CORONERS COURT
NEW SOUTH WALES

Inquest:	**Inquest into the death of Paul Smith**
Hearing dates:	16-19, 22 February 2016
Date of findings:	8 April 2016
Place of findings:	State Coroner's Court, Glebe
Findings of:	Deputy State Coroner HCB Dillon
Catchwords:	**CORONERS – Cause and manner of death –** Industrial accident – Worker trapped in stormwater drain -- Whether risk adequately assessed – Whether policies and procedures appropriate – Whether policies and procedures complied with – Fluid dynamics of stormwater and underestimation of risk – Whether rescue possible – Changes to infrastructure and policy consequent to fatal incident
File number:	2014/00089895

Representation:	Sgt B Lorenc (Police Advocate assisting coroner) Mr B Hull instructed by Mr G Mallos, Mallos Davis Lawyers (Smith family) Mr B Hodgkinson SC instructed by Mr S Hardy, Baker & McKenzie (SITA Australia Pty Ltd) Mr P McEniery instructed by Ms K Lockerby (Safework NSW) Mr J Makris, K&L Gates, Solicitors (Mr P Keating & Mr K Ross)
Findings:	I find that Paul Smith died on 24 March 2014 at the SITA Organic Resource Recovery Park in Lucas Heights, New South Wales by drowning due to immersion in stormwater while clearing a blocked drain in which he then became trapped during a severe storm.

Recommendations:	I make the following recommendations to SITA Australia Pty Ltd: (i) That SITA engage an independent expert in fluid dynamics to inspect and assess its organic waste recycling facilities, and any other sites from which it large volumes of water may need to be drained, to report on any serious potential or latent risks of the type that developed at the Lucas Heights site on 24 March 2014 during severe storm conditions. (ii) That SITA develop with all reasonable speed a specific plan for dealing with the problem of the rapid build-up of leachate fluids in extreme storms if the drainage system becomes blocked or overwhelmed by the volumes of stormwater, bearing in mind the well-reported scientific evidence and opinions that climate change is real and will, over time, lead to increasing frequency and severity of storms. (iii) That SITA review all EQS policies to eliminate latent conflicts between policies that apply in severe weather conditions. (iv) That SITA EQS management consider how collective mindfulness of serious risk (as described by Professor James Reason in the reasons for decision above) can be promoted and encouraged within its corporate safety culture and workplace safety training programs and procedures. In particular, I recommend that SITA consider instituting a water safety risk mindfulness training program including the showing of appropriate videos or other visual demonstrations of such risks for EQS staff and workers potentially exposed to water safety risk. (v) That SITA clarify the Emergency Response Plan to ensure that there is always a person on each SITA site delegated the authority to call a 'Code Brown' in relevant circumstances. ***I request that SITA provide its response to these recommendations within six months of the date of these findings and recommendations.***

TABLE OF CONTENTS

IN THE CORONERS COURT
GLEBE
SECTION 81 CORONERS ACT 2009

REASONS FOR DECISION

Introduction

1. This is an inquest into the death of Paul Smith who died in an industrial accident during a very severe storm on 24 March 2014. All sudden and unexpected deaths are a shock to the loved ones of those who die but this was a particularly shocking death, not only for Paul's family, to whom he was very close, but to his workmates, several of whom struggled unsuccessfully to save his life.

2. One of the reasons that his death was, and remains, so difficult for those who loved Paul to accept is that he was a very safety-conscious and highly conscientious manager, much respected in his organisation for his attention to the safety of his fellow workers.

3. The reasons for conducting coronial inquests are not merely legal. The law reflects a much more profound social purpose. In our society, one of the ways we show respect for those who die unnaturally, and for their families and loved ones, and for human life more generally, is by investigating the circumstances of those deaths. "No man is island", as the English poet John Donne once wrote. We are members of society, connected with each other. But we also know that if lives are precious, the very least we can do to show respect for those who have died, and those who mourn them, is to learn the harsh lessons such deaths may be able to teach us.

4. A coroner's primary duty and function is to examine unexpected and unnatural deaths. The Coroners Act requires coroners to make findings, if possible, as to the identity of the person who has died, the date and place of death, the cause of death and the manner or circumstances of the death. A coroner may also make recommendations with a view to preventing or reducing the risk of future deaths of a similar kind.

5. And so in this case, it is the manner and circumstances of Paul's very tragic death, and the lessons learned from it, that has been the focus of our attention. But before turning to the terrible events of 24 March 2014, it is important to consider the man whose life

was lost on that day, the living human being who was so much loved and whose loss is so sharply felt by his family and friends.

Paul Smith

6. It is true that a picture is worth a thousand words, certainly in Paul's case. His wife Karen kindly provided some pictures of Paul that show aspects of his character in ways that my words are inadequate to describe. This is one of them:

Paul in his unicorn outfit with his daughters Hannah and Eliza

7. As a family man, Paul was affectionate, fun-loving, self-deprecating, generous-spirited and full of life. He was warm, kind and intelligent, but never took himself too seriously. He loved his wife Karen, his parents Billy and Anne, his children Hannah, Eliza and Emma and his brother Chris. It was clear during the inquest that he was much loved by them as well and that his influence on them was all for the good. His impressive family reflect his fundamental decency and humanity.

8. As a professional he was highly thought-of by those who worked with him. Paul was employed as an Operations Supervisor at the Lucas Heights Organics Facility, run by SITA Australia Pty Ltd.

9. Paul had in the past worked a number of different jobs, including as a truck driver. He commenced employment with SITA in September 2011 after the company he was working for, Camden Soil Mix, was taken over. He was promoted to supervisor in early 2013. In that role, Paul had various responsibilities, which included involvement in the training of staff on the site and safety talks. His reputation was for being careful both of

his own safety and the safety of others. A number of his workmates spoke of the sharp eye he kept on those he supervised to ensure that they followed safe work practice guidelines. He insisted on adherence to proper safety standards. Daniel Malone, who was working with Paul on 24 March 2014, and who tried to drag Paul out of the water but could not, said of him, "He just wanted to see all of us go home each day."

10. Paul was also a strong swimmer and had a diving certificate. Divers are taught respect for water and how to protect themselves in water. One of the more tragic aspects of the case, then, is that it was not immaturity or recklessness or stupidity that resulted in Paul's death but that he fell victim to a risk that he did not perceive (and which the company had also not perceived) despite his characteristic carefulness.

The fatal incident and its investigation

11. The basic facts of the case are relatively straightforward although we appreciate them now with the benefit of hindsight.

12. SITA is a company that collects waste material that is transported to transfer stations, organic recycling facilities, landfills and the like. It employs about 1800 people working at more than 100 sites across Australia, most of which are in NSW. Five of these sites, including the Lucas Heights site at which Paul worked, are organic recycling facilities. The Lucas Heights site includes an organic waste processing site and a landfill area. The organic recycling site processes green waste into compost and other products for use in horticulture and landscaping.

13. In the management of its sites, SITA has developed and implemented systems known as 'Environmental, Quality and Safety' (EQS) systems which are intended to meet national standards for managing environmental, health and safety risks and to build a safe work culture throughout the organisation. The evidence presented at the inquest suggests that SITA is a generally safety-conscious company. Its EQS systems are managed overall by a specific national manager who leads a team of six people. Each business unit also has an EQS team.

14. According to the company, it conducts regular internal EQS audits that are in effect cross-checked by external audits conducted by SITA's certification body. EQS checks and site monitoring checks are conducted regularly according to a standard SITA monitoring and measurement procedure. SITA also has a national safety strategy and a risk management process that is intended to be comprehensive and is regularly updated.

15. According to the affidavit of Mr Jon Dyster, Director of Human Resources, one of SITA's safety measures is 'a comprehensive risk management process including the development and review of Site Risk Registers, [Job Safety and Environmental Analyses], Hazard IDs and emergency risks as well as a risk identification system for particular high risk areas on sites'.

16. On 24th March 2014, there was heavy rainfall in the Sydney area. Data obtained by Police and SafeWork NSW indicates that between 12.45pm and 3.45pm that day, 57.55mm of rainfall was recorded at the Lucas Heights Australian Nuclear Science and Technology Organization, which is less than one kilometre from the location of the Lucas Heights Organics Facility. The description of the weather conditions from staff on site that day indicates that the rain was 'torrential' and the area was experiencing very strong winds and thunder. Emergency services in the area had been called to incidents involving flash flooding. Detective Senior Constable Paul Baglin, who investigated Paul's death on behalf of the Coroners Court, gave evidence that the weather was extreme and unlike anything he had seen for years.

17. On this day, Paul was working in his role as supervisor at the Lucas Heights site. Around 2.30pm that day, Patrick Keating, the Site Manager and the most senior staff member on that day, was travelling back to Lucas Heights from the Camden SITA site. He and Paul had a discussion by phone about the heavy rain and Paul indicated that it was raining at Lucas Heights. Mr Keating discussed with Paul inspecting drainage points across the site to make sure there were no water issues.

18. One of the areas at the Lucas Heights site where there is a drainpipe is within an area known as the 'top pad' or 'upper pad'. This is a cleared area of around five hectares of unsealed soil which is bordered by a constructed 'bund wall' made from organic matter. The bund wall is around three metres high. Due to the nature of the operation at the Lucas Heights site, the Environmental Protection Authority had imposed a condition that water running off green waste processed at the site ('leachate') was to be kept separate from storm water and there were penalties if this did not occur. The function of the particular drainage pipe involved in this incident was to drain water from this area to the 'leachate dam'. The pipe itself measured 30cm in diameter and was made from high-density polyethylene and flowed downhill to enable water to drain from the area. As this area contained water run-off from green waste, it was not uncommon for debris, such as mulch and rubbish to accumulate in the area. At the time of the incident there was mesh

fencing around the drainpipe but that the fencing had become warped or damaged at some stage prior to Paul's death.

19. Around 2.40pm, Paul spoke with Daniel Malone, who had commenced employment with SITA in September 2013. Mr Malone was employed as a 'sorta' – a role that involved walking around the site picking up rubbish and separating it from green waste. Paul was Mr Malone's supervisor and had been involved in some of his training since he commenced employment with SITA. Paul and Mr Malone went out to check the drains. After making their way to the upper pad within the site, and finding the drain to be blocked with debris, Paul handed Mr Malone his mobile phone and wallet and entered the water to remove the blockage. Mr Malone told SafeWork NSW Inspector Robert Moore that prior to entering the water, Paul had said to him, '*Don't do what I'm about to do'*.

20. Mr Malone described the water at this time as being in line with Paul's 'belly button'. After initially attempting to remove the blockage with his hands, Paul was seen to use his feet to kick at the drain. After doing this, Paul was seen by Mr Malone to sink down into the water around a further 20 centimetres. It would appear that at this point Paul's lower limbs had been 'sucked' into the drainpipe.

21. Mr Malone entered the water in an attempt to assist Paul and after realizing that Paul was stuck and the water level was still rising, he called for assistance using a two-way radio. A number of other workers arrived and emergency services were contacted. However, despite their attempts to extract Paul from the pipe, he was unable to be freed and he drowned due to the rising water levels.

22. Professor Johan Duflou conducted a post mortem examination of Paul's body and gave the cause of death as 'immersion'. There were abrasive injuries to Paul's legs and armpits that would appear consistent with the attempt made to rescue him. No drugs or alcohol were detected in toxicological testing.

23. Following Paul's death, investigations were conducted both by the NSW Police and SafeWork NSW. Both investigations presented reports to the Coroners Court and they were tendered in evidence during the inquest. Expert reports were also obtained from Professor Stephen Armfield, Head of the University of Sydney School of Aerospace, Mechanical and Mechatronic Engineering, who specializes in fluid dynamics, and Mr Ross Brown, a hydraulic engineer, who also provided two reports to SafeWork NSW.

SITA conducted its own internal reviews of the events of 24 March and made changes to the site and their procedures and also sent out safety advice to other sites they operate.

The issues

24. The main questions and issues that Paul's death raised were to do with risk-management on the SITA site in the circumstances that arose on 24 March 2014. The issues explored were as follows:

- What was the policy or procedure applicable to unblocking drains on the SITA site as at 24 March 2014?
- Was this policy adequate to manage the risk that a person may become trapped in the pipe in which Paul Smith was caught?
- Did Paul Smith comply with the policy and if not, why not?
- What were the relevant policies and procedures applicable to the SITA site in relation to weather conditions as at 24 March 2014?
- Was there a procedure for assessing or monitoring weather conditions at the Lucas Heights site?
- Should a 'Code Brown' [Severe storm] have been called under SITA's Emergency Response Plan, and work ceased at the Lucas Heights site on 24 March 2014 before the fatal incident?
- What caused Paul Smith to be sucked into the pipe to the extent that he was unable to be rescued?
- Could anything else have been done to prevent Paul Smith's death?
- Have there been changes made to the drainage system at the site since Paul's death?
- Have there been changes made to workplace policies at the Lucas Heights site since Paul Smith's death?

25. Finally, of course, the question of whether any recommendations should be made was considered.

Practice and procedure for unblocking drains

26. In summary, at the time of Paul's death, it was the practice for supervisors, including Paul, to keep a constant eye on the drainage of water, and leachate in particular, from the top pad. The company and managers at the SITA site were very conscious of the fact that strict environmental conditions applied to the site and that leachate was not permitted to drain in an uncontrolled fashion into the stormwater system. They were also conscious of the fact that if it did, the Environmental Protection Authority could impose heavy fines upon the company. The company and management were also no doubt conscious of the wide range of regulatory powers the EPA could also exercise if it breached the conditions imposed on it. There is no doubt that Paul Smith and other managers of the site approached their environmental responsibilities conscientiously and, in Paul's case, paid close attention to the issue of leachate run-off.

27. Because of the nature of the material being processed at the site, and the constant flow of water through the organic waste, it was necessary to conduct constant inspections of the drains, especially around their inlets, to prevent build-up of detritus and blockages that would result in a rapid back-up of leachate and possible uncontrolled overflows.

28. In relation to the clearing and unblocking of drains, the ERP Flood Action plan also stipulated that during a flood or storm SITA staff were not to walk into water that was deeper than gumboot height without a depth gauge stick, a life vest and a safety line, and if in doubt, were not to enter the water. (I will refer to this as the 'gumboot' rule.)

29. The procedure for preventing and clearing up blockages and build-ups of rubbish around the mouths of drains was unsophisticated but generally effective. The drains had rather amateurishly designed guards constructed around their mouths. This collected some material. The rest of the rubbish that collected was cleared away by workers using gardening-type implements. Occasionally, a front-end loader might be employed to move a large amount of material but this seems to have been rarely done and probably for good reason: front-end loaders are not finely-tuned instruments and might do more damage than good except when shifting large volumes of material. The use of a hand tool was sufficient in most cases, and was a more efficient and accurate method of clearing the mouth of a 30cm drain.

30. Until the fatal incident, this practical, hands-on approach was thought by the workers and managers to be effective and was not thought to entail any significant risk to

workers. The practice when water exceeded the height of a gumboot, generally speaking, appears to have been that workers would stand above the drain on solid ground and attempt to clear the blockage with a long-handled tool.

31. Whether the 'gumboot' rule was always complied with, however, is unclear. During the hearing a suggestion was made that workmates of Paul's had, at a barbecue, been joking about one of the group more or less swimming in leachate on one occasion. Apart from this unsubstantiated proposition, and some evidence that there was a set of waders on the site, there is no evidence of cavalier non-compliance with the 'gumboot' rule or of a generally reckless attitude to workplace safety on the site. Indeed, as I have earlier emphasised, Paul Smith himself had a reputation for conscientiousness and safety-consciousness and it is doubtful that he would have permitted any consistent disregard of safe work practices.

Why did Paul Smith not comply with the 'gumboot' rule?

32. There can be no doubt that, when attempting to clear the drain on 24 March 2014, Paul did not comply with the 'gumboot' rule. Nor did he take shelter indoors. The real issue is why he did not.

33. The most likely explanation appears to me to be that the torrential downpour that deluged the site led to a very rapid and voluminous build-up of water, carrying with it towards the drain a significant quantity of organic debris. It is clear from the evidence of Mr Malone that Paul was conscious of this. We can also infer from his position as a manager of the site, and the senior supervisor on the upper pad at the time, and from his reputation for conscientiousness, that he saw it as his responsibility to ensure that the leachate did not overflow and to meet that responsibility he was prepared to breach a safety rule. He did not and would not ask someone else to do that – as he told Mr Malone: '*Don't do what I'm about to do'*. He took that responsibility on himself but, of course, without perceiving the magnitude of the risk involved. It is probable that, at the time, he thought that the worst thing that could happen to him would be that he might slip and be covered in filthy water and mud, a repulsive but not especially dangerous experience.

34. That raises the general question of risk perception and consequent risk management which I will consider further below.

35. At the time of Paul's death, SITA had an Emergency Response Plan ('ERP') for the Lucas Heights Resource Recovery Park, including the organics facility. The version in place at the time of Paul's death, which had been issued in October 2013, included a section on 'Flooding' or 'Severe Storm'. In the ERP they were called 'Code Brown' external emergencies. In a 'Code Brown' situation involving flooding, a Chief Warden for the site was required to advise workers of the 'Code Brown' status and direct them to move indoors.

36. On 24 March 2014, the Chief Warden was Mr Kim Ross. He was at the Lucas Heights site that day but not at the upper pad. In an interview with SafeWork NSW, Mr Ross said that at the time of Paul's death there had not been any previous occasions where workers had been moved indoors after ceasing work under the provisions of the ERP relating to flood response. 'Code Browns' are, almost by definition, rare events.

37. A 'Code Brown' was not called on 24 March although the conditions for doing so had been met. The Chief Warden was not present on the site and Paul was the next most senior person. The evidence given at the hearing suggested that most workers took a common sense approach during storms: if they were on foot, they got out of the storm. If they were working in machines, they would often continue. In other words, common sense was generally applied.

38. In my view, however, the question of greater interest here is not so much whether a Code Brown should have been called but why Paul decided not to take shelter out of the storm. As I have indicated, I believe that he felt that he had a greater responsibility than just looking after his own comfort.

39. Because large quantities of organic material was collected on the site, the large piles were either watered to keep dust and organic material from flying around, or they absorbed rain when it fell. As a consequence, the upper pad accumulated large quantities of water that had to be drained into the leachate dam on a lower level of the site. Wet ground underfoot can, obviously, be slippery. SITA therefore had imposed the 'gumboot' rule.

40. The primary purpose of this rule was to prevent injuries due to slips. One self-evident difficulty with the application of this rule is that the site is not flat and the water that accumulated is dirty. It was therefore difficult, if not impossible, for a worker to determine exactly how deep water was in any given area where a large volume of water had accumulated without walking into it.

41. The famous industrial psychologist, Professor James Reason, whose specialty is human error and accident prevention, has noted:

> *Violations [of rules or policies] are deliberate acts. People can weigh up the perceived costs and benefits of an act of non-compliance, and, when the benefits exceed the possible costs they are likely to violate… For many acts of non-compliance, experience shows that violating is often an easier way of working and brings no obvious bad effects. The benefits are immediate and the costs are seemingly remote and, in the case of accidents, unlikely.* [1]

42. These observations may well explain Paul's thought process shortly before the accident. As he must have seen it at the time, the benefits of clearing the drain [namely, preventing an overflow of leachate, consequential environmental damage, breach of regulations and possible prosecution by the EPA and even possible criticism by his employers] must obviously have outweighed the possible costs – *as he perceived them* – of breaching the 'gumboot' rule, namely, getting covered in filthy water and mud and rubbish.

43. Without previous experience of, or theoretical training regarding, the colossal forces that built up in the torrent of water and the pipe, Paul had no idea of the true risks involved. It seems likely that without the benefit of the expertise of someone like Professor Armfield, most people who had never experienced these forces would be similarly unable to perceive those risks. It is not common knowledge or common sense.

Were SITA's policies adequate to meet the circumstances of 24 March 2014?

44. On its face, the policy of not entering water that was deeper than gumboot height was clear and easy to comply with. Similarly, the 'Code Brown' rule that workers should take shelter during severe storms was clear and commonsensical.

45. The latent difficulty with these policies, however, was that they did not meet every exigency. No one anticipated a flood, and potential overflow of leachate, happening so fast and developing with the power that occurred on 24 March 2014. Therefore, SITA did not anticipate or prepare for the conflict between the policy of preventing leachate overflow by clearing drains and the 'gumboot' rule and 'Code Brown' rule of taking

[1] James Reason *The Human Contribution: Unsafe Acts, Accidents and Heroic Recoveries* Farnham, Surrey: Ashgate Publishing (2008) p57.

shelter. Paul had to make a choice between three conflicting rules or policies. He chose the one that had the greatest benefit to the company, and the community at large, placing himself at risk (although he misconstrued the magnitude and severity of that risk).

46. Had he obeyed the 'Code Brown' rule or the 'gumboot' rule, Paul's death would almost certainly not have happened on that day. But if he had not sought to clear the blockage in the drain, in the prevailing weather there was a very real possibility of leachate overflowing the bund with all the ramifications that would flow from that. For him, as a manager, for the company, and for the community, that was potential disaster, or, at the very least, a severe embarrassment. Being the good manager and good employee he was, he made the choice he did.

47. In doing so, however, his accident revealed the latent flaws in this group of policies, all of which were well-intentioned but which we can see, with the terrible clarity of hindsight, did not and could not work together under the extreme conditions in which Paul had to make his decisions.

48. Whether the risk was theoretically foreseeable or not, it was not foreseen and not guarded against.

Did SITA have a policy for monitoring weather conditions?

49. Whether or not there was a formal SITA policy or procedure for conducting weather checks, in practice SITA monitored and assessed weather conditions. According to Mr Pat Keating, the managers at the site did a daily weather check to anticipate forthcoming weather conditions. How much this was done according to a particular method is somewhat unclear.

50. More tellingly, however, the evidence showed that managers discussed weather conditions with each other as is shown by the conversation between Mr Keating and Paul which prompted Paul to check to conduct the check of the drain on 24 March that ultimately led to his death.

What caused Paul Smith to be sucked into the pipe?

51. Professor Steven Armfield is an expert in computational fluid dynamics. He offered his opinion as to the estimated forces working at the drain inlet where Paul was trapped

and further down the pipe towards the dam. In his report he considered the flow and forces involved in the length of pipe from the drain inlet to a junction about 500 metres down the pipe.

52. He explained in his report the mathematical process of his calculations:

> *Any stationary submerged object in a moving fluid, such as water flowing into the drain pipe, will experience a force acting in the direction of the flow, known as a drag force. That force is proportional to the density of the fluid, a cross-sectional area of the object in the plane to the normal flow direction, the square of the velocity of the flow, and a co-efficient that depends on geometry of the object and the velocity of the flow.*

53. He based his opinions on the application of that method to the the following assumptions which are, of course, not exact measurements but which appear to be reasonable estimates of the conditions prevailing on 24 March 2014.

54. They were: (a) that the drain pipe junction was open to the atmosphere; (b) that there were no internal flow restrictions in the pipe; (c) that the water height above the drain inlet was about one metre; (d) that the length of the pipe was about 500m; (e) that the free surface at the inlet was about five metres above the drain pipe junction free surface; and (f) that the pipe was a standard HDPE[2] pipe.

55. On those assumptions, he said that the initial velocity of water down the pipe in the first few seconds after a blockage is cleared will depend on whether the pipe is full of air or water. If full of water, the initial velocity would be about 10 metres per second and if full of air, about 4 m/sec. He estimated that after a short period of time, the velocity of water flow at the inlet would settle at full development at about 2 m/sec.

56. Using this method, on his calculations, at 10 m/s a person would experience a horizontal drag force of hundreds of kilograms equivalent. At 2 m/sec, the horizontal drag force would be in the order of 10-20 kg equivalent. Even for a fit strong man, a horizontal drag force of hundreds of kilograms would be impossible to resist. A horizontal drag force of 10 kg could be sufficient to cause a person to lose his or her footing depending on the slipperiness of the surface and other such relevant factors.

[2] High-density polyethylene

57. The forces acting on a person caught in a pipe due to the action of the initial horizontal drag force are also tremendous but depend on the state of fluid in the pipe. Professor Armfield explained that once the pipe is 'pressurised', that is, full of water from one end to the other, then a suction effect increases the force acting on the victim. He estimated that the total force acting on Paul once he was caught in the pipe was about 350 kg equivalent. Even if the pipe had been full of air, that is, 'unpressurised', the total force would have been about 70kg equivalent.

58. Given the enormous volume of water that fell on the Lucas Heights site on 24 March 2014 once the storm arrived, it is safe to assume that the pipe in which Paul became trapped was full of water and was therefore 'pressurised'.

59. In Professor Armfield's opinion, the hydraulic forces acting on Paul and preventing his workmates and those who arrived afterwards to assist were substantial. He stated in his report:

> *To apply a force of ~ 350kg, in exactly the right direction would, in my opinion, be extremely difficult in such an environment. Even the lower level of ~70kg would, in my opinion, be difficult to overcome.*

60. Professor Armfield also noted that:

> *A partial vacuum, that is a pressure below atmospheric, will be generated if the drain pipe remains full of water once the flow is blocked by Mr Smith. That will happen if the outlet at Drain 1 pipe at junction C is submerged. I believe that a scenario is possible in which the flow in Drain 2 is sufficient to maintain a pond at the pipe junction, and thereby submerge the outlet of the Drain 1 pipe. In that case the force acting on Mr Smith will be the higher level of ~350kg equivalent, as outlined above.*

61. To extract Paul from the pressurised pipe, therefore, would have required the application of more than about 350 kgs equivalent of force in exactly the opposite direction to the flow (or more than 350 kgs if the force was applied at a different angle), an impossible task in the circumstances despite the desperate efforts of Paul's workmates and other rescuers. Even the use of machinery, had it been able to be applied, would have been very difficult, if not impossible, because of the forces involved and the necessity to apply opposing forces in the correct direction. And, although it can

never be known, the use of machinery in this way may even have caused more harm to Paul than it was intended to prevent.

Could anything more have been done to prevent Paul's death?

62. This question implies at least two further questions or sub-issues: (a) could anything else have been done once he was trapped to rescue him before he died or suffered an irreversible hypoxic brain injury due to immersion in water? And (b), could anything more have been done systemically to reduce the risk to Paul?

63. The answer to the first question is that, to extract Paul, the suction effect within the pipe had to be reduced dramatically within the short time available before Paul suffered irreversible brain injury due to lack of oxygen (about four minutes). In his report, Professor Armfield commented on this possibility:

> *The important contribution of Drain 2 [which joined Drain 1 at junction C] in this case is to have a sufficient flow to keep the outlet of the Drain 1 pipe submerged, and I believe this scenario is possible. Senior Constable Casey hypothesised that, in this scenario, if the pressure were to be released between Inlet A and [junction] C, it would have been possible to rescue Mr Smith. In that case, based on my calculations, the force would be considerably reduced as hypothesised by Senior Constable Casey, however, I would note that, in my opinion, even the reduced lower force of ~70kg equivalent would still be difficult to overcome in such an environment.*

64. During the hearing, Professor Armfield expressed a pessimistic view about the possibility of releasing sufficient pressure to rescue Paul within four minutes. He said that if there were inspection ports or risers inserted above the drain, they might have been able to release some pressure if opened from the surface but said that the weight of water on Paul would still have been 'tremendous'.

65. Even if inspection ports or risers had been opened, given the volume of water that was pouring down the drains, it is seems probable that the junction would have been submerged and that therefore the pipe in which Paul was trapped would have remain either fully pressurised or almost fully pressurised. If so, this would have rendered rescue impossible.

66. The only other temporary solution immediately available may have been to give Paul a length of hose or something similar as a kind of improvised snorkel. Unfortunately, although Mr Grant Lee tried to find something that could be used, he was unable to do so.

67. The question of systemic protection and safe systems is therefore the key issue here. During the hearing, Mr Ross Brown, an expert hydraulic engineer first engaged by Workcover to report on the incident, made the very strong point that industry standards relating to the design of drains, sewers and like systems tend to be focussed on questions of efficiency rather than safety. He also emphasised that, in the wider community, there is a general lack of appreciation of the safety risks relating to drainage. Professor Armfield, in agreeing, and reminding us that a cubic metre of water weighs a tonne, stated that 'people tend to underestimate the power of water'. This is why people get washed away in large vehicles trying to cross flooded causeways, he said.

68. Neither Mr Brown nor Professor Armfield were aware of any national or international standards or guidelines for safe as well as efficient design in drainage systems. While Mr Brown saw value in, and a need for, guidance in relation to the safe design of drainage systems, both he and Professor Armfield were sceptical about the utility of attempting to develop general Australian Standards because of the wide range of site specific variables that arise.

69. In Professor Armfield's opinion, because of the forces involved in controlling large volumes of water, it is impossible to eliminate risk entirely by design. In his view, the better approach is to manage the inherent risks by a combination of appropriate risk assessment, design features in specific sites and safe work practices.

70. Mr Brown's view was that, rather than general design standards, site specific risk assessment and design is the key to addressing the design component of managing the risks associated with drainage of large volumes of water.

71. While a number of alternative methods of clearing water, such as powerful pumps, were considered during the hearing, three lessons emphasised by Professor Armfield appear to me to be the key to proper management of situations like that which arose on 24 March 2014:

72. First, in the circumstances there was no safe and better alternative method of clearing the blockage. In the environment that prevailed at the time, the only safe thing to do was to stay out of the water. (In the conditions prevailing at the time – torrential downpour of rain, high winds – it is not clear that attempting to clear the drain could have been carried out from above or beside the drain inlet without a worker being placed at risk of falling into the water and therefore being at risk of being sucked into the pipe.)

73. Second, management needs to give precise directions to people as to what they are to do in such situations and the people have to be given the means to comply.

74. I would add that mere directions may be insufficient if the reasons for the directions are insufficiently clear or are not understood by the recipients of the directions. In this case, as discussed above, SITA had given an instruction that workers were not to go beyond gumboot depth. But it had not clarified (a) the full range and magnitude of the potential risks if the rule was disobeyed nor (b) resolved the conflict between the rules that applied in this situation.

75. This leads to the third lesson that can be drawn from Professor Armfield's evidence: that SITA needed to understand and assess the nature and potential gravity of the various risks that might arise in cases of torrential storms and consider their alternatives for dealing with those risks.

76. Clearly SITA was aware of the potential for severe storms to occur. It was also aware that a rapid build-up of large volumes of water on the upper pad could occur – that was why it (or its predecessors) had installed a drainage system and surrounded the area with a high bund. It was also aware of the fact that the drains could easily become clogged and even blocked by detritus: that was why it had built guards around inlets and had regular inspections of the inlets. It was also aware of some degree of risk to workers if they worked in accumulated water although it appears that no one involved in the management of the site, least of all Paul, had any comprehension of the dangers of working close to the inlets of drains in such situations.

77. Indeed, without previous experience or training of some appropriate kind, how could they have had? Paul and his colleagues managing the site were not hydraulic engineers or specialists in computational fluid dynamics. They had not had the experience of dealing with a storm of such magnitude and ferocity before at this site. They were therefore not capable of conducting a full and accurate risk assessment of the site by

themselves. As a result of this incident, SITA engaged experts to conduct that sort of assessment. (Their reports are privileged and were not tendered in evidence in the inquest.)

78. As a result, presumably, of receiving those reports but also of hearing the expert evidence of Professor Armfield and Mr Brown and the accounts of other eyewitnesses, SITA is now in a much better position than it was before 24 March 2014 to assess and manage the risks of the site. The point here, however, is that *because* its site managers were not experts in risk assessment of the complex fluid dynamics of thousands of tonnes of water accumulating very quickly on the top pad, there was a need for expertise to be brought in from outside that management team if the true nature and magnitude of the risks on the site were to be adequately assessed.

79. I acknowledge that these comments are made with the perfect vision of hindsight. I do so not, as is done in a civil suit, to sheet home liability for the accident but so that the lessons of Paul's death can be fully absorbed and remembered. In my view, a full and accurate risk assessment would have considered the scenario that actually arose and SITA would then have considered its alternatives and made relevant decisions, none of which would have included a worker clearing the blockage in the way Paul did.

80. For example, SITA might have decided to install more drains from the top pad to the dam. It might have raised the bund height. It might have made arrangements that front-end loaders or other machines would build a temporary bund across the access road to ensure that the top pad became a dam itself until the event was over and could be safely managed. It might have built better guards across the inlets of drains (as it did later). It might have sought to renegotiate the conditions of operating the site with the EPA so as to take account of the possibility of an overflow of leachate into the stormwater system in a 1-in-100 year storm. Numerous other possibilities could be considered.

81. Sadly, it took the death of Paul to bring all of this home to the company.

Responses to Paul Smith's death

82. Both SITA and Workcover (now Safework NSW) responded to this tragedy immediately. As previously noted, Workcover conducted a full investigation. It also issued improvement notices to SITA requiring that it institute and document a safe system of work for clearing blockages from the drainage system. It also posted a safety warning

on its website which is monitored by relevant industries, companies, unions and other relevant bodies.

83. Mr Dyster, in the affidavit referred to above, outlined the changes that were made at the Lucas Heights site as a consequence of Paul's death. In summary, SITA reviewed its ERP and procedures and issued a national safety alert to all SITA staff concerning changes it had made to its policies and procedures following that review.

84. The key amendment to the ERP was to delete the 'gumboot' rule. The effect of that amendment was to prohibit entry of workers into floodwaters. SITA also conducted training sessions concerning the amended ERP.

85. More positively, following consultation with relevant workers, SITA issued new instructions concerning the clearing of drains.

86. It also installed a jetty platform over the drain inlet to enable workers to check and clear drains from a distance. It installed a screen and headwall arrangement over the relevant drain to guard against workers entering the drain opening. It also reviewed all its drains, starting at the Lucas Heights site and progressing across all its NSW sites. The review identified drain and pipe outlets at Lucas Heights that required protective guards. Headwalls, screens, safety railings and gratings have been installed at Lucas Heights since the incident.

87. According to Mr Dyster, the review of other sites in NSW disclosed no risk of the type that developed at Lucas Heights. The question that remains open, however, is the degree of expertise with which that review was conducted across NSW. I accept that SITA is a safety conscious organisation. Paul's admirable approach to safety was probably emblematic of its overall safety culture. Its EQS managers, however, like Paul, we may assume, are not professors of computational fluid dynamics and therefore may not be qualified to assess 'unknown unknowns' when it comes to some of the risks that may be latent on SITA's sites.

Can and should more be done?

88. In my view, SITA should engage an independent expert, such as Professor Armfield, to inspect at least its four other organic recycling sites, and any other sites from which it large volumes of water may need to be drained, to report on any serious potential or

latent risks of the type that developed at Lucas Heights on 24 March 2014 in extreme weather conditions.

89. Second, SITA, in my view, needs to develop a specific plan for dealing with the problem of the rapid build-up of leachate fluids in extreme storms if the drainage system becomes blocked or overwhelmed by the volumes of stormwater. It is now common knowledge that climate change is real and the consequences are still developing and are not yet fully known. One thing that is very clear, however, is that extreme weather events are becoming more common and more extreme. This needs to be planned for.

90. This means, at the very least, that EQS policies should be carefully reviewed and, if necessary, 'war-gamed' to eliminate as far as possible latent conflicts between policies, such as arose in this case. How will SITA both prevent workers exposing themselves to hazard in extreme weather events *and* prevent leachate spilling over into the environment in such events? That needs to be planned for and managed when it happens as it inevitably will.

91. Third, it is common human experience that safety warnings and the like can become so routine that they lose impact. We tire of being in a state of vigilance against dangers that rarely materialise. Safety procedures and checklists can become 'tick-a-box' exercises. Workplace safety managers can become so concentrated on compliance with rules and regulations that the reason for those rules and regulations and checklists can be forgotten. The key to workplace safety is not rules or policies as such but mindfulness of risk and care in respect of those risks. That is what real safety culture is about. As Professor James Reason puts it [3]:

> *Since catastrophic failures are rare events in well-defended complex systems, collectively mindful organisations work hard to extract the most value from what little incident and accident data they have. They actively set out to create a reporting culture by commending, even rewarding, people for reporting their errors and close calls. They work on the assumption that what seems to be an isolated failure or error is likely to come from the confluence of many upstream contributing factors. Instead of localising failures, they generalise them. Instead of applying local repairs, they strive for system reforms. They do not take the past as an infallible guide to the future. Aware that system failures can take a variety of yet-to-be-encountered forms, they are continually on the lookout for 'sneak paths'*

[3] Reason (2008) pp 240-241.

or novel ways in which active failures and latent conditions can combine to defeat or bypass the defences, barriers and safeguards. In short, collectively mindful organisations are preoccupied with the possibility of failure.

92. SITA might consider how to combat the tendency of its workers (like others in the community) to underestimate the power of water forces. In relation to water safety specifically, it is one thing for SITA to institute a rule or procedure. It is another to bring the reason behind the rule to the forefronts of the minds of the people whose safety is at stake. In his report, Professor Armfield referred to two videos that graphically highlight the kinds of dangers about which he gave evidence. To repeat in another context the cliché that a picture speaks a thousand words, SITA EQS managers might consider watching and showing to its workforce (or those who work at Lucas Heights or sites like it) those videos. [4] (Naturally, those familiar with what happened to Paul at Lucas Heights on 24 March 2014 have a very high sensitivity to this risk and may not wish to view such a video.)

93. SITA's ERP also requires clarification concerning decision-making and 'Code Browns' (and perhaps other aspects of the ERP). If a 'Chief Warden' is nominated at the person who makes decisions concerning 'Code Browns' and other emergencies, it seems that either every site should have a Chief Warden or that, in the absence of a Chief Warden, there should be a line of delegation downwards so that there is a nominated decision-maker on site for this purpose.

94. During the course of the evidence, a machine operator, Mr Glenn Sayers stated that radio coverage of the Lucas Heights site was incomplete. This evidence was disputed by Mr Ross. Because the issue was a new one and did not directly relate to Paul's death, and because the evidence was equivocal and there may be a number of technical explanations, I do not propose to make any specific recommendation to SITA concerning it other than to draw the concern raised by Mr Sayers to its attention. If it is a live issue, however, no doubt it will be addressed. In any event, as was explained, there is

[4] www.youtube.com/watch?v=JJeWB1bsieo & www.youtube.com/watch?v=fHT8tbiIlzA Note that the second of these videos is very similar in some respects to Paul's case and should be viewed only with caution. It shows a man clearing a drain in a flooded road in Brisbane. He is then sucked underwater and several men, including fire fighters and other emergency workers, struggle to rescue him. The man was able to be rescued due to the fact that fire trucks were on site and able to pump enough water out to enable the victim's head to be lifted above water level but it was very close-run thing. It graphically demonstrates both the power of the forces involved in flooded drains and the common under-estimation of the risk that such situations entail. The first video shows a boy being sucked down into stormwater drain in Brazil. Fortunately he is small enough for him to go the short length of the drain without becoming wedged into it and the drain is short enough for him to go through in seconds. For him it was an exciting event.

uninterrupted coverage to the weighbridge office which does have complete coverage of the site.

95. On the broader issue of drainage standards and design, I accept the opinions of Mr Brown and Professor Armfield that site specific design is necessary and that recommending that Standards Australia attempt to develop national standards is unlikely to be a useful or practical exercise. On the other hand, Mr Brown considered that the Queensland Urban Drainage Manual[5] was an excellent model of guidelines for designing of drainage systems. I contemplated recommending that relevant industry bodies, such as Safework Australia, the EPA, the Department of Local Government and so on consider adopting or developing such guidelines but came to the view that this was beyond the scope of this inquest, especially as those bodies had not sought leave to appear or been invited to appear.

96. Finally, the people who sought to rescue Paul themselves experienced a shocking ordeal. There can be few more distressing experiences than to work as hard as they did in filthy conditions that entailed the real possibility of physical injury to themselves, as well as the psychological trauma they certainly appear to have suffered, only to fail to rescue a much admired workmate. The Royal Humane Society recognises acts of bravery undertaken in attempts to save human life. I propose to nominate those who struggled to rescue Paul for an award or commendation by the Society. They are Daniel Malone, Dennis Maher, Damien McPherson, Grant Lee, Glenn Sayers, Marcas Axisa, Romulo Adonis and Constable Darren Sinton.

97. Government agencies to which a coroner makes recommendations are required to provide responses to the Attorney-General within six months. No such requirement is imposed on non-government organisations. I therefore request that SITA provide its response to the recommendations I make below on a voluntarily basis within six months.

Conclusions

98. The forces of nature are impersonal and do not take into account the characters of human beings who encounter them. Nevertheless, it is natural and perhaps inevitable that human beings cannot help but feel that when good people like Paul Smith are killed by natural forces that it is unjust that such a decent and lovable man should die this way.

[5] See 2013 edition: https://www.dews.qld.gov.au/__data/assets/pdf_file/0008/78128/qudm2013-provisional.pdf

99. An English writer who knew the feelings that such a death provoke in us once wrote [6]:

> *But for [grief] there is no remedy provided by nature; it is often occasioned by accidents irreparable, and dwells upon objects that have lost or changed their existence; it requires what it cannot hope, that the laws of the universe should be repealed; that the dead should return, or the past should be recalled.*

100. But because we cannot repeal the laws of the universe, or turn time backwards, it is so important to learn the lessons of a death like Paul's so that others may be prevented and that other families do not suffer the same loss and pain that the Smith family has. Although it is not the way he would have wanted to keep his friends and his workmates safe from the harm he suffered, Paul's death has led and will continue to lead to his workplace being safer for others.

101. Although there is, in my opinion, no such thing as 'closure' – and it would be presumptuous of a coroner to suggest that an inquest can provide it if there were – I hope that Paul's family may take some small measure of comfort from the fact that he has left a legacy for his friends and those who may never know him but who will work more safely at the SITA site in future.

102. I also hope that they will accept the very sincere condolences of the whole of the coronial team and the Coroners Court. While we never knew Paul in life, we have been privileged to be introduced to him through them.

Findings s 81 Coroners Act 2009

103. I find that Paul Smith died on 24 March 2014 at the SITA Organic Resource Recovery Park in Lucas Heights, New South Wales by drowning due to immersion in stormwater while clearing a blocked drain in which he then became trapped during a severe storm.

Recommendations

104. I make the following recommendations to SITA Australia Pty Ltd:

105. That SITA engage an independent expert in fluid dynamics to inspect and assess its organic waste recycling facilities, and any other sites from which it large volumes of water may need to be drained, to report on any serious potential or latent risks of the

[6] Samuel Johnson *Selected Essays* London: Penguin (2003) p.121

type that developed at the Lucas Heights site on 24 March 2014 during severe storm conditions.

106. That SITA develop with all reasonable speed a specific plan for dealing with the problem of the rapid build-up of leachate fluids in extreme storms if the drainage system becomes blocked or overwhelmed by the volumes of stormwater, bearing in mind the well-reported scientific evidence and opinions that climate change is real and will, over time, lead to increasing frequency and severity of storms.

107. That SITA review all EQS policies to eliminate latent conflicts between policies that apply in severe weather conditions.

108. That SITA EQS management consider how collective mindfulness of serious risk (as described by Professor James Reason – see above) can be promoted and encouraged within its corporate safety culture and workplace safety training programs and procedures. In particular, I recommend that SITA consider instituting a water safety risk mindfulness training program including the showing of appropriate videos or other visual demonstrations of such risks for EQS staff and workers potentially exposed to water safety risk.

109. That SITA clarify the Emergency Response Plan to ensure that there is always a person on each SITA site delegated the authority to call a 'Code Brown' in relevant circumstances.

110. I request that SITA provide its response to these recommendations within six months of the date of these findings and recommendations.

Magistrate Hugh Dillon
Deputy State Coroner