

**APPENDIX 9D**

**RISK ASSESSMENT FOR  
PROPOSED DG VEHICLE FERRY PIER  
- SAFETY PARAMETERS**

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#### **A9D.1      PARAMETER FILES**

A total of three sets of parameter files were used in the SAFEIT analysis. All three sets had minor differences that were unique to the releases scenarios in which they modelled.

The three sets are:

- Continuous releases
- Instantaneous releases; and
- BLEVE's.

## A9D.2 Continuous Releases

Default atmospheric temperature_____	22.85	C
Default atmospheric pressure_____	101325	N/m2
Relative humidity_____	78	%
Default surface roughness parameter_____	0.1	
Default surface temperature_____	16.85	C
Atmospheric molecular weight_____	28.966	
Atmospheric specific heat at constant pressure_	1004	J/kg*K
Number of wind directions_____	16	
Angular Offset_____	0	degree
Pipe roughness_____	0.0457	mm
Excess Flow Valve velocity head losses_____	0	
Non-Return Valve velocity head losses_____	0	
Shut-Off Valve velocity head losses_____	0	
Frequency of bends in long pipes_____	0	1/m
Frequency of couplings in long pipes_____	0	1/m
Frequency of junctions in long pipes_____	0	1/m
Frequency of bends in short pipes_____	0.2	1/m
Frequency of couplings in short pipes_____	0.5	1/m
Frequency of junctions in short pipes_____	0.1	1/m
Upper volume change limit/step_____	0.5	
Lower volume change limit/step_____	0.15	
Minimum RV diameter ratio_____	1	
Relief valve safety factor_____	1.2	
Critical pressure greater than flow phase_____	0.34474	bar
Default line length_____	10	m
Default Liquid Fraction_____	1	fraction
Default volume changes_____	2.999999	per h
Short pipe length_____	10	m
Path-length factor for long pipes_____	1.4142	
Failure spacing along pipes_____	50	m
Minimum pipe inventory considered_____	0.25	fraction
Calculate full-bore rupture cases_____	Yes	
Pipe leak size_____	0.1	fraction
Maximum time for detection of leaks_____	3600	s
Normal gas flow velocity in pipes_____	20	m/s
Normal liquid flow velocity in pipes_____	1	m/s
Non-ignition prob. for flammable toxics_____	0.5	fraction
Reduce EDFs along each pipe_____	Yes	
Reduce EDFs from each unit_____	No	
Error factor for EDF reduction_____	1.2	
Maximum event frequency for EDF reduction_____	0.001	per yr
PIPEDF print flag(0=none, 4=full, 5=diag)_____	1	
Base failure-rate distributed along pipe_____	Yes	
Non-equilibrium (i.e. no flashing) flow_____	Yes	
Failure-to-close-on-detection prob. S/O valves_	0.01	
Minimum frequency for an EDF case_____	6.500001e-007	per yr
Leak rate normally detectable_____	0.1	fraction
Time to shut non return valve_____	5	s
Time to shut excess flow valve_____	5	s
Maximum release duration_____	3600	s
Minimum temperature allowed_____	- 263.15	C
Maximum temperature allowed_____	626.85	C
Maximum pressure allowed_____	1000	bar
Maximum liquid head allowed_____	100	m
Maximum release velocity_____	500	m/s
Range of release angles_____	90.00021	degree
Minimum drop size allowed_____	1e- 005	mm
Maximum drop size allowed_____	10	mm
BLEVE radiation level 1_____	4	kW/m2
BLEVE radiation level 2_____	12.5	kW/m2
BLEVE radiation level 3_____	37.5	kW/m2

Jet flame radiation level 1	4	kW/m2
Jet flame radiation level 2	12.5	kW/m2
Jet flame radiation level 3	37.5	kW/m2
Pool fire radiation level 1	4	kW/m2
Pool fire radiation level 2	12.5	kW/m2
Pool fire radiation level 3	37.5	kW/m2
LFL fraction to finish	0.5	fraction
Jet fire correction factor	3	
Calculate jet fire?	Yes	
Effect radiation level	12.5	kW/m2
Radiation total dose	500000	J/m2
Maximum SEP for a BLEVE	400	kW/m2
Maximum SEP for a Jet flame	400	kW/m2
Explosion efficiency	0.1	
Explosion overpressure level 1	0.02068	bar
Explosion overpressure level 2	0.1379	bar
Explosion overpressure level 3	0.2068	bar
Minimum explosive mass	100	kg
Explosion location criterion	3	
Venting equation constant	24.82	N/m2
Blast damage coefficient: heavy damage	0.03	
Blast damage coefficient: light damage	0.06	
Early explosion correction factor	3	
Maximum number of evaporation rates	6	
Pool minimum thickness	5	mm
Surface thermal conductivity	2.21	W/m*K
Surface roughness factor	2.634	
Surface thermal diffusivity (per second)	9.48e-007	m2
Solar radiation flux	0.5	kW/m2
Continuous Critical Weber number	12.5	
Print level	132 Columns	
Flamm.: height for calculation of effects	0	m
Flamm.: result grid step in X-direction	10	m
Toxics: height for calculation of effects	0	m
Toxics: results grid step in X-direction	25	m
Toxics: result grid step in Y-direction	2.5	m
Atmospheric temp and pressure profile	3	
Wind speed profile	2	
Temperature reference height (m)	10	m
Wind speed reference height (m)	10	m
Cut-off height for wind speed profile (m)	1	m
Dispersing surface temperature	16.85	C
Default dispersing surface type	Land	
Default bund surface type	Concrete	
Minimum integration step size (distance)	0.1	m
Maximum integration step size (distance)	100	m
Minimum integration step size (time)	0.1	s
Maximum integration step size (time)	10	s
Maximum distance for dispersion	10000	m
Minimum release velocity for cont. release	0.1	m/s
Default minimum release height	1	m
Maximum height for dispersion	1000	m
Toxics: minimum probability of death	0.001	
Minimum concentration of interest	0.0025	%
Maximum distance of interest	10000	m
Droplet evaporation thermodynamics model	2	
Flammable mass calculation method	2	
Method For Stopping Dispersion Calc	1	
Treatment of top of mixing layer	1	
Quasi-instantaneous transition parameter	0.8	
Finite Duration Correction Flag	3	
Multi-component toxic calculation method	1	

Force cloud to rain out at source_____	Yes	
Calculate consequence plotting data_____	Yes	
Accuracy for integration of dispersion_____	0.001	
Accuracy for droplet integration_____	0.001	
Turbulent Schmidt number_____	1	
Jet entrainment coefficient alpha1_____	0.11	
Jet entrainment coefficient alpha2_____	0.26	
Dense cloud parameter alpha (continuous)_____	1.6	
Dense cloud parameter beta (continuous)_____	0.015	
Dense cloud parameter gamma (continuous)_____	0.05	
Dense cloud parameter k (continuous)_____	0.15	
Dense cloud parameter alpha (instant)_____	1	
Dense cloud parameter beta (instant)_____	0.015	
Dense cloud parameter gamma (instant)_____	0.3	
Dense cloud parameter k (instantaneous)_____	1.2	
Ratio instantaneous/continuous sigma-y_____	1	
Ratio instantaneous/continuous sigma-z_____	1	
Drag coefficient between plume and air_____	0.15	
Drag coefficient between plume and ground_____	1.5	
Impact parameter - plume/ground_____	0.8	
Lift-off suppression parameter_____	2	
Base averaging time_____	10	s
Expansion zone length/source diameter ratio_____	0.01	
Toxics: cut-off rate for pool evaporation_____	0.001	kg/s
Height for concentration output_____	0	m
Flamm.: cut-off rate for pool evaporation_____	0.1	kg/s
Flamm.: accuracy of flammable mass calc_____	0.001	
Minimum vap fract for convection from ground_____	0.0015	fraction
Drop/expansion velocity for inst. release_____	0.8	m/s
Minimum cloud depth_____	0.02	m
Default bund height_____	0	m
Duration for jet fire averaging_____	20	s
Time to BLEVE_____	20	s
Expansion energy cutoff for droplet angle_____	690	J/kg
Flamm.: inclination _____	Variable	
Flamm.: angle of inclination _____	0	degree
Dense cloud parameter beta (pool vaporisation)_____	0.015	
Pool vaporisation entrainment parameter_____	1.5	
Distance multiple for full passive entrainment_____	2	
Density tolerance for cloud buoyancy_____	0.005	kg/m3
Automatic setting of Impact calculation grid_____	No	
Impact Calculation Grid: Lower X limit_____	- 500	m
Impact Calculation Grid: Upper X limit_____	1000	m
Impact Calculation Grid: Lower Y limit_____	- 500	m
Impact Calculation Grid: Upper Y limit_____	1000	m
Minimum case frequency considered_____	1e-012	
Minimum event probability considered_____	1e-012	
Fraction population outdoors, F-N_____	0.1	
Fraction population outdoors, night, F-N_____	0.01	
Fraction population outdoors, risk_____	1	
Fraction population outdoors, night, risk_____	1	
Fraction out killed by explosion R1_____	0.3	
Fraction in killed by explosion R1_____	1	
Fraction out killed by explosion R1-2_____	0.1	
Fraction in killed by explosion R1-2_____	0.3	
Fraction out killed by flash fire_____	1	
Fraction in killed by flash fire_____	0.1	
Fraction out killed by BLEVE_____	0.7	
Fraction in killed by BLEVE_____	0.2	
Fraction out killed by jet flame_____	0.7	
Fraction in killed by jet flame_____	0.1	
Fraction out killed by pool fire_____	0.7	

Fraction in killed by pool fire\_\_\_\_\_0.1  
 Fraction out killed by toxics\_\_\_\_\_0.9  
 Fraction in killed by toxics\_\_\_\_\_0.1  
 Pop omega factor (per person)\_\_\_\_\_0  
 No sub-squares across ellipse in flamm. impct\_10  
 Max times to subdivide a square in flamm. impct5  
 Multiplying factor for toxic F-N spread\_\_\_\_\_2  
 Probability of BLEVE\_\_\_\_\_1  
 Probability of fire\_\_\_\_\_1  
 Route 1a true jet. comb jet horiz. fraction\_\_\_\_0.6  
 Route 1a true jet. prob. horiz. ignition\_\_\_\_\_0.4  
 Route 1a true jet. prob. horiz. jet fire\_\_\_\_\_0.9  
 Route 1a true jet. prob. horiz. explosion\_\_\_\_\_0.1  
 Route 1a true jet. prob. vertical ignition\_\_\_\_\_0.2  
 Route 1a true jet. prob. vertical jet fire\_\_\_\_\_0.9  
 Route 1a true jet. prob. vertical explosion\_\_\_\_\_0.1  
 Route 3a true jet. comb jet horiz. fraction\_\_\_\_0.6  
 Route 3a true jet. prob. horiz. ignition\_\_\_\_\_0.4  
 Route 3a true jet. prob. horiz. jet fire\_\_\_\_\_0.9  
 Route 3a true jet. prob. horiz. explosion\_\_\_\_\_0.1  
 Route 3a true jet. prob. vertical ignition\_\_\_\_\_0.2  
 Route 3a true jet. prob. vertical jet fire\_\_\_\_\_0.9  
 Route 3a true jet. prob. vertical explosion\_\_\_\_\_0.1  
 Route 1b probability of delayed flash fire\_\_\_\_\_0.9  
 Route 1b probability of delayed explosion\_\_\_\_\_0.1  
 Route 2 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 2 probability of delayed explosion\_\_\_\_\_0.1  
 Route 3b probability of delayed flash fire\_\_\_\_\_0.9  
 Route 3b probability of delayed explosion\_\_\_\_\_0.1  
 Route 4 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 4 probability of delayed explosion\_\_\_\_\_0.1  
 Route 5 probability of immediate ignition\_\_\_\_\_0  
 Route 5 probability of early pool fire\_\_\_\_\_0  
 Route 5 probability of delayed pool fire\_\_\_\_\_0  
 Route 5 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 5 probability of delayed explosion\_\_\_\_\_0.1  
 Route 6 probability of immediate ignition\_\_\_\_\_0.3  
 Route 6 probability of early pool fire\_\_\_\_\_1  
 Route 6 probability of delayed pool fire\_\_\_\_\_0.15  
 Route 6 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 6 probability of delayed explosion\_\_\_\_\_0.1  
 Route 7 probability of immediate ignition\_\_\_\_\_0  
 Route 7 probability of early pool fire\_\_\_\_\_0  
 Route 7 probability of delayed pool fire\_\_\_\_\_0  
 Route 7 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 7 probability of delayed explosion\_\_\_\_\_0.1  
 Route 8 probability of immediate ignition\_\_\_\_\_0  
 Route 8 probability of early pool fire\_\_\_\_\_0  
 Route 8 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 8 probability of delayed explosion\_\_\_\_\_0.1  
 Route 9 probability of immediate ignition\_\_\_\_\_0.3  
 Route 9 probability of early pool fire\_\_\_\_\_1  
 Route 9 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 9 probability of delayed explosion\_\_\_\_\_0.1  
 Route 10 probability of immediate ignition\_\_\_\_\_0.3  
 Route 10 probability of BLEVE\_\_\_\_\_1  
 Route 10 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 10 probability of delayed explosion\_\_\_\_\_0.1  
 Route 11 probability of immediate ignition\_\_\_\_\_0.3  
 Route 11 probability of BLEVE\_\_\_\_\_1  
 Route 11 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 11 probability of delayed explosion\_\_\_\_\_0.1

Route 12 probability of immediate ignition	0.3	
Route 12 probability of BLEVE	1	
Route 12 probability of delayed pool fire	0.15	
Route 12 probability of delayed flash fire	0.9	
Route 12 probability of delayed explosion	0.1	
Route 13 probability of immediate ignition	0.3	
Route 13 probability of BLEVE	1	
Route 13 probability of delayed flash fire	0.9	
Route 13 probability of delayed explosion	0.1	
Route 14 probability of immediate ignition	0.3	
Route 14 probability of BLEVE	1	
Route 14 probability of delayed pool fire	0.15	
Route 14 probability of delayed flash fire	0.9	
Route 14 probability of delayed explosion	0.1	
Route 15 probability of immediate ignition	0.3	
Route 15 probability of BLEVE	1	
Route 15 probability of delayed flash fire	0.9	
Route 15 probability of delayed explosion	0.1	
Route 16 probability of immediate ignition	0.3	
Route 16 probability of BLEVE	1	
Route 16 probability of delayed flash fire	0.9	
Route 16 probability of delayed explosion	0.1	
Route 17 probability of immediate ignition	0.3	
Route 17 probability of BLEVE	1	
Route 17 probability of delayed pool fire	0.15	
Route 17 probability of delayed flash fire	0.9	
Route 17 probability of delayed explosion	0.1	
Route 18 probability of immediate ignition	0.3	
Route 18 probability of BLEVE	1	
Route 18 probability of delayed flash fire	0.9	
Route 18 probability of delayed explosion	0.1	
Route 19 probability of immediate ignition	0.3	
Route 19 probability of BLEVE	1	
Route 19 probability of delayed pool fire	0.15	
Route 19 probability of delayed flash fire	0.9	
Route 19 probability of delayed explosion	0.1	
Route 20 probability of immediate ignition	0.3	
Route 20 probability of BLEVE	1	
Route 20 probability of delayed flash fire	0.9	
Route 20 probability of delayed explosion	0.1	
Probability of toxic	1	
1st Risk contour level	1	per yr
2nd Risk contour level	1	per yr
3rd Risk contour level	1	per yr
4th Risk contour level	1	per yr
5th Risk contour level	1	per yr
6th Risk contour level	1e- 005	per yr
7th Risk contour level	1e- 006	per yr
8th Risk contour level	1e- 007	per yr
9th Risk contour level	1e- 008	per yr
10th Risk contour level	1	per yr
1st Risk contour Color	Black	
2nd Risk contour Color	Black	
3rd Risk contour Color	Black	
4th Risk contour Color	Black	
5th Risk contour Color	Black	
6th Risk contour Color	Red	
7th Risk contour Color	Green	
8th Risk contour Color	Blue	
9th Risk contour Color	Magenta	
10th Risk contour Color	Magenta	
Line thickness for contours	2	

Line type for contours (thickness =1 only)	_____Solid	
Minimum risk level	_____1e- 008	per yr
Display risk criteria lines	_____Yes	
Maximum risk criteria line start N	_____1	
Maximum risk criteria line start F	_____0.001	per yr
Maximum risk criteria line end N	_____10	
Maximum risk criteria line end F	_____0.0001	per yr
Minimum risk criteria line start N	_____1	
Minimum risk criteria line start F	_____1e- 005	per yr
Minimum risk criteria line end N	_____10	
Minimum risk criteria line end F	_____1e- 006	per yr
Aversion index	_____1	



### A9D.3 Instantaneous Releases

Default atmospheric temperature_____	22.85	C
Default atmospheric pressure_____	101325	N/m2
Relative humidity_____	78	%
Default surface roughness parameter_____	0.1	
Default surface temperature_____	16.85	C
Atmospheric molecular weight_____	28.966	
Atmospheric specific heat at constant pressure_	1004	J/kg*K
Number of wind directions_____	16	
Angular Offset_____	0	degree
Pipe roughness_____	0.0457	mm
Excess Flow Valve velocity head losses_____	0	
Non-Return Valve velocity head losses_____	0	
Shut-Off Valve velocity head losses_____	0	
Frequency of bends in long pipes_____	0	1/m
Frequency of couplings in long pipes_____	0	1/m
Frequency of junctions in long pipes_____	0	1/m
Frequency of bends in short pipes_____	0.2	1/m
Frequency of couplings in short pipes_____	0.5	1/m
Frequency of junctions in short pipes_____	0.1	1/m
Upper volume change limit/step_____	0.5	
Lower volume change limit/step_____	0.15	
Minimum RV diameter ratio_____	1	
Relief valve safety factor_____	1.2	
Critical pressure greater than flow phase_____	0.34474	bar
Default line length_____	10	m
Default Liquid Fraction_____	1	fraction
Default volume changes_____	2.999999	per h
Short pipe length_____	10	m
Path-length factor for long pipes_____	1.4142	
Failure spacing along pipes_____	50	m
Minimum pipe inventory considered_____	0.25	fraction
Calculate full-bore rupture cases_____	Yes	
Pipe leak size_____	0.1	fraction
Maximum time for detection of leaks_____	3600	s
Normal gas flow velocity in pipes_____	20	m/s
Normal liquid flow velocity in pipes_____	1	m/s
Non-ignition prob. for flammable toxics_____	0.5	fraction
Reduce EDFs along each pipe_____	Yes	
Reduce EDFs from each unit_____	No	
Error factor for EDF reduction_____	1.2	
Maximum event frequency for EDF reduction_____	0.001	per yr
PIPEDF print flag(0=none, 4=full, 5=diag)_____	1	
Base failure-rate distributed along pipe_____	Yes	
Non-equilibrium (i.e. no flashing) flow_____	Yes	
Failure-to-close-on-detection prob. S/O valves_	0.01	
Minimum frequency for an EDF case_____	1e- 015	per yr
Leak rate normally detectable_____	0.1	fraction
Time to shut non return valve_____	5	s
Time to shut excess flow valve_____	5	s
Maximum release duration_____	3600	s
Minimum temperature allowed_____	- 263.15	C
Maximum temperature allowed_____	626.85	C
Maximum pressure allowed_____	1000	bar
Maximum liquid head allowed_____	100	m
Maximum release velocity_____	500	m/s
Range of release angles_____	90.00021	degree
Minimum drop size allowed_____	1e- 005	mm
Maximum drop size allowed_____	10	mm
BLEVE radiation level 1_____	4	kW/m2
BLEVE radiation level 2_____	12.5	kW/m2
BLEVE radiation level 3_____	37.5	kW/m2

Jet flame radiation level 1	4	kW/m2
Jet flame radiation level 2	12.5	kW/m2
Jet flame radiation level 3	37.5	kW/m2
Pool fire radiation level 1	4	kW/m2
Pool fire radiation level 2	12.5	kW/m2
Pool fire radiation level 3	37.5	kW/m2
LFL fraction to finish	0.5	fraction
Jet fire correction factor	3	
Calculate jet fire?	Yes	
Effect radiation level	12.5	kW/m2
Radiation total dose	500000	J/m2
Maximum SEP for a BLEVE	400	kW/m2
Maximum SEP for a Jet flame	400	kW/m2
Explosion efficiency	0.1	
Explosion overpressure level 1	0.02068	bar
Explosion overpressure level 2	0.1379	bar
Explosion overpressure level 3	0.2068	bar
Minimum explosive mass	100	kg
Explosion location criterion	3	
Venting equation constant	24.82	N/m2
Blast damage coefficient: heavy damage	0.03	
Blast damage coefficient: light damage	0.06	
Early explosion correction factor	3	
Maximum number of evaporation rates	6	
Pool minimum thickness	5	mm
Surface thermal conductivity	2.21	W/m*K
Surface roughness factor	2.634	
Surface thermal diffusivity (per second)	9.48e-007	m2
Solar radiation flux	0.5	kW/m2
Continuous Critical Weber number	12.5	
Print level	132 Columns	
Flamm.: height for calculation of effects	0	m
Flamm.: result grid step in X-direction	10	m
Toxics: height for calculation of effects	0	m
Toxics: results grid step in X-direction	25	m
Toxics: result grid step in Y-direction	2.5	m
Atmospheric temp and pressure profile	3	
Wind speed profile	2	
Temperature reference height (m)	10	m
Wind speed reference height (m)	10	m
Cut-off height for wind speed profile (m)	1	m
Dispersing surface temperature	16.85	C
Default dispersing surface type	Land	
Default bund surface type	Concrete	
Minimum integration step size (distance)	0.1	m
Maximum integration step size (distance)	100	m
Minimum integration step size (time)	0.1	s
Maximum integration step size (time)	10	s
Maximum distance for dispersion	10000	m
Minimum release velocity for cont. release	0.1	m/s
Default minimum release height	1	m
Maximum height for dispersion	1000	m
Toxics: minimum probability of death	0.001	
Minimum concentration of interest	0.0025	%
Maximum distance of interest	10000	m
Droplet evaporation thermodynamics model	2	
Flammable mass calculation method	2	
Method For Stopping Dispersion Calc	1	
Treatment of top of mixing layer	1	
Quasi-instantaneous transition parameter	0.8	
Finite Duration Correction Flag	3	
Multi-component toxic calculation method	1	

Force cloud to rain out at source_____	Yes	
Calculate consequence plotting data_____	Yes	
Accuracy for integration of dispersion_____	0.001	
Accuracy for droplet integration_____	0.001	
Turbulent Schmidt number_____	1	
Jet entrainment coefficient alpha1_____	0.11	
Jet entrainment coefficient alpha2_____	0.26	
Dense cloud parameter alpha (continuous)_____	1.6	
Dense cloud parameter beta (continuous)_____	0.015	
Dense cloud parameter gamma (continuous)_____	0.05	
Dense cloud parameter k (continuous)_____	0.15	
Dense cloud parameter alpha (instant)_____	1	
Dense cloud parameter beta (instant)_____	0.015	
Dense cloud parameter gamma (instant)_____	0.3	
Dense cloud parameter k (instantaneous)_____	1.2	
Ratio instantaneous/continuous sigma-y_____	1	
Ratio instantaneous/continuous sigma-z_____	1	
Drag coefficient between plume and air_____	0.15	
Drag coefficient between plume and ground_____	1.5	
Impact parameter - plume/ground_____	0.8	
Lift-off suppression parameter_____	2	
Base averaging time_____	10	s
Expansion zone length/source diameter ratio_____	0.01	
Toxics: cut-off rate for pool evaporation_____	0.001	kg/s
Height for concentration output_____	0	m
Flamm.: cut-off rate for pool evaporation_____	0.1	kg/s
Flamm.: accuracy of flammable mass calc_____	0.001	
Minimum vap fract for convection from ground_____	0.0015	fraction
Drop/expansion velocity for inst. release_____	0.8	m/s
Minimum cloud depth_____	0.02	m
Default bund height_____	0	m
Duration for jet fire averaging_____	20	s
Time to BLEVE_____	20	s
Expansion energy cutoff for droplet angle_____	690	J/kg
Flamm.: inclination _____	Variable	
Flamm.: angle of inclination _____	0	degree
Dense cloud parameter beta (pool vaporisation)_____	0.015	
Pool vaporisation entrainment parameter_____	1.5	
Distance multiple for full passive entrainment_____	2	
Density tolerance for cloud buoyancy_____	0.005	kg/m3
Automatic setting of Impact calculation grid_____	No	
Impact Calculation Grid: Lower X limit_____	- 500	m
Impact Calculation Grid: Upper X limit_____	1000	m
Impact Calculation Grid: Lower Y limit_____	- 500	m
Impact Calculation Grid: Upper Y limit_____	1000	m
Minimum case frequency considered_____	1e-012	
Minimum event probability considered_____	1e-012	
Fraction population outdoors, F-N_____	0.1	
Fraction population outdoors, night, F-N_____	0.01	
Fraction population outdoors, risk_____	1	
Fraction population outdoors, night, risk_____	1	
Fraction out killed by explosion R1_____	0.3	
Fraction in killed by explosion R1_____	1	
Fraction out killed by explosion R1-2_____	0.1	
Fraction in killed by explosion R1-2_____	0.3	
Fraction out killed by flash fire_____	1	
Fraction in killed by flash fire_____	0.1	
Fraction out killed by BLEVE_____	0.7	
Fraction in killed by BLEVE_____	0.2	
Fraction out killed by jet flame_____	0.7	
Fraction in killed by jet flame_____	0.1	
Fraction out killed by pool fire_____	0.7	

Fraction in killed by pool fire_____	0.1
Fraction out killed by toxics_____	0.9
Fraction in killed by toxics_____	0.1
Pop omega factor (per person)_____	0
No sub-squares across ellipse in flamm. impct_	10
Max times to subdivide a square in flamm. impct	5
Multiplying factor for toxic F-N spread_____	2
Probability of BLEVE_____	1
Probability of fire_____	1
Route 1a true jet. comb jet horiz. fraction____	0.6
Route 1a true jet. prob. horiz. ignition_____	0.4
Route 1a true jet. prob. horiz. jet fire_____	0.9
Route 1a true jet. prob. horiz. explosion_____	0.1
Route 1a true jet. prob. vertical ignition_____	0.2
Route 1a true jet. prob. vertical jet fire_____	0.9
Route 1a true jet. prob. vertical explosion_____	0.1
Route 3a true jet. comb jet horiz. fraction____	0.6
Route 3a true jet. prob. horiz. ignition_____	0.4
Route 3a true jet. prob. horiz. jet fire_____	0.9
Route 3a true jet. prob. horiz. explosion_____	0.1
Route 3a true jet. prob. vertical ignition_____	0.2
Route 3a true jet. prob. vertical jet fire_____	0.9
Route 3a true jet. prob. vertical explosion_____	0.1
Route 1b probability of delayed flash fire_____	0.9
Route 1b probability of delayed explosion_____	0.1
Route 2 probability of delayed flash fire_____	0.9
Route 2 probability of delayed explosion_____	0.1
Route 3b probability of delayed flash fire_____	0.9
Route 3b probability of delayed explosion_____	0.1
Route 4 probability of delayed flash fire_____	0.9
Route 4 probability of delayed explosion_____	0.1
Route 5 probability of immediate ignition_____	0.3
Route 5 probability of early pool fire_____	1
Route 5 probability of delayed pool fire_____	0.15
Route 5 probability of delayed flash fire_____	0.9
Route 5 probability of delayed explosion_____	0.1
Route 6 probability of immediate ignition_____	0.3
Route 6 probability of early pool fire_____	1
Route 6 probability of delayed pool fire_____	0.15
Route 6 probability of delayed flash fire_____	0.9
Route 6 probability of delayed explosion_____	0.1
Route 7 probability of immediate ignition_____	0.3
Route 7 probability of early pool fire_____	1
Route 7 probability of delayed pool fire_____	0.15
Route 7 probability of delayed flash fire_____	0.9
Route 7 probability of delayed explosion_____	0.1
Route 8 probability of immediate ignition_____	0.3
Route 8 probability of early pool fire_____	1
Route 8 probability of delayed flash fire_____	0.9
Route 8 probability of delayed explosion_____	0.1
Route 9 probability of immediate ignition_____	0.3
Route 9 probability of early pool fire_____	1
Route 9 probability of delayed flash fire_____	0.9
Route 9 probability of delayed explosion_____	0.1
Route 10 probability of immediate ignition_____	0.3
Route 10 probability of BLEVE_____	1
Route 10 probability of delayed flash fire_____	0.9
Route 10 probability of delayed explosion_____	0.1
Route 11 probability of immediate ignition_____	0.3
Route 11 probability of BLEVE_____	1
Route 11 probability of delayed flash fire_____	0.9
Route 11 probability of delayed explosion_____	0.1

Route 12 probability of immediate ignition	0.3	
Route 12 probability of BLEVE	1	
Route 12 probability of delayed pool fire	0.15	
Route 12 probability of delayed flash fire	0.9	
Route 12 probability of delayed explosion	0.1	
Route 13 probability of immediate ignition	0.3	
Route 13 probability of BLEVE	1	
Route 13 probability of delayed flash fire	0.9	
Route 13 probability of delayed explosion	0.1	
Route 14 probability of immediate ignition	0.3	
Route 14 probability of BLEVE	0.1	
Route 14 probability of delayed pool fire	0	
Route 14 probability of delayed flash fire	0.9	
Route 14 probability of delayed explosion	0.1	
Route 15 probability of immediate ignition	0.3	
Route 15 probability of BLEVE	1	
Route 15 probability of delayed flash fire	0.9	
Route 15 probability of delayed explosion	0.1	
Route 16 probability of immediate ignition	0.3	
Route 16 probability of BLEVE	1	
Route 16 probability of delayed flash fire	0.9	
Route 16 probability of delayed explosion	0.1	
Route 17 probability of immediate ignition	0.3	
Route 17 probability of BLEVE	1	
Route 17 probability of delayed pool fire	0.15	
Route 17 probability of delayed flash fire	0.9	
Route 17 probability of delayed explosion	0.1	
Route 18 probability of immediate ignition	0.3	
Route 18 probability of BLEVE	1	
Route 18 probability of delayed flash fire	0.9	
Route 18 probability of delayed explosion	0.1	
Route 19 probability of immediate ignition	0.3	
Route 19 probability of BLEVE	1	
Route 19 probability of delayed pool fire	0.15	
Route 19 probability of delayed flash fire	0.9	
Route 19 probability of delayed explosion	0.1	
Route 20 probability of immediate ignition	0.3	
Route 20 probability of BLEVE	1	
Route 20 probability of delayed flash fire	0.9	
Route 20 probability of delayed explosion	0.1	
Probability of toxic	1	
1st Risk contour level	1	per yr
2nd Risk contour level	1	per yr
3rd Risk contour level	1	per yr
4th Risk contour level	1	per yr
5th Risk contour level	1	per yr
6th Risk contour level	1e- 005	per yr
7th Risk contour level	1e- 006	per yr
8th Risk contour level	1e- 007	per yr
9th Risk contour level	1e- 008	per yr
10th Risk contour level	1	per yr
1st Risk contour Color	Black	
2nd Risk contour Color	Black	
3rd Risk contour Color	Black	
4th Risk contour Color	Black	
5th Risk contour Color	Black	
6th Risk contour Color	Red	
7th Risk contour Color	Green	
8th Risk contour Color	Blue	
9th Risk contour Color	Magenta	
10th Risk contour Color	Black	
Line thickness for contours	2	

Line type for contours (thickness =1 only)	_____Solid	
Minimum risk level	_____1e- 008	per yr
Display risk criteria lines	_____Yes	
Maximum risk criteria line start N	_____1	
Maximum risk criteria line start F	_____0.001	per yr
Maximum risk criteria line end N	_____10	
Maximum risk criteria line end F	_____0.0001	per yr
Minimum risk criteria line start N	_____1	
Minimum risk criteria line start F	_____1e- 005	per yr
Minimum risk criteria line end N	_____10	
Minimum risk criteria line end F	_____1e- 006	per yr
Aversion index	_____1	

#### A9D.4 BLEVE's

Default atmospheric temperature_____	22.85	C
Default atmospheric pressure_____	101325	N/m2
Relative humidity_____	78	%
Default surface roughness parameter_____	0.1	
Default surface temperature_____	16.85	C
Atmospheric molecular weight_____	28.966	
Atmospheric specific heat at constant pressure_	1004	J/kg*K
Number of wind directions_____	16	
Angular Offset_____	0	degree
Pipe roughness_____	0.0457	mm
Excess Flow Valve velocity head losses_____	0	
Non-Return Valve velocity head losses_____	0	
Shut-Off Valve velocity head losses_____	0	
Frequency of bends in long pipes_____	0	1/m
Frequency of couplings in long pipes_____	0	1/m
Frequency of junctions in long pipes_____	0	1/m
Frequency of bends in short pipes_____	0.2	1/m
Frequency of couplings in short pipes_____	0.5	1/m
Frequency of junctions in short pipes_____	0.1	1/m
Upper volume change limit/step_____	0.5	
Lower volume change limit/step_____	0.15	
Minimum RV diameter ratio_____	1	
Relief valve safety factor_____	1.2	
Critical pressure greater than flow phase_____	0.34474	bar
Default line length_____	10	m
Default Liquid Fraction_____	1	fraction
Default volume changes_____	2.999999	per h
Short pipe length_____	10	m
Path-length factor for long pipes_____	1.4142	
Failure spacing along pipes_____	50	m
Minimum pipe inventory considered_____	0.25	fraction
Calculate full-bore rupture cases_____	Yes	
Pipe leak size_____	0.1	fraction
Maximum time for detection of leaks_____	3600	s
Normal gas flow velocity in pipes_____	20	m/s
Normal liquid flow velocity in pipes_____	1	m/s
Non-ignition prob. for flammable toxics_____	0.5	fraction
Reduce EDFs along each pipe_____	Yes	
Reduce EDFs from each unit_____	No	
Error factor for EDF reduction_____	1.2	
Maximum event frequency for EDF reduction_____	0.001	per yr
PIPEDF print flag(0=none, 4=full, 5=diag)_____	1	
Base failure-rate distributed along pipe_____	Yes	
Non-equilibrium (i.e. no flashing) flow_____	Yes	
Failure-to-close-on-detection prob. S/O valves_	0.01	
Minimum frequency for an EDF case_____	6.500001e-007	per yr
Leak rate normally detectable_____	0.1	fraction
Time to shut non return valve_____	5	s
Time to shut excess flow valve_____	5	s
Maximum release duration_____	3600	s
Minimum temperature allowed_____	- 263.15	C
Maximum temperature allowed_____	626.85	C
Maximum pressure allowed_____	1000	bar
Maximum liquid head allowed_____	100	m
Maximum release velocity_____	500	m/s
Range of release angles_____	90.00021	degree
Minimum drop size allowed_____	1e- 005	mm
Maximum drop size allowed_____	10	mm
BLEVE radiation level 1_____	4	kW/m2
BLEVE radiation level 2_____	12.5	kW/m2
BLEVE radiation level 3_____	37.5	kW/m2

Jet flame radiation level 1	4	kW/m2
Jet flame radiation level 2	12.5	kW/m2
Jet flame radiation level 3	37.5	kW/m2
Pool fire radiation level 1	4	kW/m2
Pool fire radiation level 2	12.5	kW/m2
Pool fire radiation level 3	37.5	kW/m2
LFL fraction to finish	0.5	fraction
Jet fire correction factor	3	
Calculate jet fire?	Yes	
Effect radiation level	12.5	kW/m2
Radiation total dose	500000	J/m2
Maximum SEP for a BLEVE	400	kW/m2
Maximum SEP for a Jet flame	400	kW/m2
Explosion efficiency	0.1	
Explosion overpressure level 1	0.02068	bar
Explosion overpressure level 2	0.1379	bar
Explosion overpressure level 3	0.2068	bar
Minimum explosive mass	100	kg
Explosion location criterion	3	
Venting equation constant	24.82	N/m2
Blast damage coefficient: heavy damage	0.03	
Blast damage coefficient: light damage	0.06	
Early explosion correction factor	3	
Maximum number of evaporation rates	6	
Pool minimum thickness	5	mm
Surface thermal conductivity	2.21	W/m*K
Surface roughness factor	2.634	
Surface thermal diffusivity (per second)	9.48e-007	m2
Solar radiation flux	0.5	kW/m2
Continuous Critical Weber number	12.5	
Print level	132 Columns	
Flamm.: height for calculation of effects	0	m
Flamm.: result grid step in X-direction	10	m
Toxics: height for calculation of effects	0	m
Toxics: results grid step in X-direction	25	m
Toxics: result grid step in Y-direction	2.5	m
Atmospheric temp and pressure profile	3	
Wind speed profile	2	
Temperature reference height (m)	10	m
Wind speed reference height (m)	10	m
Cut-off height for wind speed profile (m)	1	m
Dispersing surface temperature	16.85	C
Default dispersing surface type	Land	
Default bund surface type	Concrete	
Minimum integration step size (distance)	0.1	m
Maximum integration step size (distance)	100	m
Minimum integration step size (time)	0.1	s
Maximum integration step size (time)	10	s
Maximum distance for dispersion	10000	m
Minimum release velocity for cont. release	0.1	m/s
Default minimum release height	1	m
Maximum height for dispersion	1000	m
Toxics: minimum probability of death	0.001	
Minimum concentration of interest	0.0025	%
Maximum distance of interest	10000	m
Droplet evaporation thermodynamics model	2	
Flammable mass calculation method	2	
Method For Stopping Dispersion Calc	1	
Treatment of top of mixing layer	1	
Quasi-instantaneous transition parameter	0.8	
Finite Duration Correction Flag	3	
Multi-component toxic calculation method	1	



Force cloud to rain out at source_____	Yes	
Calculate consequence plotting data_____	Yes	
Accuracy for integration of dispersion_____	0.001	
Accuracy for droplet integration_____	0.001	
Turbulent Schmidt number_____	1	
Jet entrainment coefficient alpha1_____	0.11	
Jet entrainment coefficient alpha2_____	0.26	
Dense cloud parameter alpha (continuous)_____	1.6	
Dense cloud parameter beta (continuous)_____	0.015	
Dense cloud parameter gamma (continuous)_____	0.05	
Dense cloud parameter k (continuous)_____	0.15	
Dense cloud parameter alpha (instant)_____	1	
Dense cloud parameter beta (instant)_____	0.015	
Dense cloud parameter gamma (instant)_____	0.3	
Dense cloud parameter k (instantaneous)_____	1.2	
Ratio instantaneous/continuous sigma-y_____	1	
Ratio instantaneous/continuous sigma-z_____	1	
Drag coefficient between plume and air_____	0.15	
Drag coefficient between plume and ground_____	1.5	
Impact parameter - plume/ground_____	0.8	
Lift-off suppression parameter_____	2	
Base averaging time_____	10	s
Expansion zone length/source diameter ratio_____	0.01	
Toxics: cut-off rate for pool evaporation_____	0.001	kg/s
Height for concentration output_____	0	m
Flamm.: cut-off rate for pool evaporation_____	0.1	kg/s
Flamm.: accuracy of flammable mass calc_____	0.001	
Minimum vap fract for convection from ground_____	0.0015	fraction
Drop/expansion velocity for inst. release_____	0.8	m/s
Minimum cloud depth_____	0.02	m
Default bund height_____	0	m
Duration for jet fire averaging_____	20	s
Time to BLEVE_____	20	s
Expansion energy cutoff for droplet angle_____	690	J/kg
Flamm.: inclination _____	Variable	
Flamm.: angle of inclination _____	0	degree
Dense cloud parameter beta (pool vaporisation)_____	0.015	
Pool vaporisation entrainment parameter_____	1.5	
Distance multiple for full passive entrainment_____	2	
Density tolerance for cloud buoyancy_____	0.005	kg/m3
Automatic setting of Impact calculation grid_____	No	
Impact Calculation Grid: Lower X limit_____	- 500	m
Impact Calculation Grid: Upper X limit_____	1000	m
Impact Calculation Grid: Lower Y limit_____	- 500	m
Impact Calculation Grid: Upper Y limit_____	1000	m
Minimum case frequency considered_____	1e-012	
Minimum event probability considered_____	1e-012	
Fraction population outdoors, F-N_____	0.1	
Fraction population outdoors, night, F-N_____	0.01	
Fraction population outdoors, risk_____	1	
Fraction population outdoors, night, risk_____	1	
Fraction out killed by explosion R1_____	0.3	
Fraction in killed by explosion R1_____	1	
Fraction out killed by explosion R1-2_____	0.1	
Fraction in killed by explosion R1-2_____	0.3	
Fraction out killed by flash fire_____	1	
Fraction in killed by flash fire_____	0.1	
Fraction out killed by BLEVE_____	0.7	
Fraction in killed by BLEVE_____	0.2	
Fraction out killed by jet flame_____	0.7	
Fraction in killed by jet flame_____	0.1	
Fraction out killed by pool fire_____	0.7	

Fraction in killed by pool fire\_\_\_\_\_0.1  
 Fraction out killed by toxics\_\_\_\_\_0.9  
 Fraction in killed by toxics\_\_\_\_\_0.1  
 Pop omega factor (per person)\_\_\_\_\_0  
 No sub-squares across ellipse in flamm. impct\_10  
 Max times to subdivide a square in flamm. impct5  
 Multiplying factor for toxic F-N spread\_\_\_\_\_2  
 Probability of BLEVE\_\_\_\_\_1  
 Probability of fire\_\_\_\_\_1  
 Route 1a true jet. comb jet horiz. fraction\_\_\_0.6  
 Route 1a true jet. prob. horiz. ignition\_\_\_\_\_0.4  
 Route 1a true jet. prob. horiz. jet fire\_\_\_\_\_0.9  
 Route 1a true jet. prob. horiz. explosion\_\_\_\_\_0.1  
 Route 1a true jet. prob. vertical ignition\_\_\_\_\_0.2  
 Route 1a true jet. prob. vertical jet fire\_\_\_\_\_0.9  
 Route 1a true jet. prob. vertical explosion\_\_\_\_\_0.1  
 Route 3a true jet. comb jet horiz. fraction\_\_\_0.6  
 Route 3a true jet. prob. horiz. ignition\_\_\_\_\_0.4  
 Route 3a true jet. prob. horiz. jet fire\_\_\_\_\_0.9  
 Route 3a true jet. prob. horiz. explosion\_\_\_\_\_0.1  
 Route 3a true jet. prob. vertical ignition\_\_\_\_\_0.2  
 Route 3a true jet. prob. vertical jet fire\_\_\_\_\_0.9  
 Route 3a true jet. prob. vertical explosion\_\_\_\_\_0.1  
 Route 1b probability of delayed flash fire\_\_\_\_\_0.9  
 Route 1b probability of delayed explosion\_\_\_\_\_0.1  
 Route 2 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 2 probability of delayed explosion\_\_\_\_\_0.1  
 Route 3b probability of delayed flash fire\_\_\_\_\_0.9  
 Route 3b probability of delayed explosion\_\_\_\_\_0.1  
 Route 4 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 4 probability of delayed explosion\_\_\_\_\_0.1  
 Route 5 probability of immediate ignition\_\_\_\_\_0.3  
 Route 5 probability of early pool fire\_\_\_\_\_1  
 Route 5 probability of delayed pool fire\_\_\_\_\_0.15  
 Route 5 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 5 probability of delayed explosion\_\_\_\_\_0.1  
 Route 6 probability of immediate ignition\_\_\_\_\_0.3  
 Route 6 probability of early pool fire\_\_\_\_\_1  
 Route 6 probability of delayed pool fire\_\_\_\_\_0.15  
 Route 6 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 6 probability of delayed explosion\_\_\_\_\_0.1  
 Route 7 probability of immediate ignition\_\_\_\_\_0.3  
 Route 7 probability of early pool fire\_\_\_\_\_1  
 Route 7 probability of delayed pool fire\_\_\_\_\_0.15  
 Route 7 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 7 probability of delayed explosion\_\_\_\_\_0.1  
 Route 8 probability of immediate ignition\_\_\_\_\_0.3  
 Route 8 probability of early pool fire\_\_\_\_\_1  
 Route 8 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 8 probability of delayed explosion\_\_\_\_\_0.1  
 Route 9 probability of immediate ignition\_\_\_\_\_0.3  
 Route 9 probability of early pool fire\_\_\_\_\_1  
 Route 9 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 9 probability of delayed explosion\_\_\_\_\_0.1  
 Route 10 probability of immediate ignition\_\_\_\_\_1  
 Route 10 probability of BLEVE\_\_\_\_\_1  
 Route 10 probability of delayed flash fire\_\_\_\_\_0  
 Route 10 probability of delayed explosion\_\_\_\_\_0  
 Route 11 probability of immediate ignition\_\_\_\_\_0.3  
 Route 11 probability of BLEVE\_\_\_\_\_1  
 Route 11 probability of delayed flash fire\_\_\_\_\_0.9  
 Route 11 probability of delayed explosion\_\_\_\_\_0.1

Route 12 probability of immediate ignition	0.3	
Route 12 probability of BLEVE	1	
Route 12 probability of delayed pool fire	0.15	
Route 12 probability of delayed flash fire	0.9	
Route 12 probability of delayed explosion	0.1	
Route 13 probability of immediate ignition	0.3	
Route 13 probability of BLEVE	1	
Route 13 probability of delayed flash fire	0.9	
Route 13 probability of delayed explosion	0.1	
Route 14 probability of immediate ignition	1	
Route 14 probability of BLEVE	1	
Route 14 probability of delayed pool fire	0	
Route 14 probability of delayed flash fire	0	
Route 14 probability of delayed explosion	0	
Route 15 probability of immediate ignition	0.3	
Route 15 probability of BLEVE	1	
Route 15 probability of delayed flash fire	0.9	
Route 15 probability of delayed explosion	0.1	
Route 16 probability of immediate ignition	0.3	
Route 16 probability of BLEVE	1	
Route 16 probability of delayed flash fire	0.9	
Route 16 probability of delayed explosion	0.1	
Route 17 probability of immediate ignition	0.3	
Route 17 probability of BLEVE	1	
Route 17 probability of delayed pool fire	0.15	
Route 17 probability of delayed flash fire	0.9	
Route 17 probability of delayed explosion	0.1	
Route 18 probability of immediate ignition	0.3	
Route 18 probability of BLEVE	1	
Route 18 probability of delayed flash fire	0.9	
Route 18 probability of delayed explosion	0.1	
Route 19 probability of immediate ignition	0.3	
Route 19 probability of BLEVE	1	
Route 19 probability of delayed pool fire	0.15	
Route 19 probability of delayed flash fire	0.9	
Route 19 probability of delayed explosion	0.1	
Route 20 probability of immediate ignition	0.3	
Route 20 probability of BLEVE	1	
Route 20 probability of delayed flash fire	0.9	
Route 20 probability of delayed explosion	0.1	
Probability of toxic	1	
1st Risk contour level	1	per yr
2nd Risk contour level	1	per yr
3rd Risk contour level	1	per yr
4th Risk contour level	1	per yr
5th Risk contour level	1	per yr
6th Risk contour level	1	per yr
7th Risk contour level	1e- 006	per yr
8th Risk contour level	1e- 007	per yr
9th Risk contour level	1e- 008	per yr
10th Risk contour level	1	per yr
1st Risk contour Color	Black	
2nd Risk contour Color	Black	
3rd Risk contour Color	Black	
4th Risk contour Color	Black	
5th Risk contour Color	Black	
6th Risk contour Color	Red	
7th Risk contour Color	Red	
8th Risk contour Color	Blue	
9th Risk contour Color	Magenta	
10th Risk contour Color	Magenta	
Line thickness for contours	2	

Line type for contours (thickness =1 only)	_____Solid	
Minimum risk level	_____1e- 008	per yr
Display risk criteria lines	_____Yes	
Maximum risk criteria line start N	_____1	
Maximum risk criteria line start F	_____0.001	per yr
Maximum risk criteria line end N	_____10	
Maximum risk criteria line end F	_____1e- 005	per yr
Minimum risk criteria line start N	_____1	
Minimum risk criteria line start F	_____1e- 005	per yr
Minimum risk criteria line end N	_____10	
Minimum risk criteria line end F	_____1e- 007	per yr
Aversion index	_____1	