discussed issues that included why the plant was not operating as it was contractually obligated to, why the City had not paid QFS as agreed and issues of water quality that had potentially prevented the desalination plant from working as it should. After the failure of this mediation process, QFS terminated their contract with the CoCT and sued CoCT for breach of contract. The CoCT asked the court to dismiss the application on the grounds that QFS were in breach of the Legal Proceedings against Certain Organs of State Act (Legal Proceedings Act) (Gosling, 2019a). The CoCT denied knowing that “the uptake area was contaminated with sewage, that it had failed to inform QFS about this, and that its tender specifications were inadequate to purify water contained with sewage” as reported by Gosling (2019a: online). The CoCT furthermore denied they had introduced additional amended purification levels to those of the required SANS:241 standard (Gosling, 2019a). The court case is ongoing at the time of writing, with the CoCT and QFS both spending large sums of money over the discrepancies in water quality data, access to such data, transparency around these issues and explaining why the desalination plant did not work.

The narrative and evidence that have thus far played out around the desalination plant proves that the CoCT's adherence to the Blue Flag paradigm and their reliance on their own CSIR report as proof are ineffective and simply highlights how the CoCT respond to and manage issues and information pertaining to ocean pollution and the marine outfalls. The CSIR report was commissioned to address these concerns and effectively to provide proof that the city should be granted a permit under the new licensing regime to discharge sewage via the outfalls. The failure of the city's sea water quality monitoring system, as demonstrated by the expensive failure of the desalination plant at the Waterfront, points to two fundamental problems with how science is pursued by the municipal authority. The actions of the City with regards to the desalination plant demonstrate "post truth" tactics, in terms of which facts, and information are manipulated or presented in a particular way to suit a specific narrative (Green, 2021).

The commitment of the City's beach management team to scientific truth is in question, and the science being practiced by the City is furthermore not in the public interest, as beaches are managed in terms of Blue Flag criteria rather than public health concerns. These two matters form the focus of the conclusion of this study.

Conclusion: Sealing through Transparen(sea)

To dispose first and investigate later is an invitation to disaster, for once radioactive elements have been deposited at sea they are irretrievable. The mistakes that are made now are made for all time.

– Rachel Carson, *The Sea Around Us*

Beach and seawater quality affect a city's wellbeing in myriad ways, and the range of concerns identified in this study underscores the critical importance of good beach management. In order to achieve that good management, it is critical that scientific assessment of contamination be used to caution the public as to when and where beaches may be contaminated.

This study shows that the current approach to science-based beach management in Cape Town is *retrospective*, relying on Blue Flag criteria that are not scientifically sound in terms of adequate beach management and assessment of seawater quality. The Blue Flag program relies on point-based sampling of *E. coli* and *Enterococcus* over a specific period of time. However, given how long it takes the laboratories to analyse samples, *E. coli* and *Enterococcus* counts can only determine whether seawater was polluted in prior weeks or months. By contrast, the precautionary principle, which national, provincial and local governments in South Africa are bound to apply in terms of environmental law, is *prospective*. There is thus a mismatch between the scientific methods applied in terms of Blue Flag criteria and the law.

Finding 1. The Precautionary Principle, Blue Flag and Prospective Modelling

The precautionary principle advocates for future thinking and a proactive approach to environmental concerns such as beach and sea water quality. Predictive modelling is one of the most useful tools from which to apply the concept of future proofing and thinking (Olyphant & Whitman, 2004; Frick, et al., 2008; Thoe et al., 2015). Thoe et al. (2015: 423) note that sea water quality can rapidly change due to “hydro-metrological conditions over time scales from minutes to days”, and in Cape Town this can mean the difference between swimming through effluent that has been blown shoreward or not. Predictive modelling was first introduced as a method for assessing seawater quality safety limits by the World Health

Organisation in 2003 (Thoe et al., 2015: 423) and has since become a staple tool in seawater quality analysis. It is important to note here that predictive modelling should be used in conjunction with the current method of point-based sampling that the Blue Flag paradigm champions, as found in a Stanford University study that notes that “it is important to continue collecting and analysing water samples to monitor any changes in beach pollution conditions, as well as to continually update predictive models to reflect the most up-to-date beach conditions” (Thoe, et al., 2015: 430). When conducted transparently, this kind of sampling is useful in annual monitoring, but modelling techniques are best served for day-to-day management to provide water users and concerned citizens with reliable, up-to-date information and data.

The controversy over the effects of the marine outfalls and the desalination tender (Chapter 3) serves as a case study for the kinds of management, politics and belief systems that the City has brought to bear on issues of water and sanitation. The precautionary principle, duty of care and polluter-pays principles have not been applied to the management of the marine outfalls in Cape Town. Instead, the CoCT’s checkbox managerialist approach to water management has proven to be problematic, as it has championed a managerial type of science and reduced an entire ecosystem to a few small data points from which to understand a complex situation – all this to the detriment of the public in a time of crisis.

The precautionary principle is founded on the English legal concept of “duty of care” and in essence is intended to safeguard the environment in instances of scientific uncertainty (Morodi, 2016: 7). Globally, the precautionary principle has become a crucial element of environmental legal protection, and its application would be appropriate here given the extent of scientific uncertainty in the CSIR report and the Lwandle review thereof – more so, given Petrik et al.’s (2017) findings that Cape Town’s urban oceans are profoundly affected by toxicity. The CoCT’s reliance on an absence of direct evidence of effect to claim the evidence of absence reflects a misapplication of scientific probability and a misunderstanding of findings in relation to specific terms of reference.

Questions and concerns about the desalination plant address important aspects of scientific practice that were discussed in Chapters 2 and 3. When Rachel Carson received a letter in 1958 from a farmer claiming that DDT sprayed on a nearby marsh had killed the resident songbirds, Carson explored the possibility that DDT could be harmful, an issue that scientists

and politicians had not previously investigated, preferring to focus on the positive aspects of the chemical instead (Popova, n.d.). In her discussion of the usage and dangers of DDT in the 1960s, Carson highlighted the sort of problems that can occur when scientific research is focused on a single aspect of a product or issue. Experiential and anecdotal evidence opened up the sorts of questions that scientists and chemical companies had ignored and were reluctant to ask. Other examples of the harm caused by this approach are explored in the movie *Dark Waters* (2019)¹¹ and in the eventual banning of asbestos in the late 1990s (UNESCO, 2005: 10).¹²

The precautionary principle and duty of care principle exist not just to protect the environment, but also to create a proactive rather than reactive response to environmental concerns. As I showed in Chapter 3, the domino effect can come into play when market-led science governs the public interest, underscoring the problem of post-truthism (Mavelli, 2019: 57). Furthermore, the issues around the CoCT's Waterfront desalination plant show that the science commissioned by the City to investigate the safety of its marine effluent outfalls has been compromised by an abuse of retrospective science that encourages non-disclosure. The case study of the desalination plant offers a critical moment from which to reassess the beach management science considered adequate by the City, and it is my contention that a precautionary approach to the outfalls would improve public safety and could be improved in real time by citizen science participation.

Finding 2. Science for the Market or Science for the Public?

Friedo Herbig and Richard Meissner (2019) present a case for South Africa's current sewage crisis to be regarded as a conservation crime and argue that while on paper South African water authorities subscribe to the "polluter pays" principle, in practice they "pay the polluter" (Herbig & Meissner, 2019: 3). According to the environmental principle of "polluter pays", the person or entity responsible for polluting the environment is held accountable and must pay for any damage caused to the environment by their actions (or lack thereof) (Glazweski

¹¹ The movie describes chemical giant DuPont's use of the largely unregulated PFOA chemical in Teflon, which was causing cancer and deformities in the small town of Parkersburg, West Virginia via the town's water supply (Rich, 2016).

¹² Approximately 2 million tonnes of asbestos were produced between 1879 and 1998. Despite finding "reasonable grounds" to declare it harmful based on experiments on rats in 1911, factories in the United Kingdom found insufficient evidence to justify concern over its production. Numerous studies linked it to an increase in mesothelioma cancer, but it was not until 1998 that the EU, and a year later the WTO, banned all forms of asbestos (Unesco, 2005: 10).

& Plit, 2015:202). Herbig and Meisser (2019) describe myriad issues relating to a South African crisis of wastewater management and quality and its consequences. Among other failures and concerns, they note the existence of “59 waste water plants that do not meet standards” (2019:3) and the effects of dumping raw sewage into the oceans around Cape Town and into other water sources, such as the Vaal River, which supplies drinking water to about 45% of the South African population.

Despite the many examples cited by Herbig and Meissner, the various levels of government in South Africa have not taken responsibility or been held accountable for their failure to act in the face of these pollution crises. The polluter-pays principle has thus not been applied to government entities, and instead citizens have been left to pay their taxes but live with the consequences of government’s failure to adequately manage and protect municipal, provincial and national water resources.

Herbig and Meissner (2019: 6) argue that municipalities believe “that water purification at the drinking end of the cycle mitigates their lack of concern for polluting the input process”, but water pollution affects ecosystem health in a plethora of ways. Nonetheless, municipal water supply is considered a problem of supply, rather than a problem of urban metabolism. When water and sanitation are seen as a problem of supply rather than as a problem of ecology, the management principle becomes commercial and market-driven. So too, scientific enquiry becomes commercial and framed in terms of marketing needs. This study has sought to demonstrate that the CoCT has favoured market-driven concerns and contract- driven science that do not serve the public when assessing the quality and safety of the receiving waters of the city’s marine outfalls. Post-truth and science-for-hire involve the reshaping, forming and manipulating of data and facts to suit a particular argument. Lee McIntyre, author of *Post-Truth* (2018), provides more insight into this term in a Future Hindsight (2020) podcast, in which he defines it as “Political subordination of reality, a tactic that authoritarians use to corrupt our beliefs ... Not a failing of knowledge, more so one of politics.” McIntyre uses post-truth to describe a tactic used to manufacture doubt to manipulate people: by manufacturing doubt about, for example, climate change or the effects of tobacco, the veracity of scientific findings and known facts is brought into question.

Doubt creation, therefore, leads to the questioning of truth: What is truth? Does truth exist? Latour (2004) writes about the problematic nature of obfuscation, truth, fact and how we know that something is real. He discusses contemporary critique and notes that critique can

be constructed in such a way that nothing can be known as real or reliable. In this current global moment, where information is at our fingertips and can be gathered from a plethora of sources, including social media, news agencies and online articles, this information overload makes it difficult to distinguish between evidence-based facts and statements moulded and shaped to suit a particular argument and agenda.

McIntyre (2018) addresses the concern in the post-truth era that doubt can be manufactured to confuse populations and promote specific agendas, which are often not rooted in good, reliable evidence. He refers to Hannah Arendt's writings about Nazism and totalitarian political movements: "in an ever-changing incomprehensible world, the masses had reached the point where at the same time they would believe anything, and think that everything was possible, and nothing was true" (in McIntyre, 1951: 382).

The issue about how data, science and politics have been handled with regards to the Cape Town marine outfalls lies in the disjuncture and understanding of how politics, science, data and ways of knowing work. In a conversation with Ava Kofman (2018: online), Bruno Latour suggests that:

Scientific facts should instead be seen as a product of scientific inquiry. Facts were "networked"; they stood or fell not on the strength of their inherent veracity but on the strength of the institutions and practices that produced them and made them intelligible. If this network broke down, the facts would go with them.

In *Post-Truth Numbers* (2017), Elizabeth Chatterjee describes what she calls audit culture, the idea that we live in an age driven by numbers and figures upon which we base our daily decision making. According to Chatterjee, we are in an age of numbers fuelled by our technocratic society; we have reduced the world to a distinctive set of numbers and have forgotten the importance of context and stories, often missing the truth of a reality that cannot be summed up in numbers.

Boossabong and Chamchong (2020: 12) note that different modalities or entities produce different types of evidence to support claims made within their own differentiated terms of reference. Accordingly, a tourism-focused science will produce evidence that markets a city, and a bureaucrat might produce key performance indicators and departmental targets – ideas imported from epidemiology that lay claim to a totalising "science" but speak to a specific set

of interests (in Cape Town's case, a microbial count that cannot address risk). The precautionary principle, by contrast, requires municipalities and other officials to guard against public health risks and offers a better basis for municipal science, and performance indicators ought therefore to be shifted accordingly. There is no singular science; the City's claim that there is, and that theirs is the only version, is the core of the problem.

The water users' stories described in Chapter 1 show that the public does not experience the reality claimed by the City with regards to seawater pollution and that there is a disjuncture between the lived experiences of frequent water users and the City's claim that there is nothing to worry about. In Chapter 2, I demonstrated that the study commissioned by the City was framed in terms of reference that render it unreliable and revealed the flaws and pitfalls of how the City practices science and how it communicates and acts on its findings. The issues exposed by QFS' Waterfront desalination plant, discussed in Chapter 3, serve as evidence in the flawed gold standard version of science that the city champions and highlights one of its very real consequences. I showed the harm to the public purse and to drought remediation when flawed seawater quality figures were tested in an emergency desalination plant that failed because the scientific measures provided by the city were inaccurate.

Boossabong and Chamchong (2020), Latour (2015) and Chatterjee (2017) draw our attention to the fact that while laboratory studies, legal frameworks, departmental mandates and lived experiences may all discuss the same issue, they do so from different perspectives and use different parameters to discuss and validate observation and experience. A discussion is needed about the collection of knowledge produced rather than a single narrow ideal of what the evidence should look like in order for it to be justifiable as valid and acceptable to determine an overall situation. The operationalisation of a totalising science, of scientism, described in a paper by Green et al. (2020: 10) as "using science-sounding words to claim the mantle of science and in turn claim political legitimacy by proposing that the information being offered is truth and therefore in the public interest", has led to a breakdown of trust in modes of evidence.

A larger question concerns the future of the City's marine sewage outfalls, which are not in line with current regulations and are out of step with international commitments such as the Stockholm Convention. In the interim, we can address the reality that different modes of

knowledge exist: that specific concerns frame a situation differently and generate different approaches to evidence. If the application of the legally prescribed precautionary principle is incorporated into beach management via proactive, transparent and meaningful public engagement processes with regards to ocean modelling, the City will be better able to address their obligation to provide timely access to information in the public interest. The longer-term discussion of alternatives to sewer outfalls might then go ahead without the distraction of the tug-of-war between the public and the municipality over science and evidence.

Annexure A: CSIR incomplete field notes

Project	CT Ousloffe			Date	10-12-13
Station	TB 13	Page #	3	Time	
Waypoint					
Crew	RP	AB	AR	BN	SA SW Other:

Weather

Precipitation	Dry	Drizzle	Rain	Storm	
Cloud cover (x/8)			Wind direction		
Wind speed	None	Slight	Moderate	Strong	Gale
State	Flat	Calm	Slight chop		Heavy chop Rough
Swell (m)					
Water colour	Brown	Green	Dark blue	Light blue	
Water clarity	Poor	Fair	Good	Very good	
Comments:					

Water

Samples	Metals	Organics	Tox	Nutrients	Bacto	Chl-a
Depth	Surface	Middle	Bottom			
YSI	Yes	No				
Comments:						

Sediment

Grab	Day	Large van Veen	Small van Veen	Ponar			
Grab penetration							
Reef?							
Samples	Benthos	Grain	Metals	COD	Organics	Bacto	Tox
Type	Shelly	Gravel	V coarse sand	Coarse sand	Medium sand	Fine sand	Mud
Colour							
Aroma	None	H ₂ S	Sewage	Other:			
Comments	1st - Stones, Sea Star, No bed 10' 37 2nd - Sand - WP 339 - 54m depth						

Project	(-> O ₂ & E _h)				Date	10-12-15	
Station	7R18	Page #	10		Time		
Waypoint							
Crew	RP	AB	AR	BN	SA	SW	Other:

Weather

Precipitation	Dry	Drizzle	Rain	Storm			
Cloud cover (x/8)			Wind direction				
Wind speed	None	Slight	Moderate	Strong	Gale		
State	Flat	Calm	Slight chop		Heavy chop	Rough	
Swell (m)							
Water colour	Brown	Green	Dark blue	Light blue			
Water clarity	Poor	Fair	Good	Very good			
Comments:							

Water

Samples	Metals	Organics	Tox	Nutrients	Bacto	Chl-a	
Depth	Surface	Middle	Bottom				
YSI	Yes	No					
Comments:							

Sediment

Grab	Day	Large van Veen		Small van Veen	Ponar		
Grab penetration							
Reef?							
Samples	Benthos	Grain	Metals	COD	Organics	Bacto	Tox
Type	Shelly	Gravel	V coarse sand	Coarse sand	Medium sand	Fine sand	Mud
Colour							
Aroma	None	H ₂ S	Sewage	Other:			
Comments	1st - No sed - Rocks - Pic 13 61 2nd - No sed - Rocks - Pic 17 67 3rd - Sed - Rocks, Shells 18 cm depth						



CITY OF CAPE TOWN

21 NOVEMBER 2017

MEDIA RELEASE

CSIR confirms sewage outfalls pose no significant risks

A study by the Centre for Scientific and Industrial Research (CSIR) into the City's sea marine outfalls has confirmed that they pose no significant risk to human health and do not measurably affect inshore water quality or the wider environment. Read more below:

The 24-month long study was commissioned by the City of Cape Town in response to concerns about the impact of the wastewater outfalls on the marine environment and human health. It has also been reviewed by external scientists.

The City appointed the Council for Scientific and Industrial Research (CSIR) in 2015 to undertake a detailed assessment. The study took place over a 24-month period starting in late 2015 and was completed in mid-2017.

The findings of the study have confirmed the City's position that the outfalls are not outstripping the assimilative capacity of the ocean. It also found that there are no measurable risks to human health posed by the outfalls through either swimming at the beach or consumption of fish caught off our coastlines. In addition, near-shore pollution (when it occurs) is as a result of urban run-off. This is typical of all urban environments.

To ensure a comprehensive assessment the study was designed to assess and measure:

- the quality of the sea water near the outfalls
- the possible accumulation of substances in ocean floor sediment
- the possible accumulation of synthetic chemicals in animal tissue.
- the characteristics and toxicity of the effluent

The final full report, data and analysis has also been externally reviewed by Dr Robin Carter from Lawndale Technologies, who found it to be scientifically robust, and who supported the findings and conclusions by the CSIR.

The CSIR Report, the External Review and the proposed long-term monitoring programmer has been submitted to the Department of Environmental Affairs and Development Planning as part of a new license application for the outfalls. The City will now continue with the ongoing long-term programmer of monitoring the outfalls to ensure public confidence and transparency going forward.

In addition to the natural waste our bodies produce, effluent contains a variety of synthetic chemicals from sources such as cosmetics, household cleaning products, bath and shower water, dishwashing water and laundry water. However, based on the chemical characteristics of effluent, and various effluent dilution scenarios in the receiving environment, the analysis shows that most chemicals and compounds in the effluents are likely to be diluted to concentrations protective of marine fauna and flora shortly after discharge (i.e. within a small distance of points where the effluent is discharged).

Trends in the concentration of metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls and non-steroidal anti-inflammatory drugs in the tissue of black mussels and west coast rock lobsters collected at sites along the Atlantic Seaboard of the Cape Peninsula in 2016 also provided no evidence that mussels or rock lobsters collected inshore of the outfalls had accumulated these chemicals to excessive concentrations in their tissue.

‘Our society produces a lot of waste and it is unavoidable that this waste eventually finds its way back to the environment in one form or another. There are over 84 000 synthetic chemicals that have been made by humans and no wastewater treatment plant is able to remove all of these components from effluent. This study confirms, however, that at current levels this waste can be safely assimilated by the ocean,’ said the City’s Mayoral Committee Member for Informal Settlements, Water and Waste Services; and Energy, Councilor Xanthea Limberg.

In addition to testing for the accumulation of synthetic chemicals, the study also looked at whether bacteria from the outfalls was reaching the bathing areas, finding that this was nothing for bathers to worry about. Bacteria dissipated within 300 meters of the diffusers (the outfalls are 1,7km off-shore), which is echoed by the results of our coastal waters monitoring programme, and the continued status of Camps Bay and Clifton as Blue Flag beaches.

‘Given the often negative and sensationalist coverage around these outfalls we are happy to have conclusive proof that disposing of waste in this way is not posing significant risks to bathers or the marine environment.

‘Going forward, the City has developed an extensive monitoring program with the assistance of four external expert marine scientists. This monitoring programme was submitted to the Department of Environmental Affairs and will be implemented as part of our permit to operate the outfalls,’ said Councillor Limberg.

The full CSIR Report, the Lwandle Review as well as the long-term monitoring programme as developed by four top external scientists is available here
<http://resource.capetown.gov.za/cityassets/Media%20Centre%20Assets/CT-Outfalls-Report.zip>

End

Issued by: Media Office, City of Cape Town

Media enquiries: Councillor Xanthea Limberg, Mayoral Committee Member for Informal Settlements, Water and Waste Services; and Energy, City of Cape Town, Tel: 021 400 1299 or Cell: 073 271 2054, Email: Xanthea.limberg@capetown.gov.za (please always copy media.account@capetown.gov.za)

Image references

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