

Refinery Emergency Response Plan

Document No: EMERG/GUIDE/000135
Company: Astron Energy
Rev: 8
Date: 2023-10-194

Astron Energy (Pty) Limited Cape Town Refinery

Document Title: Refinery Emergency Response Plan (RERP)
Document No: EMERG/GUIDE/000135
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REFINERY EMERGENCY RESPONSE PLAN (RERP)

Version	Effective Date	Next Review Date	Document Authority Name	Position
8	2022		E. Mmesi	Chief Fire Officer

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APPENDIX 1.

APPENDIX 6. INCIDENT PRE-PLANS

These tactical plans are developed to help the specialist ground staff dealing with the emergency at hand. The plans identify the manpower, equipment and other resources required to deal with the incident, and graphically portray local hazards to be observed.

Generic off-site and on-site incidents highlighted through discussion with plant operating personnel and specialists that may give rise to Refinery Emergencies, are to be analysed using a high-level hazard assessment method per location (on-site and off-site areas). The hazard assessment draws on operating experience and corporate / industrial standards. It indicates the specific scenarios of each generic incident at a specific location, for which a detailed pre-plan should be developed.

The development of Incident Pre-plans specific to identified scenarios is anticipated to be an evolutionary process. Pre-plans being developed on a priority basis depend on the risk associated with that scenario.

Incident pre plans are available at the following link: <O:\REFALL\Pre-Plans>

The generic incidents identified for high level hazard assessment, to determine Pre-plan scenarios, have been identified as follows:

On-Site	
Location	Area/ Scenario
Process Operations	Zone 1
	Zone 2
	Zone 4
	Zone 5
	Flare Area
Blending and Shipping Area	Tank farm - Tank Fires
	Tank farm - Bund Fires
	Tank farm - Roof Sinking Incidents
	Separator Area
	TTLR- Road loading area
	LPG - TTLR
	Oil Spills
	Crude Oil Receiving Station (Spills/Fires)
	LPG Spheres
	Butane Bullet
Tank farm - Seal Fires	
Buildings & Workshops	Administration Buildings
	Workshops

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On-Site

Location	Area/ Scenario
	Laboratory
	Motor Control Centres
	Analyser Houses
	Canteen / Korean Clubhouse
	General Stores
	Chemical Storage Buildings
	Bulk Truck Rebuild Workshop fires
	Contractor Site fires
	Computer Back-up Centre

Off-Site

Location	Area
Refinery to Saldanha Bay	Crude Oil Shipping Line
Refinery to Cape Town Harbour	Product Shipping Lines
Saldanha Bay Harbour	Tanker Incidents (Fires/Oil Spills)
Cape Town Harbour	Tanker Incidents (Fires/Oil Spills at Eastern Mole or Tanker Basin)
Ballast Area Incidents	Crude Oil Booster Pump
	Slop Facilities
	Tanker Berth incidents

The following incident scenarios are addressed in the Pre Plans as applicable:

On-Site

Scenario	Area	Pre Plan Number
Fires	Jet Fires (Gas under pressure, Hydrocarbon liquids at high temperature and pressure)	PFP01
	Pool Fires (Hydrocarbons not at high pressure)	PFP01
	Flash Fires (Gas under pressure, Hydrocarbon liquids at high temperature and pressure)	PFP01
	Fireballs (Gas under pressure, Hydrocarbon liquids at high temperature and pressure)	PFP01
	Tank Fires (Atmospheric storage tanks)	PFP03
	Bund Fire	PFP04
Explosions	VCE (Gas under pressure)	PFP 02
	BLEVE (Liquid under pressure)	PFP 01
Toxic clouds gas	Hydrogen Sulphide	PFP 02
	Sulphur Dioxide	PFP 02
	Combustion products	PFP 02

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PFP 01: POOL / JET / LPG

POTENTIAL		MITIGATION ACTIONS
PEOPLE	<ul style="list-style-type: none"> MISSING PERSONNEL AND CASUALTIES WITH BURNS INJURIES OR INHALATION OF TOXIC FUMES. LIFE SAFETY HAZARDS TO SITE PERSONNEL COMMUNITY IMPACT OBSCURED VISIBILITY ON MAIN HIGHWAY 	<ul style="list-style-type: none"> SITE ALARMS, EVACUATE ALL PERSONNEL & CONFIRM MUSTERS EMERGENCY INSTRUCTION TO COMMUNITY NOTIFICATION TO LOCAL POLICE –ROAD CLOSURE & TRAFFIC DIVERSIONS. COMMUNITY TO STAY INDOORS, CLOSE WINDOWS, EVACUATE DENSE SMOKE AREAS.
ENVIRONMENT	<ul style="list-style-type: none"> SMOKE PLUME ENVIRONMENTAL IMPACT FIRE WATER RUN OFF 	<ul style="list-style-type: none"> PROMPT AND EFFECTIVE FOAM BLANKETING ACTIONS. WATER INLETS AND DRAINS MONITORED BY FIRE TEAM AND SPILL CONTAINMENT MEASURES IMPLEMENTED THROUGHOUT INCIDENT
ASSET	<ul style="list-style-type: none"> LIGHTWEIGHT EQUIPMENT AND STRUCTURES WITHIN 50M COULD FAIL IN 5 MINUTES HEAVYWEIGHT LARGE EQUIPMENT, THICK WALL PIPING AND HEAVYWEIGHT STRUCTURES WITHIN 50M COULD FAIL IN 10 MINUTES PREPARE FOR FAILURE OF ASSETS WITHIN 75M AFTER 30 MINUTES STRUCTURES WITHIN 100M WILL BE SERVERY WEAKENED AFTER 30 MINUTES 	<ul style="list-style-type: none"> EARLY ALARM BY OPERATOR FIRE AND GAS PANEL. DETECTION AND ACTIVATION OF RIM SEAL FOAM POURER FIRE SUPPRESSION SYSTEMS. ACTIVATION OF TANK SHELL PROTECTION DELUGE SYSTEM INITIATE TANK RECIRCULATION, GRAVITY TRANSFER OR BUND DRAINAGE
INCIDENT OBJECTIVES		INCIDENT STRATEGY
PEOPLE	<ul style="list-style-type: none"> RESCUE OF PERSONNEL IN THE IMMEDIATE AREA PROTECTION OF COMMUNITY CLOSURE OF ROAD AFFECTED BY SMOKE PLUME 	<ul style="list-style-type: none"> CONFIRM MUSTER NUMBERS AND IDENTIFY MISSING MOBILISE MEDICAL TEAMS NOTIFICATION TO THE LOCAL COMMUNITY, POLICE AND HIGHWAY AGENCY
ENVIRONMENT	<ul style="list-style-type: none"> CONFINEMENT OF FIREWATER RUNOFF IDENTIFICATION OF DRAINAGE SYSTEMS WITH POTENTIAL ROUTE TO UNCONTROLLED WATER SOURCE MONITOR AIR QUALITY EXTINGUISHMENT 	<ul style="list-style-type: none"> FIRE WATER MANAGEMENT, INCLUDING DEPLOYMENT OF CONTAINMENT EQUIPMENT DEPLOYMENT OF POLLUTION CONTROL EQUIPMENT ON & OFF SITE DEPLOY AIR QUALITY MONITORING & SAMPLING EQUIPMENT DEPLOYMENT OF FIREFIGHTING RESOURCES
ASSET	<ul style="list-style-type: none"> PROTECT VESSELS, SCE, STRUCTURES WITHIN THE RADIANT HEAT IMPACT RANGE MONITOR TANK FILL/DISCHARGE LEVELS. HYDROCARBON INVENTORY REDUCTION EXTINGUISH RIM SEAL FIRE BEFORE ESCALATING TO FULL SURFACE 	<ul style="list-style-type: none"> DEPLOY FIRE TEAM FOR RIM SEAL / FULL SURFACE FIREFIGHTING RESPONSE OPERATIONS TO MONITOR TANK LEVELS PRODUCT TRANSFER CAPABILITY FIRE TEAM TO ESTABLISH BOUNDARY COOLING ON IMPACTED ASSETS.
TACTICS		
APPROACH	OFFENSIVE	DEFENSIVE
<ul style="list-style-type: none"> <input type="checkbox"/> ACTIVATE FIRE PUMPS <input type="checkbox"/> APPROACH UPHILL AND UPWIND. <input type="checkbox"/> IDENTIFY & COMMUNICATE BEST ACCESS AND EGRESS ROAD BASED ON CURRENT WIND DIRECTION. <input type="checkbox"/> ASSESS RISK AND CHOOSE FAVOURABLE POSITION FOR FORWARD COMMAND POST & STAGING AREA. <input type="checkbox"/> TAKE NOTE WHEN PARKING FIRE VEHICLES, PARK OUTSIDE THE BATTERY LIMITS. <input type="checkbox"/> POSITION APPARATUS AT A SAFE DISTANCE AWAY FROM POSSIBLE HAZARDS SUCH AS RADIATING HEAT, STRUCTURAL COLLAPSE, CONSIDER PLACEMENT NEAR BLAST RESISTANT STRUCTURES FOR SHIELDING <input type="checkbox"/> BEWARE OF OVERHEAD POWER LINES WHEN POSITIONING APPARATUS. <input type="checkbox"/> FOAM EQUIPMENT SHOULD BE MADE AVAILABLE USING THE PIERCE CONNECTED TO THE FIRE WATER SYSTEM IN CASE THAT THE FIRE EXTENDS TO THE OUTSIDE AND CAUSES AN EXTERNAL GROUND FIRE AS WELL. <input type="checkbox"/> LIAISE WITH THE OSC FOR INCIDENT INFORMATION, INCLUDING DETAILS OF THE FORWARD COMMAND POST AND STAGING AREA. <input type="checkbox"/> CONDUCT A SIZE-UP ASSESSMENT REFER TO THERMAL CONTOURS MAPS <input type="checkbox"/> SELECT SAFE SYSTEMS OF WORK. 	<ul style="list-style-type: none"> <input type="checkbox"/> ENSURE THAT THE HOT ZONE CONSIDERS BOIL-OVER POTENTIAL SAFETY ZONE. <input type="checkbox"/> FOAM ATTACK SHOULD NOT BE STARTED UNTIL FOAM SUPPLY FOR THE TANK IS AVAILABLE. <input type="checkbox"/> ENSURE ONLY ONE ENTRY & EXIT INTO THE HOT ZONE. <input type="checkbox"/> PERSONNEL ENTERING THE HOT ZONE SHALL WEAR FULL BUNKER GEAR AND SCBA AS PART OF THEIR REQUIRED PPE. <input type="checkbox"/> MOBILISE WILLIAMS AMBASSADOR FOAM CANNON AND FOAM TRAILERS. ESTABLISH WORK ZONE AT A SAFE BUT EFFECTIVE DISTANCE. <input type="checkbox"/> CONSIDER FACTORS SUCH AS: <ul style="list-style-type: none"> ✓ TANK STRUCTURAL CONDITION ✓ POSITION AND CONDITION OF ROOF DRAINS ✓ VOLUME IN TANK ✓ STATUS OF TANK AND VALVES ✓ DEPTH OF WATER BOTTOMS ✓ CAPACITY OF TANK TO ACCEPT TOTAL FOAM SOLUTIONS WITHOUT CAUSING AN OVERFILL ✓ WIND DIRECTION ✓ WEATHER CONDITIONS 	<ul style="list-style-type: none"> <input type="checkbox"/> EVACUATE ALL PERSONNEL FORM THE HOT ZONE AND THE COLD ZONE THAT IS ESTABLISHED. <input type="checkbox"/> PROVIDE COOLING TO PROTECT ADJACENT STRUCTURES FROM POTENTIAL RADIATION EXPOSURE. WHICH INCLUDES TANKS, CABLES, STRUCTURES, ADJACENT EQUIPMENT, ETC. <input type="checkbox"/> A CONTROLLED BURN REQUIRES PUMPING OUT OF AS MUCH OF THE PRODUCT AS POSSIBLE, BEING AWARE OF ANY WATER IN THE TANK WHICH COULD LEAD TO BOIL OVER. <input type="checkbox"/> WATER MANAGEMENT TO REDUCE FLOODING THE AREA. <input type="checkbox"/> CONTINUOUSLY COMMUNICATE WITH THE ON SCENE COMMANDER AS HE HAS AN OUTSIDE VIEW OF THE INCIDENT WHICH WILL HELP. <input type="checkbox"/> EACH SECTOR FIGHTING THE FIRE NEEDS TO REPORT BACK ON WHAT THEY SEE TO THE ON SCENE COMMANDER. <input type="checkbox"/> UNMANNED CROSSFIRE MONITORS OR MOBILE WATER MONITORS. <input type="checkbox"/> DEPLOY ADDITIONAL GROUND MONITORS FOR COOLING OF STRUCTURES, SCE OR PRESSURE VESSELS WITHIN THE CRITICAL THERMAL RANGE OF <63M RADIUS FROM THE BURNING TANK.
RESPONSE PLANNING CONSIDERATIONS		
<ul style="list-style-type: none"> <input type="checkbox"/> DO NOT AUTHORISE FIREFIGHTING OPERATIONS TO EXTINGUISH A FULL SURFACE FIRE WITHOUT ALL NECESSARY RESOURCES ON THE SCENE. <input type="checkbox"/> CAPACITY OF TANK TO ACCEPT TOTAL FOAM SOLUTIONS WITHOUT CAUSING AN OVERFILL. <input type="checkbox"/> RADIANT HEAT IS NOT PREDICTED TO IMPACT ON ADJACENT TANKS. TANK SHELL TEMPERATURE SHOULD BE MONITORED AND IF NECESSARY COOLING OF ADJACENT TANKS COULD BE A TACTIC TO SHIELD ADJACENT TANKS PRIOR TO ALL FOAM DELIVERY AND PERSONNEL RESOURCES ARE ON THE SCENE. <input type="checkbox"/> COOLING OF THE TANK THAT IS ON FIRE IS NOT RECOMMENDED UNLESS COMPLETE 360 DEGREE COOLING CAN BE ACCOMPLISHED. <input type="checkbox"/> MONITOR FIRE SITUATION AND IF FIRE IS ESCALATING DETERMINE THE POTENTIAL SPREAD OF FIRE TO NEARBY TANKS AND ENSURE THAT MEASURES ARE IN PLACE TO PREVENT THE SPREAD OF FIRE AND PREPARE RESOURCES TO DEAL WITH POTENTIAL FIRE SPREAD. 		

SCENARIO DETAILS				RESOURCES				TACTICS																															
				Fire Water				LPG Pool																															
				Supply	Volume	Max Expected Duration (hh:mm)																																	
				Reservoir Tank	4540 m ³	2:13	2:57	4:26	6:39	<input type="checkbox"/> Isolate source of leak. <input type="checkbox"/> Assess need for equipment / vehicle at location																													
				Impound Basin	66000 m ³	32:16	43:01	64:34	96:46	<input type="checkbox"/> Assess fire conditions and if safe, deploy portable water monitors for cooling area. <input type="checkbox"/> Deploy downwind monitors or curtain sprays to contain or direct liberated gas and prevent it reaching ignition sources.																													
				Water Cooling Application & Volume Requirements																																			
				Application Rate l/min/m ²	Application Duration (Min)	Total Cooling Water (lpm)		Water		<input type="checkbox"/> Prepare upwind monitors or curtain sprays in case wind direction changes <input type="checkbox"/> Monitor LFL levels and protect intervention teams with water curtains s																													
				10.2	120	17,040		2,045 m ³																															
				10.2	120	1,534		1,534 m ³																															
				10.2	120	12,780		1,022 m ³																															
				10.2	120	682		682 m ³																															
				Equipment Requirements / Manpower Requirements Ozzie – Oscillating Portal Fire Monitor				LPG Fire																															
				Number	Hose	BLEVE Prevention		Manpower		<input type="checkbox"/> Use hose lines with curtain spray to protect firefighters setting up foam monitors <input type="checkbox"/> Apply foam from monitors and regularly top up																													
				10 -12	24 LDH	17,040		24		<input type="checkbox"/> Direct streams on to flame impinged or heat affected steelwork																													
				7 – 9	18 LDH	12,780		18		<input type="checkbox"/> Monitor cooling spray nozzle's must be set to power cone to increase effective cooling surface area.																													
				5-6	12 LDH	8,520		12																															
				3 - 4	8 LDH	5,680		8																															
				Tanker loading Area				BLEVE Prevention																															
Key: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;"></td> <td>Jet / Pool Fire</td> <td></td> <td>Monitor</td> </tr> <tr> <td style="text-align: center;"></td> <td>Vapour Cloud Explosion Risk</td> <td></td> <td>Isolation Valve</td> </tr> <tr> <td style="text-align: center;"></td> <td>H₂S Potential</td> <td></td> <td>Fire Hydrant</td> </tr> </table>					Jet / Pool Fire		Monitor		Vapour Cloud Explosion Risk		Isolation Valve		H ₂ S Potential		Fire Hydrant	Fire Hazard Zone Distances (m)				All fuel supply to loading racks should <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: red; color: white;">37.5 kW/m²</td> <td style="background-color: orange; color: white;">12.5 kW/m²</td> <td style="background-color: yellow; color: white;">6.3 kW/m²</td> <td rowspan="5"> <ul style="list-style-type: none"> Personnel likely to be fatalities Lightweight equipment and Structures within 50m could fail in 5 minutes Heavyweight large equipment, Thick wall piping and heavyweight structures within 50m could fail in 10 minutes </td> </tr> <tr> <td>79.03</td> <td>102.2</td> <td>121.7</td> </tr> <tr> <td>33.39</td> <td>41</td> <td>46.78</td> </tr> <tr> <td>70.3</td> <td>90.66</td> <td>107.7</td> </tr> <tr> <td>8.25</td> <td>11.71</td> <td>13.69</td> </tr> </table>				37.5 kW/m ²	12.5 kW/m ²	6.3 kW/m ²	<ul style="list-style-type: none"> Personnel likely to be fatalities Lightweight equipment and Structures within 50m could fail in 5 minutes Heavyweight large equipment, Thick wall piping and heavyweight structures within 50m could fail in 10 minutes 	79.03	102.2	121.7	33.39	41	46.78	70.3	90.66	107.7	8.25	11.71	13.69
					Jet / Pool Fire		Monitor																																
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33.39	41	46.78																																					
70.3	90.66	107.7																																					
8.25	11.71	13.69																																					
				<input type="checkbox"/> Activate Deluge System <input type="checkbox"/> All fuel supply to loading racks should be stopped (shut). <input type="checkbox"/> Foam equipment is readily available in the area, foam drums connected to Trucks that are safe to be moved away may be moved. Restrict access area to be barricaded with Emergency Tape. <input type="checkbox"/> Personnel attacking the fire shall wear Full Bunker gear and SCBA as part of their required PPE. <input type="checkbox"/> Monitor fire situation and if fire is escalating determine the potential spread of fire to nearby equipment or trucks and ensure that measures are in place to stop the spread of fire. <input type="checkbox"/> Protect adjacent structures from potential radiation exposure which includes other road tankers and tanks that located on the north side of the loading bay. <input type="checkbox"/> Evacuate all personnel form the TTLR building. <input type="checkbox"/> Periodically check the drains for debris. <input type="checkbox"/> Continue to cool after the fire has been extinguished.				<input type="checkbox"/> Assess flame impingement or radiant heat impacts on equipment, spheres or bullets in the bund and immediate vicinity (Fire Hazard Z one) <input type="checkbox"/> Assess if flame impingement is above or below liquid level. <input type="checkbox"/> If impingement above liquid level, supply cooling spay immediately. <input type="checkbox"/> Do not rely only on the fixed water monitors – additional cooling streams may be urgently required. <input type="checkbox"/> LPG storage vessels threatened by fire should be kept sufficiently cool to prevent vessel failure. This can be achieved by an application of 10l/min/m ² water on to the vessels at a rate sufficient to maintain an adequate film of water over the surface of the vessels and the structural supports. <input type="checkbox"/> Evacuate area immediately.																															
Fire Pump Information																																							
Two firewater pumps are provided (38G-106A/106B) feeding a 16inch firewater main. The main is pressurised by a jockey pump (38G-101)																																							

Refinery Emergency Response Plan

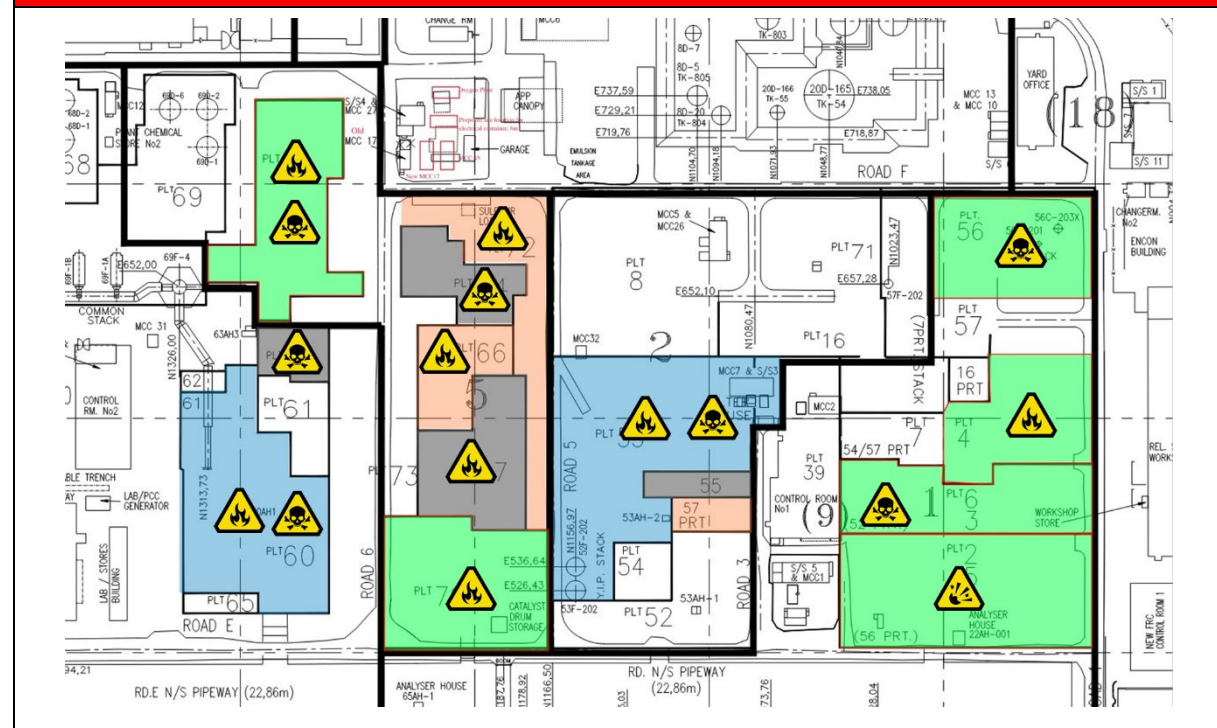
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PFP 02: LPG / Gas Release - Unignited

POTENTIAL		MITIGATION ACTIONS
PEOPLE	<ul style="list-style-type: none"> MISSING PERSONNEL AND CASUALTIES WITH INHALATION OF TOXIC FUMES. COMMUNITY IMPACT 	<ul style="list-style-type: none"> SITE ALARMS, EVACUATION & CONFIRM MUSTERS EMERGENCY INSTRUCTION TO COMMUNITY NOTIFICATION TO LOCAL POLICE –ROAD CLOSURE & TRAFFIC DIVERSIONS. COMMUNITY TO STAY INDOORS, CLOSE WINDOWS, EVACUATE DENSE GAS AREAS.
ENVIRONMENT	<ul style="list-style-type: none"> TOXIC GAS CLOUD MIGRATION TO PUBLIC AREA / HIGHWAYS 	<ul style="list-style-type: none"> PROMPT NOTIFICATION AND ALERT TO LOCAL POLICE AND FIRE SERVICE PROMPT AND EFFECTIVE FOAM BLANKETING ACTIONS. WATER INLETS AND DRAINS MONITORED BY FIRE TEAM AND SPILL CONTAINMENT MEASURES IMPLEMENTED THROUGHOUT INCIDENT
ASSET	<ul style="list-style-type: none"> IGNITION SOURCES – UNCONFINED / CONFINED VAPOUR CLOUD EXPLOSION 	<ul style="list-style-type: none"> EARLY ALARM BY OPERATOR FIRE AND GAS PANEL. DETECTION AND ACTIVATION OF RIM SEAL FOAM POURER FIRE SUPPRESSION SYSTEMS. ACTIVATION OF TANK SHELL PROTECTION DELUGE SYSTEM INITIATE TANK RECIRCULATION, GRAVITY TRANSFER OR BUND DRAINAGE
INCIDENT OBJECTIVES		INCIDENT STRATEGY
PEOPLE	<ul style="list-style-type: none"> RESCUE OF PERSONNEL IN THE IMMEDIATE AREA PROTECTION OF COMMUNITY CLOSURE OF ROAD AFFECTED BY SMOKE PLUME 	<ul style="list-style-type: none"> CONFIRM MUSTER NUMBERS AND IDENTIFY MISSING MOBILISE MEDICAL TEAMS NOTIFICATION TO THE LOCAL COMMUNITY, POLICE AND HIGHWAY AGENCY
ENVIRONMENT	<ul style="list-style-type: none"> CONFINEMENT OF FIREWATER RUNOFF IDENTIFICATION OF DRAINAGE SYSTEMS WITH POTENTIAL ROUTE TO UNCONTROLLED WATER SOURCE MONITOR AIR QUALITY EXTINGUISHMENT 	<ul style="list-style-type: none"> FIRE WATER MANAGEMENT, INCLUDING DEPLOYMENT OF CONTAINMENT EQUIPMENT DEPLOYMENT OF POLLUTION CONTROL EQUIPMENT ON & OFF SITE DEPLOY AIR QUALITY MONITORING & SAMPLING EQUIPMENT DEPLOYMENT OF FIREFIGHTING RESOURCES
ASSET	<ul style="list-style-type: none"> PROTECT VESSELS, SCE, STRUCTURES WITHIN THE RADIANT HEAT IMPACT RANGE MONITOR TANK FILL/DISCHARGE LEVELS. HYDROCARBON INVENTORY REDUCTION EXTINGUISH RIM SEAL FIRE BEFORE ESCALATING TO FULL SURFACE 	<ul style="list-style-type: none"> DEPLOY FIRE TEAM FOR RIM SEAL / FULL SURFACE FIREFIGHTING RESPONSE OPERATIONS TO MONITOR TANK LEVELS PRODUCT TRANSFER CAPABILITY FIRE TEAM TO ESTABLISH BOUNDARY COOLING ON IMPACTED ASSETS.
TACTICS		
APPROACH	OFFENSIVE	DEFENSIVE
<ul style="list-style-type: none"> <input type="checkbox"/> ACTIVATE FIRE PUMPS <input type="checkbox"/> APPROACH UPHILL AND UPWIND. <input type="checkbox"/> CONTINUOUSLY COMMUNICATE WITH THE ON SCENE COMMANDER FOR INCIDENT SCENE UPDATES. <input type="checkbox"/> IDENTIFY & COMMUNICATE BEST ACCESS AND EGRESS ROAD BASED ON CURRENT WIND DIRECTION. <input type="checkbox"/> ASSESS AND CHOOSE FAVOURABLE POSITION FOR FORWARD COMMAND POST & STAGING AREA. ONLY ONE ENTRY & EXIT INTO THE HOT ZONE. <input type="checkbox"/> POSITION APPARATUS AT A SAFE DISTANCE AWAY FROM POSSIBLE HAZARDS SUCH AS RADIATING HEAT, STRUCTURAL COLLAPSE, CONSIDER PLACEMENT NEAR BLAST RESISTANT STRUCTURES FOR SHIELDING <input type="checkbox"/> BEWARE OF OVERHEAD POWER LINES WHEN POSITIONING APPARATUS. <input type="checkbox"/> FOAM EQUIPMENT SHOULD BE MADE AVAILABLE USING THE PIERCE CONNECTED TO THE FIRE WATER SYSTEM IN CASE THAT THE FIRE EXTENDS TO THE OUTSIDE AND CAUSES AN EXTERNAL GROUND FIRE AS WELL. <input type="checkbox"/> LIAISE WITH THE OSC FOR INCIDENT INFORMATION, INCLUDING DETAILS OF THE FORWARD COMMAND POST AND STAGING AREA. <input type="checkbox"/> CONDUCT A SIZE-UP ASSESSMENT REFER TO THERMAL CONTOURS MAPS <input type="checkbox"/> SELECT SAFE SYSTEMS OF WORK. 	<p>UNIGNITED</p> <ul style="list-style-type: none"> <input type="checkbox"/> EQUIPMENT AND PERSONNEL SHOULD BE PLACED IN A SAFE LOCATION TAKING IN CONSIDERATION THE WIND DIRECTION. <input type="checkbox"/> TAKE NOTE WHEN PARKING FIRE VEHICLES, TO PARK THEM OUTSIDE THE BATTERY LIMITS AND UP-WIND. <input type="checkbox"/> MONITOR FIRE SITUATION FOR FIRE ESCALATION AND POTENTIAL SPREAD TO NEARBY UNITS. DEPLOY MEASURES TO STOP THE SPREAD OR LIMIT THE IMPACTS OF OF FIRE AND TO DEAL WITH THE FIRE IF IT DID SPREAD. <p>IGNITED</p> <ul style="list-style-type: none"> <input type="checkbox"/> PERSONNEL TO DEPLOY COOLING 38/45MM HOSE LINES AND UNMANNED CROSSFIRE MONITORS. <input type="checkbox"/> FOAM EQUIPMENT SHOULD BE MADE AVAILABLE (HOWEVER ONLY TO BE USED AS THE LAST RESORT WITH CONSULTATION WITH THE ON-SCENE COMMANDER) USING THE PIERCE OR E-01 CONNECTED TO THE FIRE WATER SYSTEM IN CASE THAT THE FIRE EXTENDS TO THE OUTSIDE AND CAUSES AN EXTERNAL GROUND FIRE AS WELL. <input type="checkbox"/> PERSONNEL ENTERING THE HOT ZONE SHALL WEAR FULL BUNKER GEAR AND SCBA AS PART OF THEIR REQUIRED PPE. <input type="checkbox"/> WATER MANAGEMENT TO REDUCE FLOODING THE AREA. <input type="checkbox"/> EACH SECTOR FIGHTING THE FIRE NEEDS TO REPORT BACK ON WHAT 	<p>DEFENSIVE</p> <ul style="list-style-type: none"> <input type="checkbox"/> ENSURE THAT THE HOT ZONE IS BARRICADED WITH EMERGENCY TAPE. <input type="checkbox"/> EVACUATE ALL PERSONNEL FORM THE HOT ZONE AND THE COLD ZONE THAT IS ESTABLISHED. <input type="checkbox"/> PROTECT ADJACENT STRUCTURES FROM POTENTIAL RADIATION EXPOSURE WHICH INCLUDES CABLES, STRUCTURES, ADJACENT EQUIPMENT, CAT LADDERS ETC. <p>DEFENSIVE</p> <ul style="list-style-type: none"> <input type="checkbox"/> ACTIVATION OF LPG – ROAD LOADING DELUGE SYSTEM <input type="checkbox"/> WHEN LPG IS ISOLATED ENSURE THAT THE FIRE IS OUT BEFORE COOLING IS STOPPED (TAKE NOTE NOT TO EXTINGUISH LPG FIRE AS THIS COULD LEAD TO BLEVE).
RESPONSE PLANNING CONSIDERATIONS		
<ul style="list-style-type: none"> <input type="checkbox"/> DO NOT AUTHORISE FIREFIGHTING OPERATIONS TO EXTINGUISH A FULL SURFACE FIRE WITHOUT ALL NECESSARY RESOURCES ON THE SCENE. <input type="checkbox"/> CAPACITY OF TANK TO ACCEPT TOTAL FOAM SOLUTIONS WITHOUT CAUSING AN OVERFILL. <input type="checkbox"/> RADIANT HEAT IS NOT PREDICTED TO IMPACT ON ADJACENT TANKS. TANK SHELL TEMPERATURE SHOULD BE MONITORED AND IF NECESSARY COOLING OF ADJACENT TANKS COULD BE A TACTIC TO SHIELD ADJACENT TANKS PRIOR TO ALL FOAM DELIVERY AND PERSONNEL RESOURCES ARE ON THE SCENE. <input type="checkbox"/> COOLING OF THE TANK THAT IS ON FIRE IS NOT RECOMMENDED UNLESS COMPLETE 360 DEGREE COOLING CAN BE ACCOMPLISHED. <input type="checkbox"/> MONITOR FIRE SITUATION AND IF FIRE IS ESCALATING DETERMINE THE POTENTIAL SPREAD OF FIRE TO NEARBY TANKS AND ENSURE THAT MEASURES ARE IN PLACE TO PREVENT THE SPREAD OF FIRE AND PREPARE RESOURCES TO DEAL WITH POTENTIAL FIRE SPREAD. 		

THEY SEE TO THE ON SCENE COMMANDER.

SCENARIO DETAILS



Key:

	Jet / Pool Fire	Monitor
	Vapour Cloud Explosion Risk	Isolation Valve
	H ₂ S Potential	Fire Hydrant

Fire Hazard Zone Distances (m)			Radiant Heat Risks
37.5 kW/m ²	12.5 kW/m ²	6.4 kW/m ²	
79.03	102.2	121.7	<ul style="list-style-type: none"> Lightweight equipment and Structures within 50m could fail in 5 minutes Heavyweight large equipment, thick wall piping and heavyweight structures within 50m could fail in 10 minutes
33.39	41	46.78	
70.3	90.66	107.7	
8.25	11.71	13.69	

- Prepare for the failure of assets within 20 m after 30 minutes
- Structures within 100m will be severely weakened after 30 minutes
- Limit Firefighters in the area, full PPE and < 1 min

Fire Pump Information

Three firewater pumps are provided (38G-114/117/118) in addition to the jockey pump (38G-116). Firewater pumps 38G-117 and 38G-118 are each rated at 990m³/h, whilst 38G-114 is rated at 828m³/hr. Pumps 38G-117/118 are diesel-driven, and 38G-114 is electrically

RESOURCES

Fire Water				
Supply	Volume	Max Expected Duration		
Reservoir Tank	4540 m ³	2:13	2:57	4:26
Impound Basin	66000 m ³	32:16	43:01	64:34

Foam			
Concentration	Type	Qty	Location
Alcoseal	3 – 6% AR-FFP	3 x 15,000 litres	Foam Concentrate
Alcoseal	3 – 6% AR-FFP	2 x 15,000 litres	Fixed Rigid Foam
FP70	3% Fluoroprotein	1 x 25,000 litres	Overhead foam

Water Cooling Application & Volume Requirements			
Application Rate l/min/m ²	Duration (Min)	Total Cooling Water (lpm)	Water
10.2	120	17,040	2,045 m ³
10.2	120	1,534 m ³	1,534 m ³
10.2	120	12,780	1,022 m ³
10.2	120	682 m ³	682 m ³

Equipment Requirements / Manpower Requirements			
Ozzie – Oscillating Portal Fire Monitor			
Number	Hose 70mm	Total Cooling Water (lpm)	Manpower Req.
10 - 12	24	17,040	24
7 – 9	18	12,780	18
5-6	12	8,520	12
3 - 4	8	5,680	8

Pool Fires <100m²

Type	Requirements	Manpower Requirements	Hose Requirements	Foam Concentrate
DP Extinguisher	4	4	NA	NA
Handheld nozzle	1	4	4+ inductor	2 x 25l Drums

TACTICS

Unignited Gas Release

- Isolate source of leak.
- Identify gas cloud travel direction and implement response from an upwind direction.
- Establish boundary gas monitoring.
- Identify & if safe, isolate all potential ignition sources.
- Monitor drains, sewage systems for gas migration.
- For a small release, set up monitors set to spray stream to agitate gas at leak source.
- Use water screens/curtain sprays to check and minimise gas migration – **Caution may cause static.**
- Expect ignition at any time! Establish a wide Hazard zone and keep all personnel outside of this perimeter.**
- Do not allow personnel to enter the gas cloud.**

Gas or Vapour Dispersion with Water

- Firefighter in Full firefighting PPE & SCBA
- Approach scene from upwind direction.
- Handheld hose lines with curtain spray to protect approaching fire teams.
- Deploy portable monitors & withdraw fireteams.
- Reassess effectiveness of water spray streams if conditions change.
- Establish remote gas monitors to monitor extent of gas cloud inside and outside of water spray containment area.

Explosion Prevention

- Monitor gas cloud LEL boundary.
- Identify and isolate potential ignition sources in the vicinity, provide curtain water sprays or water spray from a monitor to dilute gas

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driven.

Evacuate area immediately.

PFP 03: Storage Tank Rim Seals / Full Surface Fires

POTENTIAL		MITIGATION ACTIONS	
PEOPLE	<ul style="list-style-type: none"> MISSING PERSONNEL AND CASUALTIES WITH BURNS INJURIES OR INHALATION OF TOXIC FUMES. LIFE SAFETY HAZARDS TO SITE PERSONNEL COMMUNITY IMPACT OBSCURED VISIBILITY ON MAIN HIGHWAY 	<ul style="list-style-type: none"> SITE ALARMS & CONFIRM MUSTERS EMERGENCY INSTRUCTION TO COMMUNITY NOTIFICATION TO LOCAL POLICE –ROAD CLOSURE & TRAFFIC DIVERSIONS. COMMUNITY TO STAY INDOORS, CLOSE WINDOWS, EVACUATE DENSE SMOKE AREAS. 	
ENVIRONMENT	<ul style="list-style-type: none"> SMOKE PLUME ENVIRONMENTAL IMPACT FIRE WATER RUN OFF 	<ul style="list-style-type: none"> PROMPT AND EFFECTIVE FOAM BLANKETING ACTIONS. WATER INLETS AND DRAINS MONITORED BY FIRE TEAM AND SPILL CONTAINMENT MEASURES IMPLEMENTED THROUGHOUT INCIDENT 	
ASSET	<ul style="list-style-type: none"> LIGHTWEIGHT EQUIPMENT AND STRUCTURES WITHIN 50M COULD FAIL IN 5 MINUTES HEAVYWEIGHT LARGE EQUIPMENT, THICK WALL PIPING AND HEAVYWEIGHT STRUCTURES WITHIN 50M COULD FAIL IN 10 MINUTES PREPARE FOR FAILURE OF ASSETS WITHIN 75M AFTER 30 MINUTES STRUCTURES WITHIN 100M WILL BE SERVERY WEAKENED AFTER 30 MINUTES 	<ul style="list-style-type: none"> EARLY ALARM BY OPERATOR FIRE AND GAS PANEL. DETECTION AND ACTIVATION OF RIM SEAL FOAM POURER FIRE SUPPRESSION SYSTEMS. ACTIVATION OF TANK SHELL PROTECTION DELUGE SYSTEM INITIATE TANK RECIRCULATION, GRAVITY TRANSFER OR BUND DRAINAGE 	
INCIDENT OBJECTIVES		INCIDENT STRATEGY	
PEOPLE	<ul style="list-style-type: none"> RESCUE OF PERSONNEL IN THE IMMEDIATE AREA PROTECTION OF COMMUNITY CLOSURE OF ROAD AFFECTED BY SMOKE PLUME 	<ul style="list-style-type: none"> CONFIRM MUSTER NUMBERS AND IDENTIFY MISSING MOBILISE MEDICAL TEAMS NOTIFICATION TO THE LOCAL COMMUNITY, POLICE AND HIGHWAY AGENCY 	
ENVIRONMENT	<ul style="list-style-type: none"> CONFINEMENT OF FIREWATER RUNOFF IDENTIFICATION OF DRAINAGE SYSTEMS WITH POTENTIAL ROUTE TO UNCONTROLLED WATER SOURCE MONITOR AIR QUALITY EXTINGUISHMENT 	<ul style="list-style-type: none"> FIRE WATER MANAGEMENT, INCLUDING DEPLOYMENT OF CONTAINMENT EQUIPMENT DEPLOYMENT OF POLLUTION CONTROL EQUIPMENT ON & OFF SITE DEPLOY AIR QUALITY MONITORING & SAMPLING EQUIPMENT DEPLOYMENT OF FIREFIGHTING RESOURCES 	
ASSET	<ul style="list-style-type: none"> PROTECT VESSELS, SCE, STRUCTURES WITHIN THE RADIANT HEAT IMPACT RANGE MONITOR TANK FILL/DISCHARGE LEVELS. HYDROCARBON INVENTORY REDUCTION EXTINGUISH RIM SEAL FIRE BEFORE ESCALATING TO FULL SURFACE 	<ul style="list-style-type: none"> DEPLOY FIRE TEAM FOR RIM SEAL / FULL SURFACE FIREFIGHTING RESPONSE OPERATIONS TO MONITOR TANK LEVELS PRODUCT TRANSFER CAPABILITY FIRE TEAM TO ESTABLISH BOUNDARY COOLING ON IMPACTED ASSETS. 	
TACTICS			RESPONSE PLANNING CONSIDERATIONS
APPROACH	OFFENSIVE	DEFENSIVE	
<ul style="list-style-type: none"> ACTIVATE FIRE PUMPS APPROACH UPHILL AND UPWIND. IDENTIFY & COMMUNICATE BEST ACCESS AND EGRESS ROAD BASED ON CURRENT WIND DIRECTION. ASSESS RISK AND CHOOSE FAVOURABLE POSITION FOR FORWARD COMMAND POST & STAGING AREA. TAKE NOTE WHEN PARKING FIRE VEHICLES, PARK OUTSIDE THE BATTERY LIMITS. POSITION APPARATUS AT A SAFE DISTANCE AWAY FROM POSSIBLE HAZARDS SUCH AS RADIATING HEAT, STRUCTURAL COLLAPSE, CONSIDER PLACEMENT NEAR BLAST RESISTANT STRUCTURES FOR SHIELDING BEWARE OF OVERHEAD POWER LINES WHEN POSITIONING APPARATUS. FOAM EQUIPMENT SHOULD BE MADE AVAILABLE USING THE PIERCE CONNECTED TO THE FIRE WATER SYSTEM IN CASE THAT THE FIRE EXTENDS TO THE OUTSIDE AND CAUSES AN EXTERNAL GROUND FIRE AS WELL. LIAISE WITH THE OSC FOR INCIDENT INFORMATION, INCLUDING DETAILS OF THE FORWARD COMMAND POST AND STAGING AREA. CONDUCT A SIZE-UP ASSESSMENT REFER TO THERMAL CONTOURS MAPS 	<ul style="list-style-type: none"> ENSURE THAT THE HOT ZONE CONSIDERS BOIL-OVER POTENTIAL SAFETY ZONE. FOAM ATTACK SHOULD NOT BE STARTED UNTIL FOAM SUPPLY FOR THE TANK IS AVAILABLE. ENSURE ONLY ONE ENTRY & EXIT INTO THE HOT ZONE. PERSONNEL ENTERING THE HOT ZONE SHALL WEAR FULL BUNKER GEAR AND SCBA AS PART OF THEIR REQUIRED PPE. MOBILISE WILLIAMS AMBASSADOR FOAM CANNON AND FOAM TRAILERS. ESTABLISH WORK ZONE AT A SAFE BUT EFFECTIVE DISTANCE. CONSIDER FACTORS SUCH AS: <ul style="list-style-type: none"> TANK STRUCTURAL CONDITION POSITION AND CONDITION OF ROOF DRAINS VOLUME IN TANK STATUS OF TANK AND VALVES DEPTH OF WATER BOTTOMS CAPACITY OF TANK TO ACCEPT TOTAL FOAM SOLUTIONS WITHOUT CAUSING AN OVERFILL WIND DIRECTION WEATHER CONDITIONS 	<ul style="list-style-type: none"> EVACUATE ALL PERSONNEL FORM THE HOT ZONE AND THE COLD ZONE THAT IS ESTABLISHED. PROVIDE COOLING TO PROTECT ADJACENT STRUCTURES FROM POTENTIAL RADIATION EXPOSURE. WHICH INCLUDES TANKS, CABLES, STRUCTURES, ADJACENT EQUIPMENT, ETC. A CONTROLLED BURN REQUIRES PUMPING OUT OF AS MUCH OF THE PRODUCT AS POSSIBLE, BEING AWARE OF ANY WATER IN THE TANK WHICH COULD LEAD TO BOIL OVER. WATER MANAGEMENT TO REDUCE FLOODING THE AREA. CONTINUOUSLY COMMUNICATE WITH THE ON SCENE COMMANDER AS HE HAS AN OUTSIDE VIEW OF THE INCIDENT WHICH WILL HELP. EACH SECTOR FIGHTING THE FIRE NEEDS TO REPORT BACK ON WHAT THEY SEE TO THE ON SCENE COMMANDER. UNMANNED CROSSFIRE MONITORS OR MOBILE WATER MONITORS. DEPLOY ADDITIONAL GROUND MONITORS FOR COOLING OF STRUCTURES, SCE OR PRESSURE VESSELS WITHIN THE CRITICAL THERMAL RANGE OF <63M RADIUS FROM THE BURNING TANK. 	<ul style="list-style-type: none"> DO NOT AUTHORISE FIREFIGHTING OPERATIONS TO EXTINGUISH A FULL SURFACE FIRE WITHOUT ALL NECESSARY RESOURCES ON THE SCENE. CAPACITY OF TANK TO ACCEPT TOTAL FOAM SOLUTIONS WITHOUT CAUSING AN OVERFILL. RADIANT HEAT IS NOT PREDICTED TO IMPACT ON ADJACENT TANKS. TANK SHELL TEMPERATURE SHOULD BE MONITORED AND IF NECESSARY COOLING OF ADJACENT TANKS COULD BE A TACTIC TO SHIELD ADJACENT TANKS PRIOR TO ALL FOAM DELIVERY AND PERSONNEL RESOURCES ARE ON THE SCENE. COOLING OF THE TANK THAT IS ON FIRE IS NOT RECOMMENDED UNLESS COMPLETE 360 DEGREE COOLING CAN BE ACCOMPLISHED. MONITOR FIRE SITUATION AND IF FIRE IS ESCALATING DETERMINE THE POTENTIAL SPREAD OF FIRE TO NEARBY TANKS AND ENSURE THAT MEASURES ARE IN PLACE TO PREVENT THE SPREAD OF FIRE AND PREPARE RESOURCES TO DEAL WITH POTENTIAL FIRE SPREAD.

SELECT SAFE SYSTEMS OF WORK.

SCENARIO DETAILS	RESOURCES	TACTICS																																																	
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		TK-204		TK-509, TK-603, TK-504, TK-503		Unleaded Petrol	
				TK-601	TK-21 TK-26	Jet A1	
				TK-403	TK-306	HCN Cutter	
				TK-104		LCN	
		TK-C1, TK-C2, TK-C4, TK-C5, TK-C7, TK-C8, TK-C9, TK-C10, TK-C11, TK-C12, TK-C13, TK-C15, TK-C16, TH-C17, TK-C19, TK-C20, TK-102, TK-202, TK-203, TK-205	TK-820, TK-821, TK-822	TK-104	TK-22 TK-807	Crude Oil	

PFP 04: Bund Fires

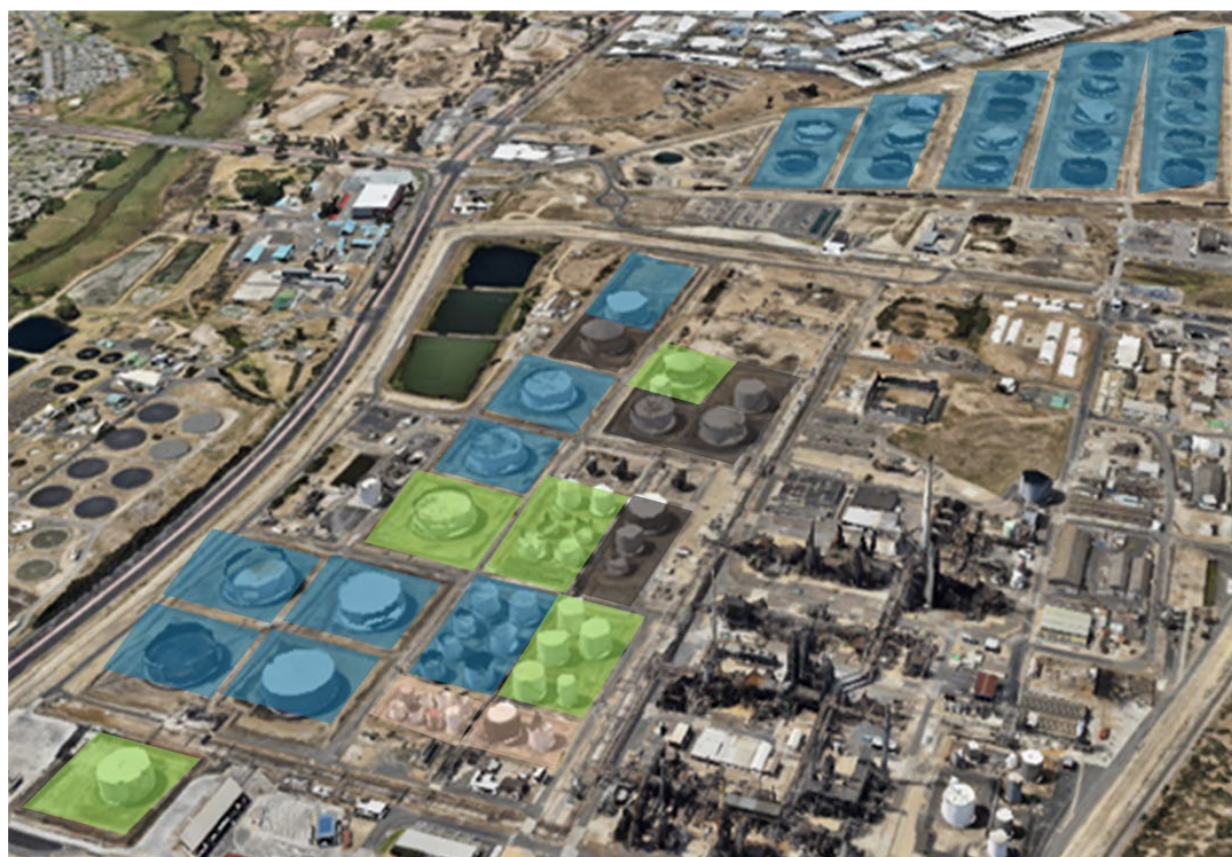
POTENTIAL		MITIGATION ACTIONS	
PEOPLE	<ul style="list-style-type: none"> MINIMAL CHANCE OF MISSING PERSONNEL. CONSIDER LIFE SAFETY OF SITE PERSONNEL CASUALTIES WITH BURNS INJURIES OR INHALATION OF TOXIC FUMES MAY COME DURING FIREFIGHTING OPERATIONS. COMMUNITY IMPACT OBSCURED VISIBILITY ON MAIN HIGHWAY 	<ul style="list-style-type: none"> SITE ALARMS & CONFIRM MUSTERS STRICT ON SCENE CONTROL AND SAFE SYSTEM OF WORK FOR RESPONDERS EMERGENCY INSTRUCTION TO COMMUNITY TO STAY INDOORS, CLOSE WINDOWS, EVACUATE DENSE SMOKE AREAS. NOTIFICATION TO LOCAL POLICE – ROAD CLOSURE & TRAFFIC DIVERSIONS 	
ENVIRONMENT	<ul style="list-style-type: none"> SMOKE PLUME ENVIRONMENTAL IMPACT FIRE WATER RUN OFF DRAINAGE AND SEWER ROUTES TO OPEN WATER SOURCES 	<ul style="list-style-type: none"> PROMPT AND EFFECTIVE FOAM BLANKETING ACTIONS CLOSURE OF BUND DRAINS DRAINS & SEWER SYSTEMS MONITORED AND SPILL CONTAINMENT MEASURES IMPLEMENTED THROUGHOUT INCIDENT 	
ASSET	<ul style="list-style-type: none"> RAPID ESCALATION & SPREAD TO NEIGHBOURING TANKS IN A SINGLE BUND UNPROTECTED EQUIPMENT AND STRUCTURES WITHIN 50M COULD FAIL IN 5 MINUTES 	<ul style="list-style-type: none"> EARLY DETECTION AND ACTIVATION ALARM BY OPERATOR FIRE AND GAS PANEL ACTIVATION OF RFFS FOR BUND FIREFIGHTING OPERATIONS AND ASSESSMENT OF COOLING PROTECTION REQUIREMENTS OF VULNERABLE EQUIPMENT IN CLOSE VICINITY 	
INCIDENT OBJECTIVES		INCIDENT STRATEGY	
PEOPLE	<p><i>Evacuate personnel in the immediate area</i></p> <ul style="list-style-type: none"> PROTECTION OF COMMUNITY & CLOSURE OF ROAD AFFECTED BY SMOKE PLUME 	<ul style="list-style-type: none"> CONFIRM MUSTER NUMBERS AND IDENTIFY MISSING NOTIFICATION TO THE LOCAL COMMUNITY, POLICE AND HIGHWAY AGENCY 	
ENVIRONMENT	<ul style="list-style-type: none"> CONFINEMENT OF FIREWATER RUNOFF IDENTIFICATION OF DRAINAGE SYSTEMS WITH POTENTIAL ROUTE TO UNCONTROLLED WATER SOURCE MONITOR AIR QUALITY 	<ul style="list-style-type: none"> FIRE WATER MANAGEMENT, INCLUDING DEPLOYMENT OF CONTAINMENT EQUIPMENT DEPLOYMENT OF POLLUTION CONTROL EQUIPMENT ON & OFF SITE DEPLOY AIR QUALITY MONITORING & SAMPLING EQUIPMENT 	
ASSET	<ul style="list-style-type: none"> EXTINGUISH BUND FIRE PROTECT VESSELS, SCE, STRUCTURES WITHIN THE RADIANT HEAT IMPACT RANGE MONITOR TANK FILL/DISCHARGE LEVELS 	<ul style="list-style-type: none"> DEPLOY FIRE TEAM FOR QUADRANT FIREFIGHTING RESPONSE BOUNDARY WATER SPRAY PROTECTION OF EQUIPMENT AND STRUCTURES OPERATIONS TO MONITOR TANK LEVELS PRODUCT TRANSFER CAPABILITY 	
TACTICS		RESPONSE PLANNING CONSIDERATIONS	
APPROACH	OFFENSIVE	DEFENSIVE	<input type="checkbox"/> IF A SMALL QUANTITY OF FUEL IN THE BUND CONSIDER ADOPTING A

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- | | | | |
|---|--|---|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> ACTIVATE FIRE PUMPS <input type="checkbox"/> APPROACH UPHILL AND UPWIND. <input type="checkbox"/> IDENTIFY & COMMUNICATE BEST ACCESS AND EGRESS ROAD BASED ON CURRENT WIND DIRECTION. <input type="checkbox"/> ASSESS RISK AND CHOOSE FAVOURABLE POSITION FOR FORWARD COMMAND POST & STAGING AREA. <input type="checkbox"/> TAKE NOTE WHEN PARKING FIRE VEHICLES, PARK OUTSIDE THE BATTERY LIMITS. <input type="checkbox"/> POSITION APPARATUS AT A SAFE DISTANCE AWAY FROM POSSIBLE HAZARDS SUCH AS RADIATING HEAT, STRUCTURAL COLLAPSE, CONSIDER PLACEMENT NEAR BLAST RESISTANT STRUCTURES FOR SHIELDING <input type="checkbox"/> BEWARE OF OVERHEAD POWER LINES WHEN POSITIONING APPARATUS. <input type="checkbox"/> FOAM EQUIPMENT SHOULD BE MADE AVAILABLE USING THE PIERCE CONNECTED TO THE FIRE WATER SYSTEM IN CASE THAT THE FIRE EXTENDS TO THE OUTSIDE AND CAUSES AN EXTERNAL GROUND FIRE AS WELL. <input type="checkbox"/> LIAISE WITH THE OSC FOR INCIDENT INFORMATION, INCLUDING DETAILS OF THE FORWARD COMMAND POST AND STAGING AREA. <input type="checkbox"/> SELECT SAFE SYSTEMS OF WORK. | <ul style="list-style-type: none"> <input type="checkbox"/> FOAM ATTACK SHOULD NOT BE STARTED UNTIL FOAM SUPPLY FOR THE TANK IS AVAILABLE. <input type="checkbox"/> CONTROL ENTRY & EXIT POINTS INTO THE HOT ZONE AROUND THE BUND. <input type="checkbox"/> PERSONNEL ENTERING THE HOT ZONE SHALL WEAR FULL BUNKER GEAR AND SCBA AS PART OF THEIR REQUIRED PPE. <input type="checkbox"/> DEPLOY ADDITIONAL COOLING MEASURES USING UNMANNED CROSSFIRE MONITORS OR MOBILE WATER MONITORS. <input type="checkbox"/> APPLY QUADRANT FIREFIGHTING TACTICS. <input type="checkbox"/> FOAM ATTACK TO THE FRONT CORNER OF THE BUND WORKING TOWARDS THE BACK OF THE BUND AND THE TANK. <input type="checkbox"/> COOLING OF TANKS WITHIN THE BUND SHOULD BE DONE USING FOAM. <input type="checkbox"/> ONCE BUND FIRE EXTINGUISHED, MONITOR AND MAINTAIN FOAM BLANKET TO PREVENT REIGNITION. <input type="checkbox"/> REVIEW WATER MANAGEMENT TO REDUCE FLOODING THE AREA. <input type="checkbox"/> | <ul style="list-style-type: none"> <input type="checkbox"/> FOR SMALL BUND FIRES – CONTROLLED BURNING FIREFIGHTING PHILOSOPHY. <input type="checkbox"/> EVACUATE ALL PERSONNEL FORM THE HOT ZONE. <input type="checkbox"/> PROVIDE COOLING TO PROTECT ADJACENT STRUCTURES FROM POTENTIAL RADIATION EXPOSURE. WHICH INCLUDES TANKS, CABLES, STRUCTURES, ADJACENT EQUIPMENT, ETC. <input type="checkbox"/> A CONTROLLED BURN REQUIRES PUMPING OUT OF AS MUCH OF THE PRODUCT REMAINING THE TANK, AS POSSIBLE. <input type="checkbox"/> CONTINUOUSLY COMMUNICATE WITH THE ON SCENE COMMANDER AS HE HAS AN OUTSIDE VIEW OF THE INCIDENT WHICH WILL HELP. <input type="checkbox"/> EACH SECTOR FIGHTING THE FIRE NEEDS TO REPORT BACK ON WHAT THEY SEE TO THE ON SCENE COMMANDER. <input type="checkbox"/> UNMANNED CROSSFIRE MONITORS OR MOBILE WATER MONITORS. <input type="checkbox"/> DEPLOY ADDITIONAL GROUND MONITORS FOR COOLING OF STRUCTURES, SCE OR PRESSURE VESSELS WITHIN THE CRITICAL THERMAL RANGE OF <63M RADIUS FROM THE BURNING TANK. | <p>CONTROLLED BURN APPROACH.</p> <ul style="list-style-type: none"> <input type="checkbox"/> DO NOT AUTHORISE FIREFIGHTING OPERATIONS TO EXTINGUISH FIRE WITHOUT ALL NECESSARY RESOURCES ON THE SCENE. <input type="checkbox"/> ASSESS THE CAPACITY OF THE BUND TO CONTAIN THE SPILLED CONTENTS AND THE FIREFIGHTING FOAM. <input type="checkbox"/> COOLING OF THE TANK THAT IS ON FIRE IS NOT RECOMMENDED UNLESS COMPLETE 360 DEGREE COOLING CAN BE ACCOMPLISHED. <input type="checkbox"/> CONDUCT A SIZE-UP ASSESSMENT REFER TO THERMAL CONTOURS MAPS. <input type="checkbox"/> MONITOR FIRE SITUATION AND IF FIRE IS ESCALATING DETERMINE THE POTENTIAL SPREAD OF FIRE TO NEARBY RISKS AND ENSURE THAT MEASURES ARE IN PLACE TO PREVENT THE SPREAD OF FIRE AND PREPARE RESOURCES TO DEAL WITH POTENTIAL FIRE SPREAD. |
|---|--|---|--|

SCENARIO DETAILS



Key:	Monitor	Isolation Valve	
Fire Main	FH 2	FH3	FH 4
Contour Distances (m)			Radiant Heat Risks <ul style="list-style-type: none"> Lightweight equipment and Structures within 50m could fail in 5 minutes Heavyweight large equipment, Thick wall piping and heavyweight structures within 50m could fail in 10 minutes
37.5 kW/m ²	12.5 kW/m ²	6.3 kW/m ²	
43.21	95.11	128.12	
43.35	88.25	117.2	
41.2	74.41	101.48	
41.2	74.41	101.48	
<ul style="list-style-type: none"> Prepare for failure of assets within 75m after 30 minutes Structures within 100m will be severely weakened after 30 minutes 			

Fire Pump Information

Three firewater pumps are provided (38G-114/117/118) in addition to the jockey pump (38G-116). Firewater pumps 38G-117 and 38G-118 are each rated at 990m³/h, whilst 38G-114 is rated at 828m³/hr. Pumps 38G-117/118 are diesel-driven, and 38G-114 is electrically driven.

RESOURCES

Fire Water					
Supply	Volume	Max Expected Duration (hh:mm)			
Reservoir Tank	4540 m ³	2:06	2:40	4:01	8:02
Impound Basin	66000 m ³	29:15	39:00	58:30	117:01

Foam			
Concentration	Type	Qty	Location
Alcoseal	3 – 6% AR-FFP	3 x 15,000 litres	Foam Concentrate Trailers
Alcoseal	3 – 6% AR-FFP	2 x 15,000 litres	Fixed Rigid Foam Tankers
FP70	3% Fluoroprotein	1 x 25,000 litres	Overhead foam tankers

Foam Application & Volume Requirements				
Application Rate l/min/m ²	Application Duration (Min)	Water	Concentrate (litres)	Max Solution Required (l/m)
6.5	30 / quadrant	2,256 m ³	67,680	18,800
6.5	30 / quadrant	1,692 m ³	50,760	14,100
6.5	30 / quadrant	1,128 m ³	33,840	9,400
6.5	30 / quadrant	564 m ³	16,920	4,700

Equipment Requirements / Manpower Requirements					
Crossfire Portable Fire Monitors					
Number	Hose	Produced Foam Vol.	Manpower	Foam Vehicles	
4	30 LDH	18,800 lpm	12	2 x Fixed Rigid Foam Tankers	1 x Foam Concentrate
3	21 LDH	14,100 lpm	9	2 x Fixed Rigid Foam Tankers	
2	12 LDH	9,400 lpm	6	1 x Fixed Rigid Foam Tankers	
1	12 LDH	4,700 lpm	3	1 x Fixed Rigid Foam Tankers	

CONTROLLED BURNING

- Passive response options that maybe considered if:
- ✓ Insufficient firewater/foam concentrate
 - ✓ Minimal fuel in the bund, likely to self-extinguish in a relatively short period
 - ✓ Low probability of success or high risk to firefighting in attempts to extinguish the fire
 - ✓ Insufficient capacity available in the bund to contain fuel and firewater/foam volume.

TACTICS

PARTIAL BUND FIRE

- Use bund fixed monitors once enough foam concentrate is available.
- Evaluate if flammable liquid remaining does not pose a greater hazard than if it had been allowed to continue burning
- Use tank as a deflector when applying foam on a bund fire with monitors.
- Consider cooling of tanks in a common bund using foam.
- Benzene will need to be kept covered with a blanket of foam

FULL BUNDFIRE

- Establish an adequate water and foam supply before commencing foam attack
- Aim to extinguish and secure one area then to move on to and extinguish the next section of the bund.
- Using a spray setting apply the foam to the front of the bund, working the spray towards the tank.
- Monitor applied foam blanket quadrant approx. every 15 minutes and reapply as necessary.
- Minimise use of water monitors in tandem with foam application. Consider cooling of tanks in a common bund using foam.
- Tank cooling systems may damage foam blankets, consider cooling of tanks in a common bund using foam.
- Cool tanks, vessels and supporting structures in the vicinity of 12.5kW/m²
- Prepared for spillage control from bund failures points:
 - ✓ Bund joints
 - ✓ Tie bar holes
 - ✓ Pipe penetrations
- Ensure that nearby LPG and LNG storage vessels are kept cool at all times
- Benzene will need to be kept covered with a blanket of foam

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POTENTIAL

MITIGATION ACTIONS

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PEOPLE	<ul style="list-style-type: none"> Exposure to heat, inhalation of smoke, toxic gases. reduced visibility, disorientation due to smoke. Inability to escape/ personnel trapped. Greater risk to occupants in the floors above fire origin. Serious injury/ severe burns or single fatality. 	<ul style="list-style-type: none"> Knowledge of existing site plans and procedures. Knowledge of designated muster plan and clear evacuation paths. Immediate response from trained professional and appropriately equipped Fire Team. Search and Rescue for missing personnel/ casualties who have been overcome by smoke/ fire. Smoke detectors fitted in accommodation and work areas. 	
ENVIRONMENT	<ul style="list-style-type: none"> Low environment impact from contaminated fire water run-off in non-process areas. Smoke including unburnt carbon particles, gases and toxins, Chemical release due to fire. 	<ul style="list-style-type: none"> Spill Response Plan. Designated response personnel. Fire water run-off to be considered. 	
ASSET	<ul style="list-style-type: none"> Loss of building or damage to structural integrity. Damage to buildings housing critical facilities. Wind carrying hot embers onto process area or uninvolved or adjacent buildings. Denial of area access due to fire impact effecting structural integrity. 	<ul style="list-style-type: none"> Early detection from automated smoke and heat detectors. Early alarm to fire and gas panel emergency telephone line. Fixed systems and compartmentation established in building design. Clearly visible escape routes are available from all parts/ remain safe, and effective for the duration for which they are needed. Portable fire extinguishers at key locations to support an initial response. 	
INCIDENT OBJECTIVES		INCIDENT STRATEGY	
PEOPLE	<ul style="list-style-type: none"> Maintain safety of all personnel. Ensure responder safety. Medical support / Welfare of victims. 	<ul style="list-style-type: none"> Alert/ evacuate/ muster and account for personnel. Seek information muster checkers for details of missing personnel & last know location Deploy Fire Team with medic to FCP, Fire Team Initiate search and rescue of floor or offices where missing persons presumed. Plan and prepare Medevac as required. 	
ENVIRONMENT	<ul style="list-style-type: none"> Contain hazards / preserve environment. 	<ul style="list-style-type: none"> Monitor and contain contaminate firewater run-off and initiate additional spill control measures. 	
ASSET	<ul style="list-style-type: none"> Contain/ confine to prevent spread to neighbouring buildings. Extinguishment of fire. Overhaul / Ventilation as soon as conditions and resources allow. Damage control and salvage. Utility control. 	<ul style="list-style-type: none"> Place hose lines for boundary cooling on potential fir spread areas. Plan for an offensive firefighting strategy to save life or defensive strategy to save or protect buildings. Remove smoke by ventilation. Open walls/ceilings/ floor in fire area and check for signs of fire spread. Implement salvage operations to remove/ protect undamaged assets. 	
TACTICS			
APPROACH	OFFENSIVE	DEFENSIVE	RESPONSE PLANNING CONSIDERATIONS
<input type="checkbox"/> Evaluate the situation. <input type="checkbox"/> Introduce and declare incident objectives and strategies. <input type="checkbox"/> Assess and agree the chosen system of work. <input type="checkbox"/> Establish Time out communications schedule - Timeout, Telephone. <input type="checkbox"/> Consider Medevac options and confirm Ambulance has been notified. <input type="checkbox"/> Consider resources and requirement for Mutual Aid support. <input type="checkbox"/> Ensure no impact on process areas, consider temporary Shut Down until incident resolved. <input type="checkbox"/> Prepare plan to restore operations considering loss of accommodation or critical facilities. <input type="checkbox"/> Consider the need to provide temporary shelter/ repair business utilities. <input type="checkbox"/> Determine & manage business interruption.	<p><u>Personnel Missing/ Trapped = Offensive Internal Firefighting & Rescue.</u></p> <input type="checkbox"/> Liaise with the OSC for Incident information, including details of the Forward Command Post and Staging Area. <input type="checkbox"/> Conduct a Size-Up Assessment. <input type="checkbox"/> Select safe systems of work. <input type="checkbox"/> Ensure the OSC fully understands the ffensive Strategy approach and initiate required tactical systems of work for entry in to affected building. <input type="checkbox"/> Identify last known location of unaccounted / missing personnel to OSC. <input type="checkbox"/> Deploy the SAR Fire Team & Ready medical team to the Staging Area for receiving casualties <input type="checkbox"/> Verify casualties' injuries with medic. <input type="checkbox"/> Activate confirm that mutual aid ambulance is notified.	<p><u>No Personnel Missing/ Trapped = Defensive External firefighting & External Boundary Protection.</u></p>	<input type="checkbox"/> Re-evaluate offensive/ defensive mode every 10 minutes <input type="checkbox"/> Identify specific off-site resources that may be required. Casualties <input type="checkbox"/> Medic to establish a Triage Area for receipt of injured personnel. <input type="checkbox"/> Ensure clear egress route for stretchers to triage area. <input type="checkbox"/> Move injured to clinic or directly to clinic or hospital if ambulance in attendance.

SCENARIO DETAILS	BUILDING TYPES & HAZARDS	TACTICS
	<p style="text-align: center; background-color: red; color: white; margin: 0;">WAREHOUSE & WORKSHOPS</p> <p style="background-color: red; color: white; margin: 0;">CHEMICALS / HAZMAT</p> <ul style="list-style-type: none"> <input type="checkbox"/> Reference the Emergency Response Guide for material firefighting considerations <input type="checkbox"/> Approach from upwind <input type="checkbox"/> Establish location for decontamination with a clear path from building <input type="checkbox"/> Monitor fire water run off to drains <p style="background-color: red; color: white; margin: 0;">COMPRESSED GAS CYLINDERS</p> <ul style="list-style-type: none"> <input type="checkbox"/> Establish inner and outer cordons based on level of risk from cylinders <input type="checkbox"/> Position response vehicles outside any potential fireball and blast zone when cylinders are involved in fire <input type="checkbox"/> Evacuate the potential blast zone and give evacuation or shelter-in-place guidance to those within range of projectiles <input type="checkbox"/> Ensure that firefighters use all available substantial shielding/cover within the range of cylinders <input type="checkbox"/> Position response vehicles outside any potential fireball and blast zone when cylinders are involved in fire <input type="checkbox"/> Set up ground monitors to cool heated cylinders <input type="checkbox"/> Consider carefully moving any cylinders that have not been heated to a safe location when in a developing fire situation <input type="checkbox"/> Consider a minimum initial responder observation distance of 90 metres for LPG tanks/containers over 100 litres or 40kg mass <p style="background-color: red; color: white; margin: 0;">ASBESTOS</p> <ul style="list-style-type: none"> <input type="checkbox"/> The potential for fibre release in Asbestos Cement Products is usually low, the priority is to prevent further exposure and spread by; <input type="checkbox"/> Approach known, or suspected, asbestos incidents from upwind <input type="checkbox"/> Ensure all response vehicles and firefighters, not yet deployed, are kept at the Staging Area <input type="checkbox"/> Establish an inner cordon around the suspected hazard zone and strictly control access into it. <input type="checkbox"/> Keep the contaminated area damp <input type="checkbox"/> Cover with plastic sheeting/tarpaulin (if practicable) <input type="checkbox"/> Ensure persons entering the contaminated area(s) wear appropriate PPE and appropriate decontamination procedures are in place on exit. 	<ul style="list-style-type: none"> <input type="checkbox"/> Confirm Local Fire Alarm Activated <input type="checkbox"/> Confirm Location of building and fire <p style="background-color: red; color: white; text-align: center; margin: 0;">ON ARRIVAL</p> <ul style="list-style-type: none"> <input type="checkbox"/> Confirm that all persons accounted for <input type="checkbox"/> Ascertain possible location of missing persons <input type="checkbox"/> Confirm the location of the fire, what is on fire & if any HazMat involved <input type="checkbox"/> Look for signs of flashover / backdraught <input type="checkbox"/> Send someone to check around the outside of the building <input type="checkbox"/> Isolate electricity and gas supplies prior to application of firefighting activities <input type="checkbox"/> Prepare and charge hose lines in preparation for fire crews to enter the building <input type="checkbox"/> Personnel wearing SCBA to enter for rescue purpose only <input type="checkbox"/> Brief crews entering for rescue on possible location of missing persons <p style="background-color: red; color: white; margin: 0;">INCIDENT DEVELOPMENT ACTIONS/CONSIDERATIONS</p> <ul style="list-style-type: none"> <input type="checkbox"/> Establish a Forward Control Point <input type="checkbox"/> Check external communications have been made <input type="checkbox"/> Consider dividing the building into sectors to assist managing search <input type="checkbox"/> Ventilate building as soon as practicable <input type="checkbox"/> Look for signs of structural collapse <input type="checkbox"/> Establish a Staging Area for on coming resources <input type="checkbox"/> Establish a triage area and direct Ambulance to standby <input type="checkbox"/> Ensure you have water sprays available and correct door procedures are observed <input type="checkbox"/> Ventilate outer compartments <input type="checkbox"/> Only enter the room if you have to, beware flammable gases. Cool and ventilate thoroughly <input type="checkbox"/> All doors must be treated as if they have a potential backdraught behind them <input type="checkbox"/> Decisions to be made before opening a door - door entry procedures to be adhered to <input type="checkbox"/> Be ready to close the door quickly if a backdraught appears likely
BUILDING CORDONS AND SECTORISATION		
INNER CORDON		
<ul style="list-style-type: none"> <input type="checkbox"/> Control access to immediate scene of operations <input type="checkbox"/> Access – restricted to minimum number of personnel and managed at all times by the OSC <input type="checkbox"/> Only persons directly involved in firefighting will have access this is managed by the ERT Leader 		
OUTER CORDON		
<ul style="list-style-type: none"> <input type="checkbox"/> Controlled by the security & managed by the OSC 		

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APPENDIX 7. INCIDENT SCENARIO GUIDES

APPENDIX 71 Security Related Incidents

The Astron Energy Refinery is a National Key Point in terms of the National Key Points Act, No 102 of 1980. All security-related incidents will therefore be handled in accordance with Astron Energy Astron Energy Security Operating procedures and the guidelines as prescribed by the NKP Act and Regulations and by Astron Energy Security South Africa.

All Security incident reporting will be sent to the Security control centre via the emergency hotline on ext. 70 (seventy) or via email to and or the Chief Security Officer within 8 (eight) hours of the incident's occurrence.

7.1a Reporting Fire/Explosion or Release (Gas or Liquid) Incident (On-Site)

The following actions are triggered on notification of an emergency involving a fire/explosion or product release on-site.

Step	Who	Action
Notification	Security	<ul style="list-style-type: none"> Dispatch the Astron Energy Refinery Fire department via radio and secondly inform the Refinery Shift Lead..
Response	RSL or Fire Officer (On-Scene Commander)	<ul style="list-style-type: none"> Instruct Security control to activate the SERT on shift via the all-channel frequency on the radio.
	SERT	<ul style="list-style-type: none"> Don their personal protective clothing. Change their radio to the Fire Response Channel. Respond to the incident area and report to the On Scene Commander.
	RSL or Fire Officer (On-Scene Commander)	<ul style="list-style-type: none"> "Size-Up" the incident and notify Security of type and level of Emergency.
	Security	<ul style="list-style-type: none"> Contact the On Scene Commander (Refinery CFO) and blending and shipping Team Lead.
	SERT	<ul style="list-style-type: none"> If the incident occurs during normal working hours, the SERT members on T-week not assigned to a specific unit must also don their personal protective equipment and report to the On Scene Command at the FCV for deployment if required.
	Security	<ul style="list-style-type: none"> If a Level Two Emergency, sound the alarm as requested by the RSL and place Milnerton Fire & Rescue Services on standby using the Remrad system. Activate the IMT on standby using the send word now system
	Milnerton Fire & Rescue Services	<ul style="list-style-type: none"> if requested to respond to the Refinery by the On Scene command, will respond to the North Entrance unless otherwise requested by Security. On their arrival at the entrance, Security must notify the On Scene Commander on the "Emergency Radio" kept at the North Entrance specifically for the

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Step	Who	Action
		<p>Emergency Services. This radio is set on the “Fire Response” Frequency.</p> <ul style="list-style-type: none"> • The On Scene Commander will advise Security whether Milnerton Fire & Rescue Services must respond to the scene of the incident or whether they should go to the On-Site Staging Area North of the Fire Station. • If requested to respond to the scene of the incident, the On Scene Commander will advise Security which route should be followed. • Security will mark the route on the Refinery Plot Plan also kept at the North Entrance and give both to Milnerton Fire & Rescue Services. • If Security has staff available, they will escort Milnerton Fire & Rescue Services to the location as requested.

7.1b Requesting Ambulance/ Medical or Rescue Assistance

The following actions are triggered on notification of an emergency requesting the ambulance / medical or Rescue assistance on-site.

Step	Who	Action
Notification	Security	<ul style="list-style-type: none"> • On receiving a request for ambulance/medical or Rescue assistance dispatch the Astron Energy Refinery Fire department via radio. • Without delay, inform the medical centre sister/ nurse.
Response	Astron Energy Refinery Fire Department	<ul style="list-style-type: none"> • After sizing up of the medical emergency, either transport the patient to the clinic or to an appropriate off-site medical facility. • Request Security Control room call a standby ambulance (SA Paramedics) to stand in on-site if their ambulance is leaving the site. • Request an appropriate ambulance (Private or Provincial) be called by Security control room to transport the patient from the Astron Energy Refinery clinic to an appropriate off-site medical facility.

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7.1c Reporting a Bomb Threat (On Site)

A Bomb Threat Information Sheet is issued with every internal telephone directory. It is the responsibility of every employee to review the contents of the Bomb Threat Information Sheet.

The following actions are triggered on notification of an emergency involving a bomb threat on-site.

Step	Who	Action
Receipt	Recipient of call	<ul style="list-style-type: none"> Complete the Bomb Threat Information Sheet and contact Security on the Emergency "Hot Line" (Ext 70), passing on all relevant information.
Notification	Security	<ul style="list-style-type: none"> Immediately notify the SA Police Services on 10111, Chief Security Officer, CFO and the Emergency Management Team as detailed in Appendix 1.
Response	The Chief Security Officer, CFO and RSL	<ul style="list-style-type: none"> Report to the ECC to await the IMT or take appropriate action depending on the initial evaluation.
	SERT	<ul style="list-style-type: none"> Don personal protective clothing and await further instructions.
	Security	<ul style="list-style-type: none"> On their arrival escort the Bomb Disposal Squad to the ECC where they will meet the IMT to decide on specific actions.

8.1d Reporting an Off-Site Incident (Oil Spill or Hazmat Incident)

The following actions are triggered on notification of an off-site incident.

Step	Who	Action
Receipt	Recipient of call	<ul style="list-style-type: none"> Use the form in Appendix 5.8 to record information.
Notification	Security	<ul style="list-style-type: none"> Notify the Refinery Shift Lead and the CFO.
Response	RSL	<ul style="list-style-type: none"> Confirm the information received by contacting the person(s) who reported the incident. Depending on the information received, notify Security on the specific response to be taken.
	Security	<ul style="list-style-type: none"> Contact the On Scene Commander (Refinery CFO) and blending and shipping Team Lead.

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APPENDIX 7.2 OIL SPILL

