



# Pollution Incident Reduction Plan

Annex of tables and figures

July 2024

from  
**Southern  
Water** 

## Annex - Pollution Incident Reduction Plan, July 2024

### Tables and figures

Tables .....	3
Table 3: Newcomer sites by Asset Class 2023.....	3
Table 4: Repeat sites by Asset Class 2023 .....	3
Table 5: 2023 PIRP Delivery RAG status .....	4
Table 6: Effectiveness of Previous Interventions in 2023.....	4
Table 7: SLM density and environmental risk model .	5
Table 8: The 2024 PIRP coverage for total pollutions and the link between root cause insights to actionable plan.....	5
Table 9: 2023 Serious pollutions .....	6
Table 10: 2024 PIRP coverage for serious pollutions and the link between root cause insights from each specific serious pollution into an actionable plan. ....	6
Table 11: Planned Interventions for Clean Water .....	7
Table 12: 2024 PIRP Summary with expected benefit range .....	7
Table 13: 2024 PIRP Leading KPIs and Measures of Success .....	7
Figures .....	8
Figure 3: 2023 Asset Performance vs rainfall .....	8
Figure 4: 2022 & 2023 Weekly rainfall vs deviation to average pollution run rate .....	8
Figure 5: 2022 & 2023 Weekly long-term temperature deviation vs deviation to average pollution run rate ...	8
Figure 8: Clean Water Pollutions 2019 to 2023 .....	9
Figure 9: 2023 PIRP benefits forecast vs actual from January to December 2023 .....	9
Figure 10: Satrix models.....	9
Figure 11: 2019 to 2023* Root cause vs total Category 1-3 pollutions.....	10
Figure 14: Human Factors root causes.....	10
Figure 15: An analysis of Category 1 to 4 pollutions and their distribution within the 14 river catchments over 2023.....	11

Figure 16: The pollution process (simplified for casual assessment) ..... 11

Figure 25: 2023 Serious Pollution Root cause..... 11

Figure 26: Catastrophic and Chronic Serious Pollution Prevention, Detection and Response Root Causes for Failure Mode..... 12

Figure 28: The glide path..... 12

## Tables

Table 3: Newcomer sites by Asset Class 2023

Premise	No. Newcomer Sites	Total Sites	%
Rising Main	13	25	52%
Foul Sewers	78	85	92%
Wastewater Pumping Stations	22	56	39%
Wastewater Treatment Works	5	27	19%
<b>Wastewater Summary</b>	<b>118</b>	<b>193</b>	<b>61%</b>

Table 4: Repeat sites by Asset Class 2023

Premise	No. Repeat Sites	Total Sites	%
Rising Main	4	25	16%
Foul Sewers	4	85	5%
Wastewater Pumping Stations	22	56	39%
Wastewater Treatment Works	19	27	70%
<b>Wastewater Summary</b>	<b>49</b>	<b>193</b>	<b>25%</b>

Table 5: 2023 PIRP Delivery RAG status

Task Name	Project Description	Start	Finish	Total Cat3 Benefits	RAG Status	2023 Phased Cat3 Benefits
ASSET RESILIENCE	Platinum Health Check Remedials 52 sites	01.04.2022	31.10.2023	38	Green	29
ASSET RESILIENCE	WPS Resilience	01.05.2023	31.12.2023	34	Green	9
ASSET RESILIENCE	Generator Alarm Upgrades	01.05.2023	31.12.2023	5	Green	5
ASSET RESILIENCE	Storm Eunice Sites Auto-Resets	16.04.2023	31.10.2023	3	Green	3
ASSET RESILIENCE	Whole Network Permit Compliance	01.07.2022	30.01.2025	2	Green	2
3 LINES OF DEFENCE	Pumping Station Risk Viewer	03.10.2022	29.03.2024	21	Green	21
3 LINES OF DEFENCE	Human Factors (People & Process Improvements)	03.10.2022	31.12.2023	9	Green	8
3 LINES OF DEFENCE	FYLD Pollution Response App	01.01.2023	31.12.2023	6	Green	4
3 LINES OF DEFENCE	Sewage Pump Performance Testing	01.04.2023	29.03.2024	6	Green	8
3 LINES OF DEFENCE	Storm Pump Testing	01.12.2022	31.03.2024	3	Green	0
3 LINES OF DEFENCE	SCO and CPAC Process Systemisation	01.11.2022	03.04.2023	2	Yellow	2
ESCAPE PREVENTION	Network Digitalisation	01.01.2023	30.09.2023	18	Yellow	15
ESCAPE PREVENTION	Rising Main Calming	01.01.2023	31.12.2023	15	Green	10
ESCAPE PREVENTION	Root Ingress Surveys & Remedials	01.01.2023	31.12.2023	3	Green	3
ESCAPE PREVENTION	Condition-based Sewer Cleaning	01.06.2023	31.01.2024	3	Yellow	0
ESCAPE PREVENTION	Rising Main Burst Detection (Proof of Concept)	01.01.2023	31.12.2023	1	Green	0

Table 6: Effectiveness of Previous Interventions in 2023

Initiative	Premise	Pollution Reduction No.
Platinum Health Check Remedials 52 Sites	WPS	19
WPS Resilience (including 1st time fix)	WPS	2
Storm Eunice Sites Autoresets	WPS	2
Focus on Repeats	WPS	19
Blackstart Programme (2022 flow through)	WPS	8
Pump Autoreset system (2022 flow through)	WPS	5
Pumping Station Risk Viewer	WPS	13
Wet Well Cleaning (2022 flow through)	WPS	6
	<b>WPS Total</b>	<b>75</b>
Network Digitalisation	FS / CSO	-
Root Ingress Surveys and Remedials	FS / CSO	-
	<b>FS / CSO Total</b>	<b>-</b>
Focus on Repeats	RM	3
Operational HIT Team	RM	3
FYLD Pollution Response App	RM	2
Rising Main Calming	RM	1
	<b>RM Total</b>	<b>9</b>
Compliance Focus	WWTW	11
Storm Readiness	WWTW	16
Blackstart Programme (2022 flow through)	WWTW	4
Focus on Repeats	WWTW	18
	<b>WWTW Total</b>	<b>49</b>

Table 7: SLM density and environmental risk model

Manhole Pollution Criticality Factor	Version	Minimum Distance Threshold (Node distance from criticality factor)	Maximum Distance Threshold (Node distance from criticality factor)	Threshold Distance Unit	Target Density	Number of Nodes (Foul, Operational, Manholes) within Specified Threshold	Number of Nodes within Specified Threshold, SLM Currently Installed	% of Nodes currently installed within Specified Thresholds	Number of Nodes (Foul, Operational, Manholes) within Specified Threshold, No SLM Currently Installed	Number of Nodes (Foul, Operational, Manholes) within Specified Threshold, With install density
Distance from watercourse & Impact == T	1	0	20	m	100%	7229	2146	30%	5083	5083
	2	20	30	m	75%	3435	522	15%	2913	2185
	3	30	50	m	50%	6585	1014	15%	5571	2786
Distance from Surface Water System	1	0	2	m	0%	5945	311	5%	5634	0
	2	1	5	m	0%	45010	2542	6%	42468	0
	3	5	10	m	0%	24327	1430	6%	22897	0
Distance from RAMSAR	1	0	1	m	100%	306	34	11%	272	272
	2	1	5	m	75%	208	19	9%	189	142
	3	5	10	m	25%	252	23	9%	229	57
Distance from SAC	1	0	1	m	100%	374	33	9%	341	341
	2	1	5	m	75%	213	19	9%	194	146
	3	5	10	m	25%	236	18	8%	218	55
Distance from SSSI	1	0	1	m	100%	812	61	8%	751	751
	2	1	5	m	75%	479	50	10%	429	322
	3	5	10	m	25%	577	43	7%	534	134
Distance from Chalk River	1	0	5	m	100%	166	39	23%	127	127
	2	5	10	m	75%	155	34	22%	121	91
	3	10	20	m	25%	342	72	21%	270	68
Distance from SPA	1	0	1	m	100%	363	33	9%	330	330
	2	1	5	m	75%	228	21	9%	207	155
	3	5	10	m	25%	258	24	9%	234	59
Distance from Bathing Water	1	0	5	m	100%	3	0	0%	3	3
	2	5	10	m	75%	4	1	25%	3	2
	3	10	20	m	25%	28	1	4%	27	7
<b>Total</b>		-	-	-		<b>97535</b>	<b>8490</b>	<b>9%</b>	<b>89045</b>	<b>13113</b>

Table 8: The 2024 PIRP coverage for total pollutions and the link between root cause insights to actionable plan

Root Cause Insights	Project Description	Catastrophic				Chronic			Response		
		Electrical, Mechanical & ICA	Burst	Alarm Interpretation	Not Interrogating Other Data Sources	Blockage	Infiltration & Hydraulic Overload	Insufficient Data to Detect Issues	Delays in Escalation	1st Responder Limitations	Insufficient response
Catastrophic Prevention	WPS Resilience incl. Advanced Back Up Control										
	WWTW Flow Compliance - Inlet Penstock Related Issues										
Catastrophic Detection	Rising Main Calming - Phase 2										
	Proactive system in Control (Sentrix) to Detect Emerging Risks & Issues										
	SLM Data Frequency Optimisation										
Chronic Prevention	Rising Main Burst Detection Model										
	Asset monitoring using Samotics CBM System										
	Customer Engagement Strategy for FOG & Unflushables										
	Groundwater I&I Model, Planning Process & Remedials										
Chronic Detection	G2G Agile WWTW Pollution Improvement										
	Final Effluent Early Warning Model										
	Pollution Spotter & Customer Journey Improvements (Self-Reporting)										
Incident Response	Control Room Pollution Awareness, RAID & Playbooks										
	WW Incident Management Improvement Plan										
	Pollution High Impact response team										
	<b>Total</b>										

Table 9: 2023 Serious pollutions

Site Name	Pollution Category	Date	Asset Type	Cause
Fullerton WTW	Cat 2	08/03/2023	WTW	Sludge management
The Derrings Lydd RM	Cat 2	21/04/2023	Rising main	Burst rising main
Vale Rd, St Leonards on sea FS	Cat 2	14/05/2023	Foul Sewer	Blockage - RAG
Land at Northwood Farm, Burndell FS	Cat 2	16/05/2023	Rising main	Burst rising main
Shripney WPS, South Bersted	Cat 2	17/05/2023	WPS	Non-compliant release. Flow management
Stubbs Lane Brede FS	Cat 2	10/08/2023	Foul sewer	Blockage - RAG
Lyndhurst Golf Club RM	Cat 1	13/08/2023	Rising Main	Burst rising main
Lyndhurst WTW	Cat 1	14/08/2023	WTW	Incident management
Hartfield Rd, Forest Row FS	Cat 1	30/08/2023	Foul sewer	RAG blockage
Tile Kiln Hill WPS	Cat 1	12/09/2023	WPS	Loss of power to site
The Annex Graffham FS	Cat 2	06/10/2023	FS	Blockage – RAG, FOG, Roots
Salterns Road Hillhead WPS	Cat 2	27/10/23	WPS	Site Flooding
Gold Road Deal RM	Cat 2	28/10/23	RM	Burst rising main

Table 10: 2024 PIRP coverage for serious pollutions and the link between root cause insights from each specific serious pollution into an actionable plan.

Root Cause Insights	Project Description	Start	Finish	WWTW		WPS			Rising Mains				Foul Sewers				
				Fullerton WTW	Lyndhurst WTW	Shripney WPS	Tile Kiln Hill WPS	Salterns Road Hillhead WPS	The Derrings Lydd RM	Bognor Regis RM	Lyndhurst Golf Club RM	Gold Road Deal RM	Vale Rd, St Leonards on Sea	Stubbs Lane Brede	Hartfield Rd, Forest Row	The Annex Graffham	
Catastrophic Prevention	WPS Resilience incl. Advanced Back Up Control	Mar-24	Dec-24														
	Rising Main Calming - Phase 2	Jan-24	Dec-24														
Catastrophic Detection	Proactive system in Control (Sentrix) to Detect Emerging Risks & Issues	Jan-24	Aug-24														
	SLM Data Frequency Optimisation																
Chronic Prevention	Rising Main Burst Detection Model	Feb-24	Dec-24														
	Asset monitoring using Samotics CBM System	Feb-24	Aug-24														
Chronic Detection	Final Effluent Early Warning Model	Apr-24	Aug-24														
	Pollution Spotter & Customer Journey Improvements (Self-Reporting)	Feb-24	Dec-24														
Incident Response	Control Room Pollution Awareness, RAID & Playbooks	Nov-23	Aug-24														
	W/W Incident Management Improvement Plan	Mar-24	Dec-24														
	HIT - Pollution Responders	Apr-24	Jul-24														

Table 11: Planned Interventions for Clean Water

Root Cause Insights	Project Description	Start	Finish
Detection	Situational Awareness - Upgrade to Waternet Pro in the OCC	May-24	Dec-24
	Situational Awareness - Smart systems integration for Water and Waste	TBC	AMP8
Prevention	Stopping Large Incidents - Asset Commissioning Process	Aug-24	Feb-24
	Safe Control of Operations (SCO) Improvements	Jan-24	Sep-24
Response	Training Improvements - clarity on roles, responsibilities and process improvements	Jun-24	Dec-24
	Pollution Containment - ensuring response teams have effective equipment to reduce the impact of pollutions	Aug-24	Feb-25

Table 12: 2024 PIRP Summary with expected benefit range

Root Cause Insights	Project Description	Start	Finish	Total Cat3 Benefits	Phased Cat3 Benefits 2024
Catastrophic Prevention	WPS Resilience incl. Advanced Back Up Control	Mar-24	Dec-24	11	4
	WWTW Flow Compliance - Inlet Penstock Related Issues	Mar-24	Dec-24	5	2
	Rising Main Calming - Phase 2	Jan-24	Dec-24	3	2
Catastrophic Detection	Proactive system in Control (Sentrix) to Detect Emerging Risks & Issues	Jan-24	Aug-24	5	2
	SLM Data Frequency Optimisation	Feb-24	Jun-24	4	1
	Rising Main Burst Detection Model	Feb-24	Dec-24	2	1
Chronic Prevention	Asset monitoring using Samotics CBM System	Feb-24	Aug-24	8	4
	Customer Engagement Strategy for FOG & Unflushables	Mar-24	Dec-24	5	3
	Groundwater I&I Model, Planning Process & Remedials	Jan-24	Oct-24	9 - 4 (wet/dry year)	3 - 1 (wet/dry year)
Chronic Detection	G2G Agile WWTW Pollution Improvement	Mar-24	Nov-25	3	1
	Final Effluent Early Warning Model	Apr-24	Aug-24	5	2
Incident Response	Pollution Spotter & Customer Journey Improvements (Self-Reporting)	Feb-24	Dec-24	0	0
	Control Room Pollution Awareness, RAID & Playbooks	Nov-23	Aug-24	10	7
	WW Incident Management Improvement Plan	Mar-24	Dec-24	2	1
	Pollution High Impact response team	Apr-24	Jul-24	3	2
<b>Total</b>				<b>70</b>	<b>33</b>

Table 13: 2024 PIRP Leading KPIs and Measures of Success

No.	Task Name	Project Description	Leading KPIs	Measures of Success
1	Catastrophic Prevention	WPS Resilience incl. Advanced Back Up Control	Remedial works completed after sites have been surveyed and reviewed.	Reduction in pollutions from sites at beneficial use with all remedial works complete.
2	Catastrophic Prevention	WWTW Flow Compliance - Inlet Penstock Related Issues	Completion of remedial works and interventions following detailed site reviews.	Reduction in number of work orders raised for reactive inlet works.
3	Catastrophic Prevention	Rising Main Calming - Phase 2	Completion of installations against project forecast	Reduction in the number of burst rising mains
4	Catastrophic Detection	Proactive System in Control (Sentrix) to Detect Emerging Risks and Issues	Number of urgent alerts raised from the sites with static models applied.	Proactive work orders completed with before and after data to track accuracy of alerts.
5	Catastrophic Detection	SLM Data Frequency Optimisation	98% of urgent alerts reviewed within the agreed timeframe.	Completed proactive work orders with before and after data, reducing the severity of incidents and preventing pollutions.
6	Catastrophic Detection	Rising Main Burst Detection Model	98% of urgent alerts reviewed within the agreed timeframe.	Before and after data from proactive work orders completed, tracked to monitor false positives and confirmation of bursts.
7	Chronic Prevention	Asset Monitoring Using Samotics CBM System	Number of urgent alerts raised from Samotics SAM4 Health CBM monitors on 250 assets across both WPS and WWTWs.	Proactive work orders completed, reducing pressure on operational teams.
8	Chronic Prevention	Customer Engagement Strategy for FOG and Unflushables	Customers contacted by the Unflushable Team, through direct close contact, community presentations and soft contacts (emails etc)	Positive impact on customer behaviour, reducing the number of blockages cause by FOG and Unflushables.
9	Chronic Prevention	Groundwater I&I Model, Planning Process and Remedials.	Implementation of the Catchment Inflow and Infiltration Model in 6 full catchments.	Proactive interventions raised through usage of the model, increasing prevention of infiltration related pollutions.
10	Chronic Prevention	G2G Agile WWTW Pollution Improvement	Completion of intervention and remedial work following detailed site reviews.	Reduction in pollution incidents at the selected WWTWs in the 12 months following completion of works.
11	Chronic Detection	Final Effluent Early Warning Model	Working proof of concept on 6 WWTWs.	Completed proactive work orders, and subsequent prevention of pollution incidents.
12	Chronic Detection	Pollution Spotter and Customer Journey Improvements (Self-Reporting)	Activity, including clicks and pollution reports, via the updated Pollution Spotting website.	Improved self-reporting of pollution incidents.
13	Incident Response	Control Room Pollution Awareness, RAID & Playbooks	Production and role out of standardised checklists (playbooks), RAID and ABCs (Awareness, Behaviour and Controls).	Reduction in pollution incidents due to improved ownership and escalation by front line team.
14	Incident Response	WW Incident Management Improvement Plan	100% attendance to redesigned and re-deployed incident management training.	Improved incident management, and associated reduction in severity of pollution incidents through improved management.
15	Incident Response	Pollution High Impact Response Team	80% compliance agreed time frame for proactive work orders to be completed.	More timely response to pollutions, with a root cause mindset improving understanding of root causes of pollutions.





## Figures

Figure 3: 2023 Asset Performance vs rainfall

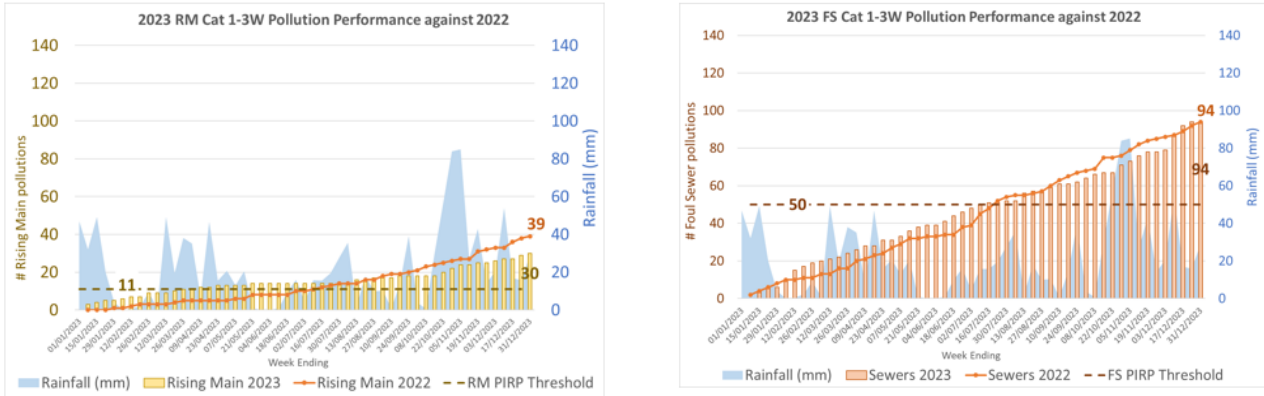


Figure 4: 2022 & 2023 Weekly rainfall vs deviation to average pollution run rate

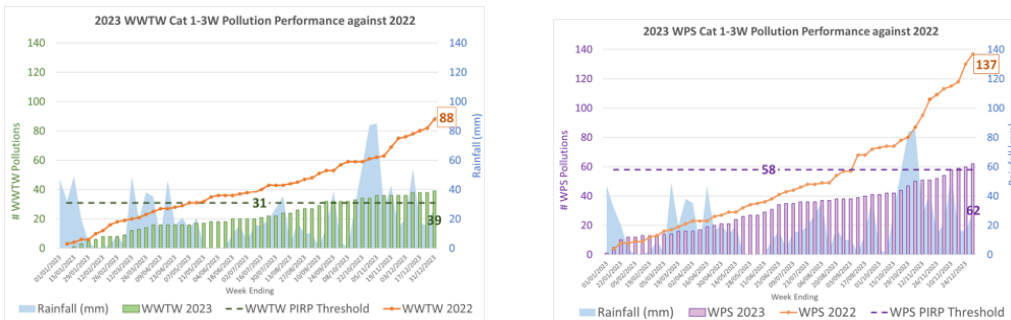


Figure 5: 2022 & 2023 Weekly long-term temperature deviation vs deviation to average pollution run rate

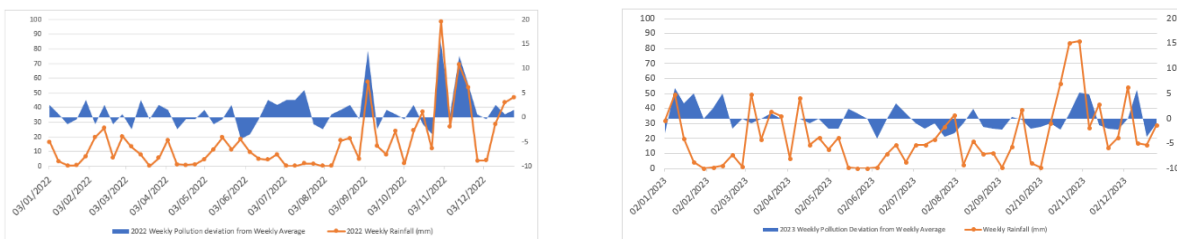


Figure 8: Clean Water Pollutions 2019 to 2023

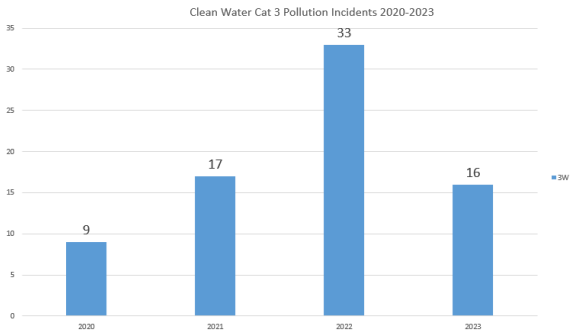


Figure 9: 2023 PIRP benefits forecast vs actual from January to December 2023

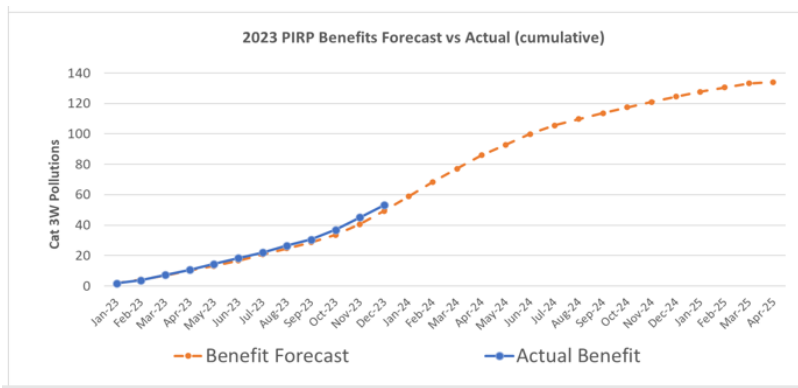


Figure 10: Sentries models

Figure 11: 2019 to 2023\* Root cause vs total Category 1-3 pollutions



Figure 14: Human Factors root causes

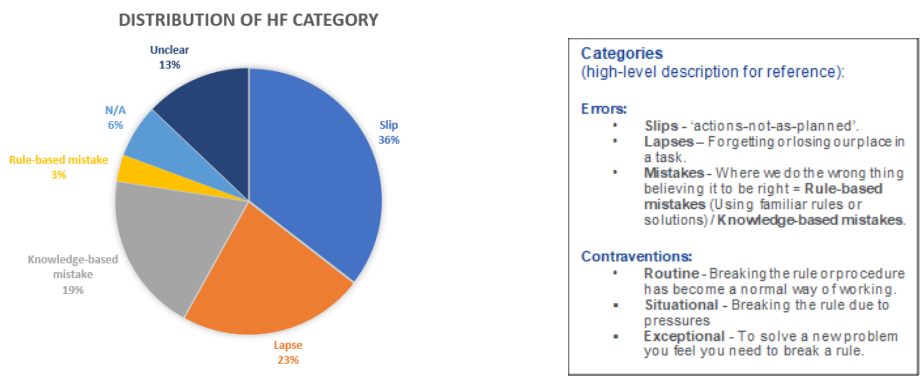


Figure 15: An analysis of Category 1 to 4 pollutions and their distribution within the 14 river catchments over 2023

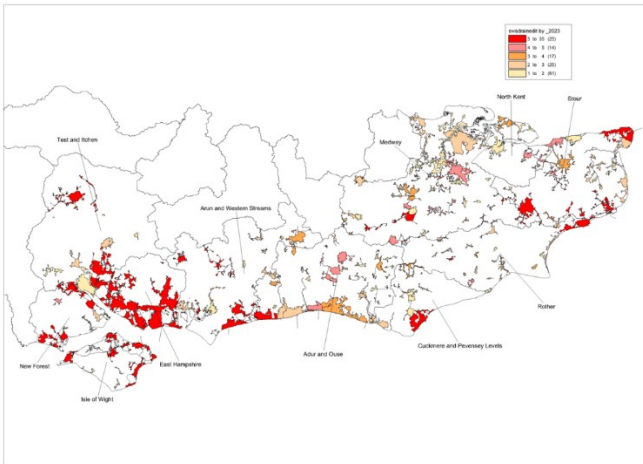


Figure 16: The pollution process (simplified for casual assessment)

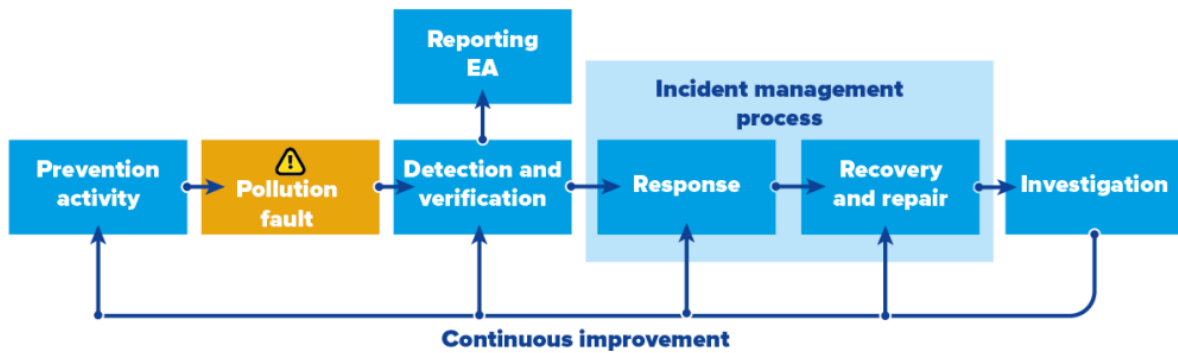


Figure 25: 2023 Serious Pollution Root cause

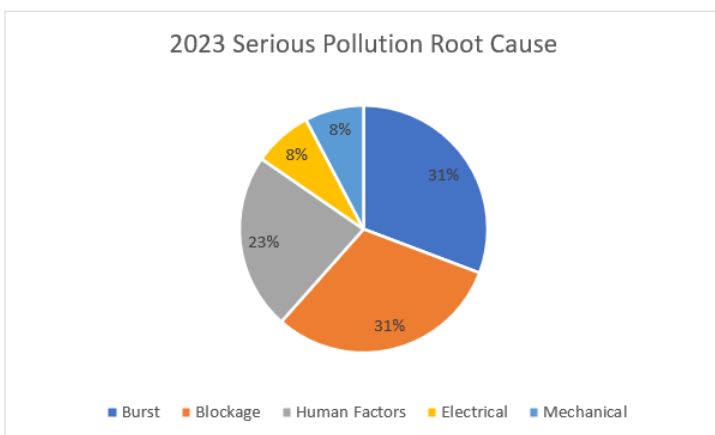


Figure 26: Catastrophic and Chronic Serious Pollution Prevention, Detection and Response Root Causes for Failure Mode

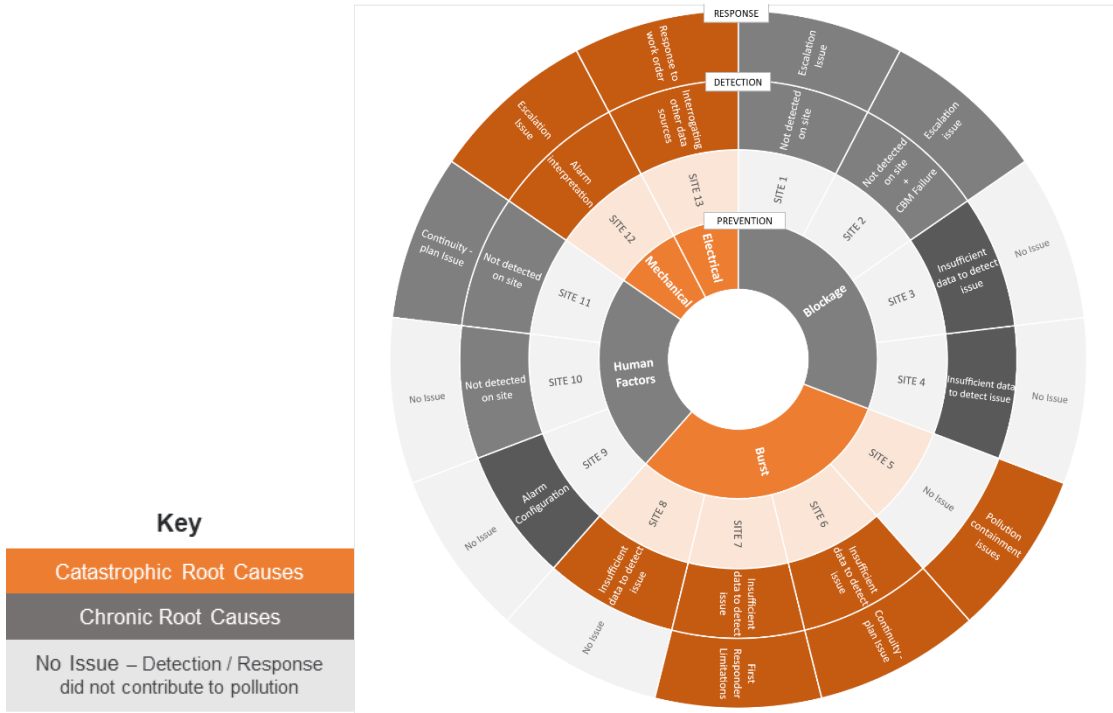


Figure 28: The glide path

