

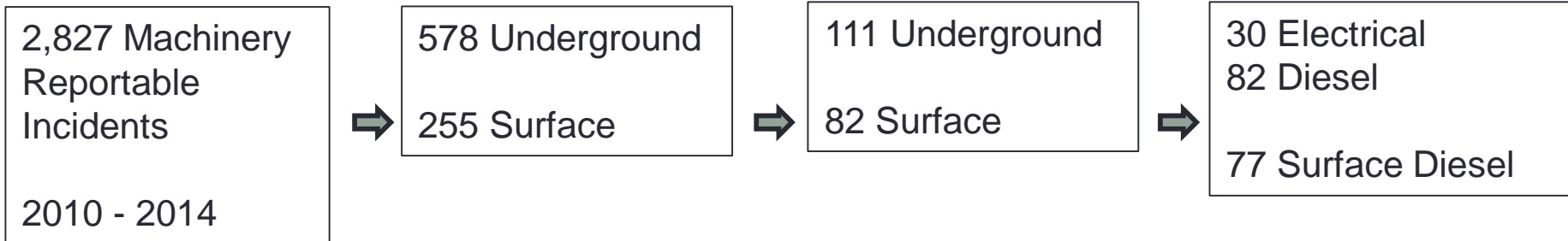
MOBILE EQUIPMENT SOUTH AFRICA

Interaction Risk – Incident Review

An analysis carried out on reportable incidents
provided by the office of the DMR

6th May 2015

DMR Data



Remove incidents that were not TMM related

- Rail
- Non mechanised

Remove incidents that were out of scope for Collision Management

- Hurt hand installing roofbolt
- Slipped accessing machine

Further split

- UG Elect/Diesel
- Surface Electric

Final incidents evaluated using limited data in the reports
'Very subjective'

UNDERGROUND MOBILE EQUIPMENT

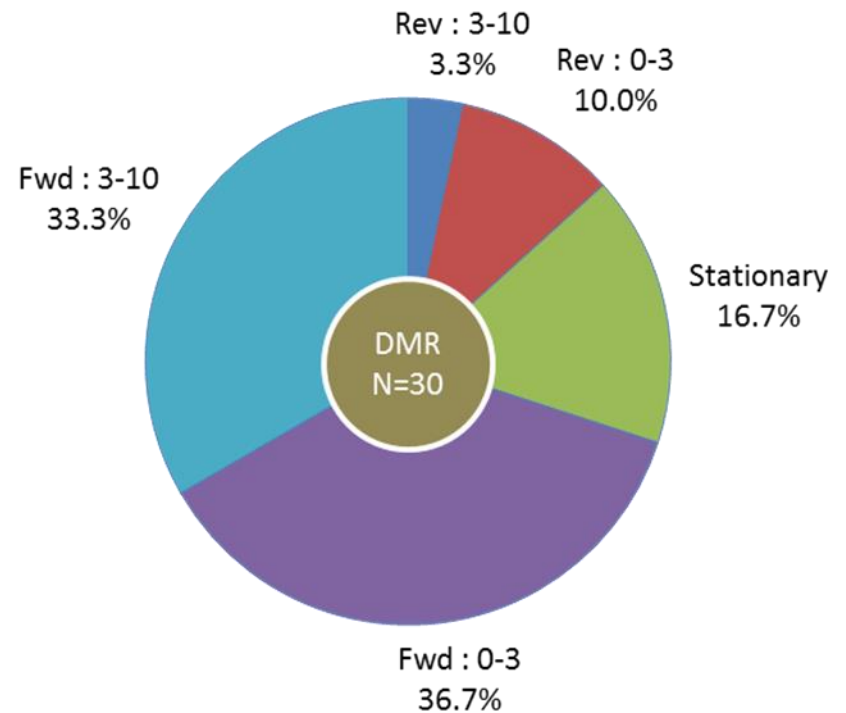
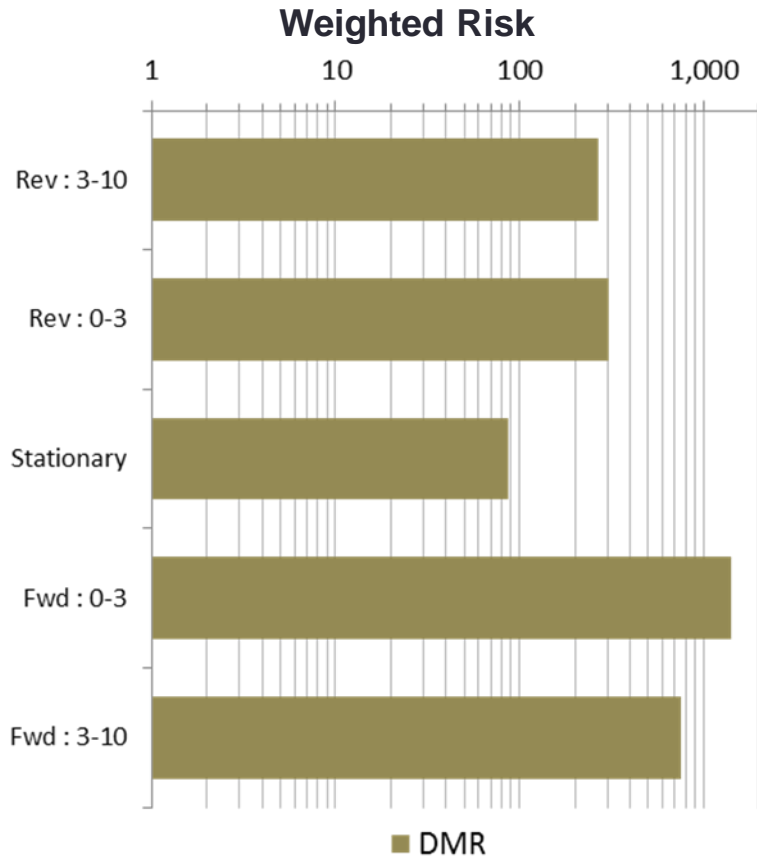
SAMRAS Codes

- Data compiled from DMR reportable incidents 2010 to 2014

SAMRAS	Vehicle	Incidents	
		Electric	Diesel
		30	82
0308B1	LHD Unit	0	54
0311A1	Roofbolter	7	0
0306B1	Mechanical miners	9	0
0308A1	Shuttle car	14	0
0309A2	LDV	0	14
0305A1	Tractor	0	11
0309B1	Bus	0	1
0309B2	Personnel transporter	0	2

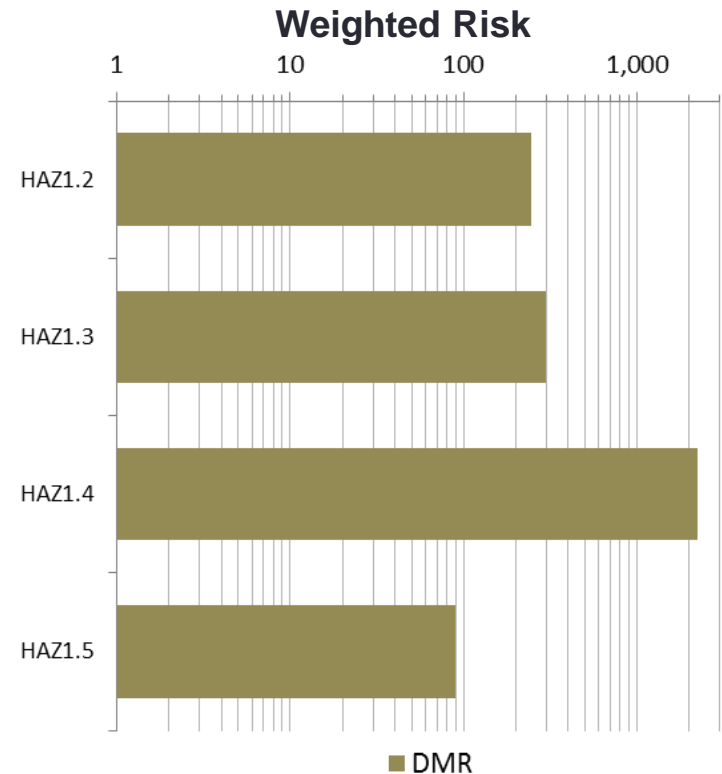
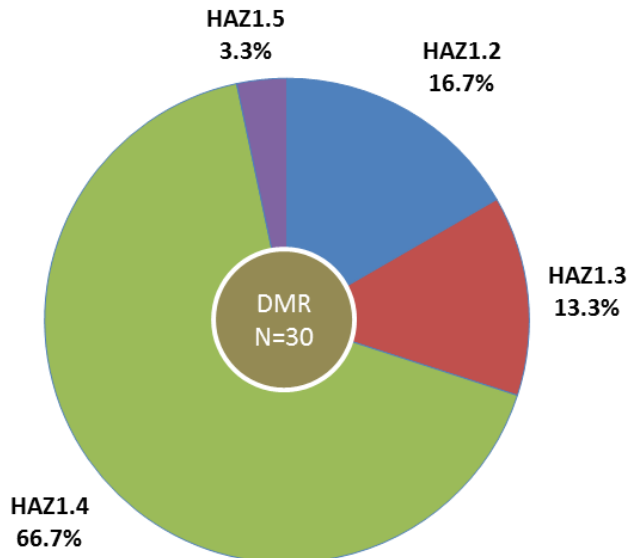
ELECTRIC UME

UG Electric - Local Object Speed

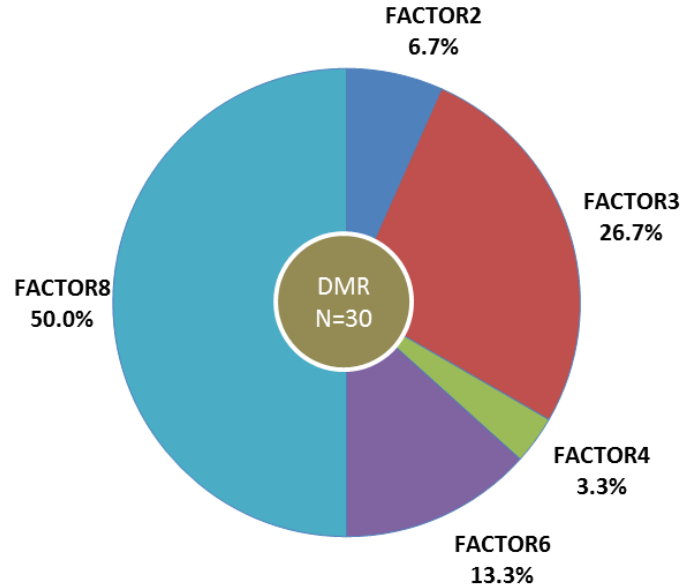


UG Electric - Hazard

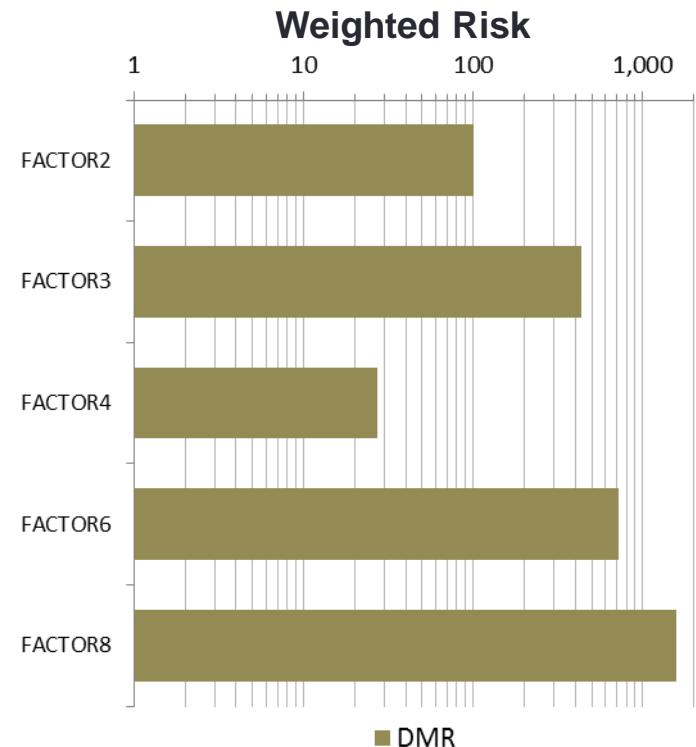
Hazard	Description
HAZ1.1	Stationary object in interaction zone
HAZ1.2	Potential hazard of another vehicle
HAZ1.3	Loss of control of vehicle
HAZ1.4	Moving into another vehicle's interaction zone
HAZ1.5	Machine left in unstable / unsafe state
HAZ1.6	Person in interaction zone
HAZ1.7	Falling object



UG Electric - Factor

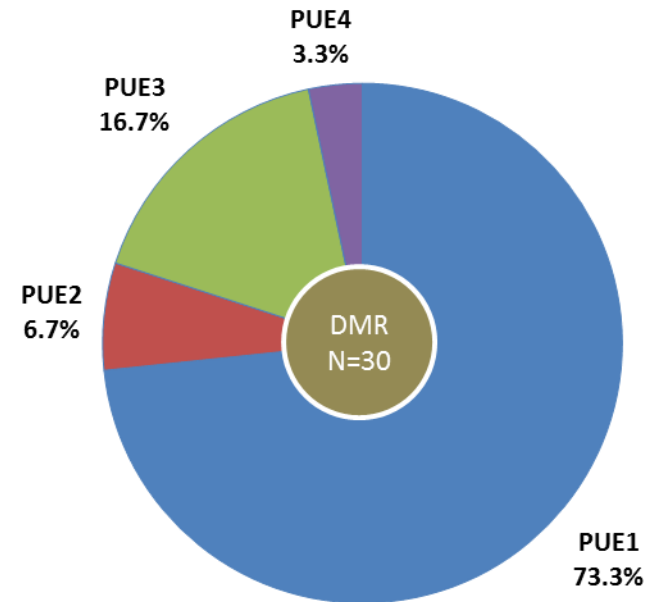
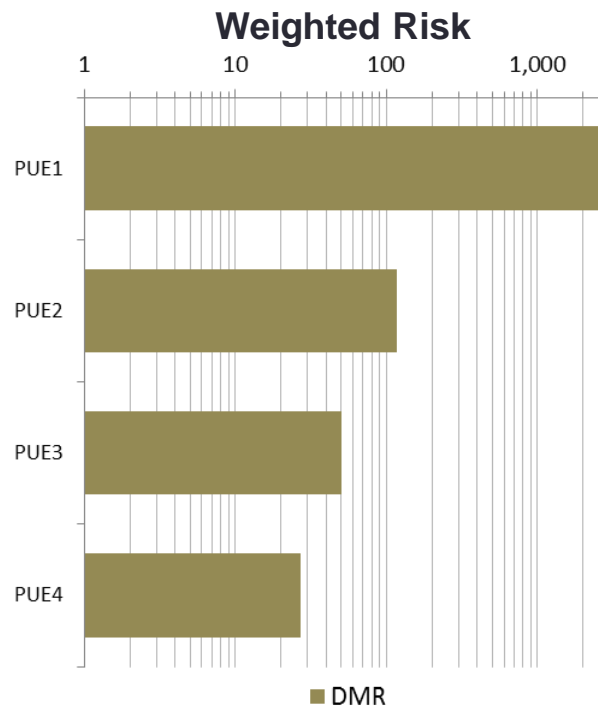


Factor	Description
FACTOR1	Not checking for changed conditions / hazards
FACTOR2	Operating in hazardous road conditions
FACTOR3	Not checking / misjudged clearances
FACTOR4	Machine not in safe state for operation / park up
FACTOR5	Operating outside the equipment limitations
FACTOR6	Not aware of personnel in immediate area
FACTOR7	Not aware of other vehicle
FACTOR8	Non-observance of established procedure / practices
FACTOR9	Over-reliance on safety systems / complacency
FACTOR10	Insufficient experience / competence / training
FACTOR11	Poor/obstructed operator visibility



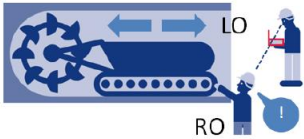
UG Electric - Unwanted Event

PUE	Object Code
PUE1	Equipment to Person Interaction
PUE2	Equipment to Equipment Interaction
PUE3	Equipment to Infrastructure Collision
PUE4	Uncontrolled Equipment / Attachment
PUE5	Equipment in Unstable Ground



UG Electric - Scenarios

P1-Person (direct)



P3-Person (indirect)



P4-Access & Egress



L1-Head-on



L2-Reverse-on



L3-Backup



L4-Dovetailing



L5-Passing Head-on



L6-Passing Reverse-on



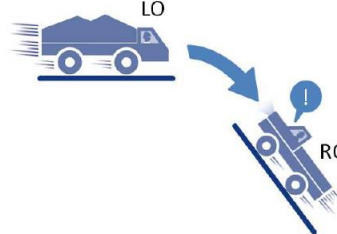
L7-Overtaking



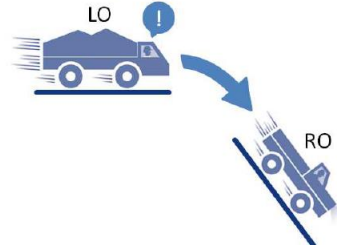
L8-Blind Approach



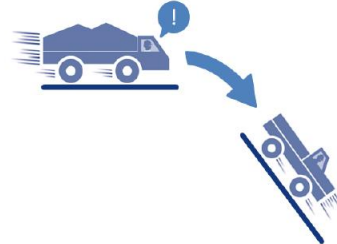
C1-Curving Head-on



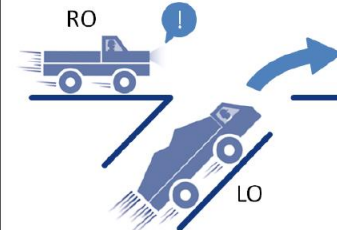
C2-Curving Dovetail



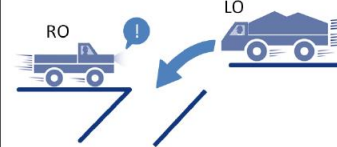
C3-Curving Reverse-on



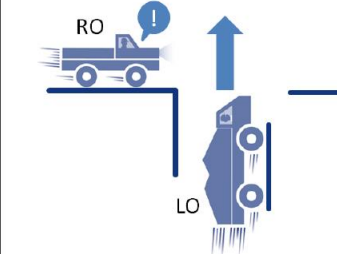
T1-Merge



T2-Crossover



T3-Intersection



O1-Obstacle



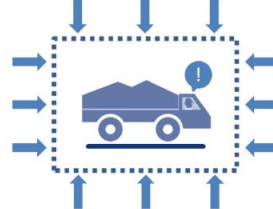
V1-Void



V4-Loss of Control



V6-Congested Area



R1-Swing

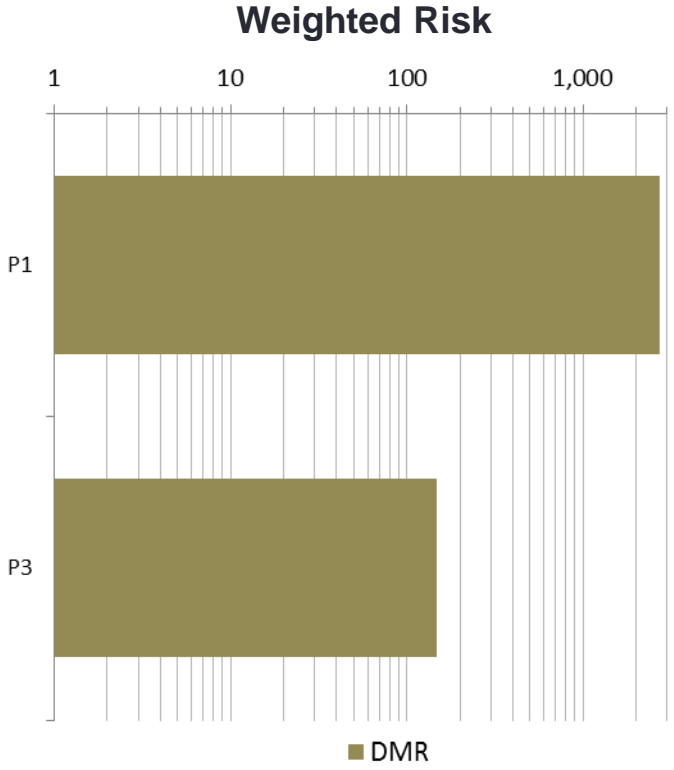
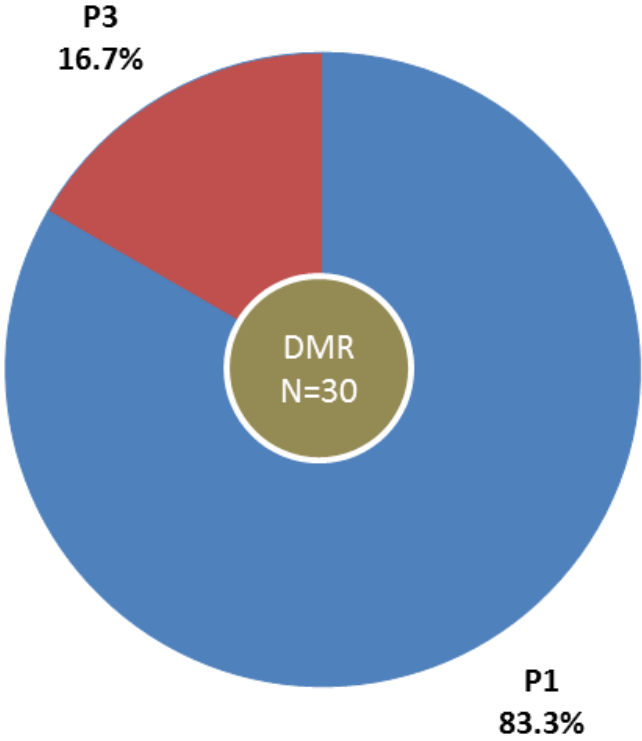


R2-Drop



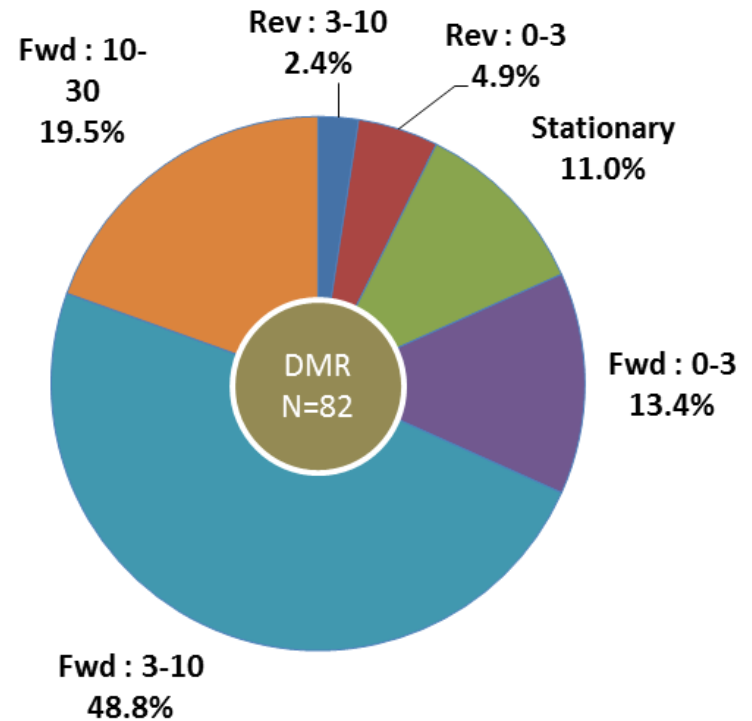
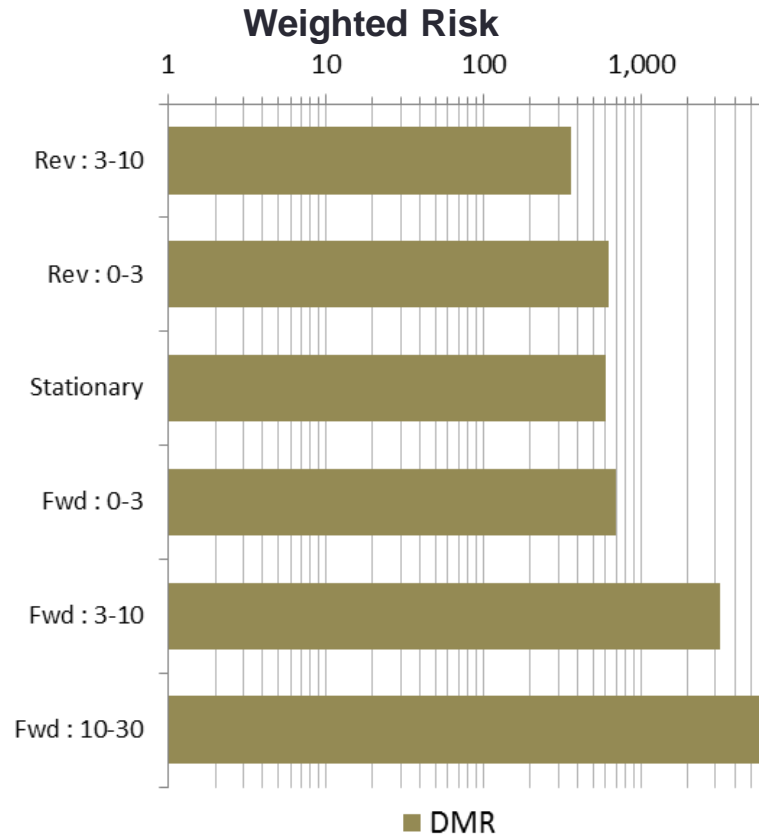
UG Electric - Scenarios

Scenario
P1-Person (direct)
P3-Person (indirect)



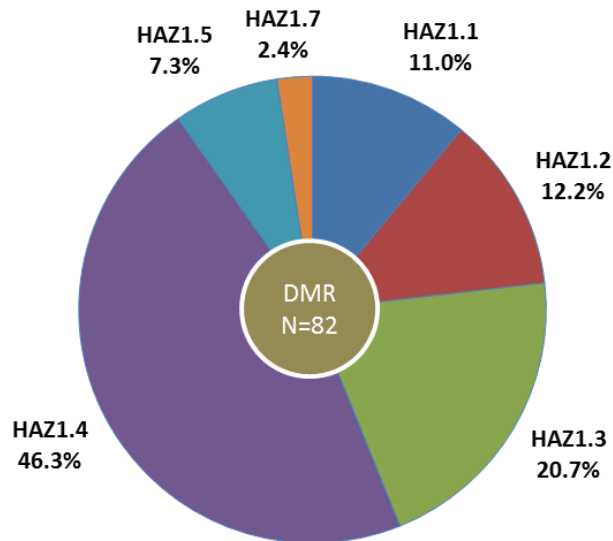
DIESEL UME

UG Diesel - Local Object Speed

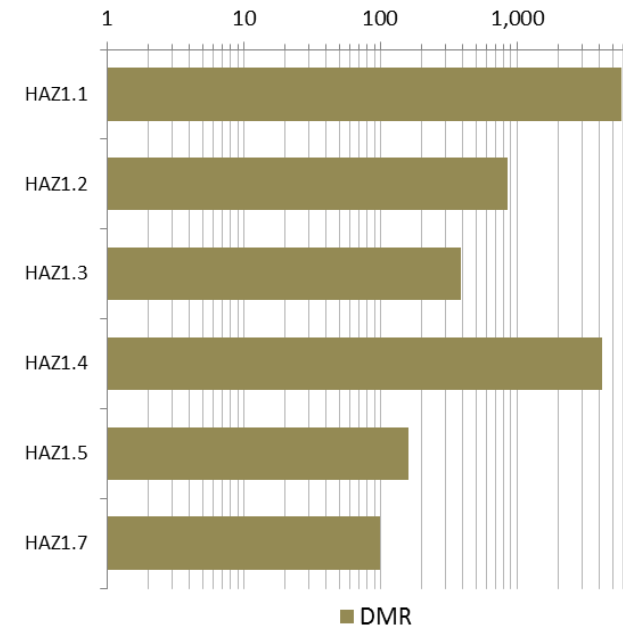


UG Diesel - Hazard

Hazard	Description
HAZ1.1	Stationary object in interaction zone
HAZ1.2	Potential hazard of another vehicle
HAZ1.3	Loss of control of vehicle
HAZ1.4	Moving into another vehicle's interaction zone
HAZ1.5	Machine left in unstable / unsafe state
HAZ1.6	Person in interaction zone
HAZ1.7	Falling object

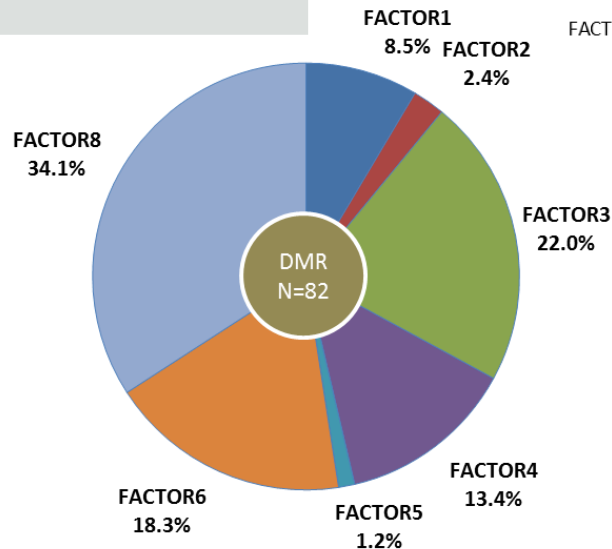
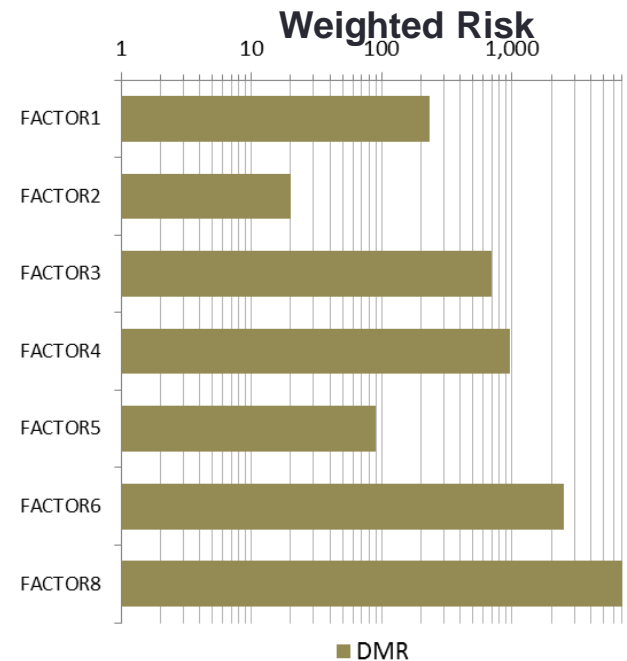


Weighted Risk



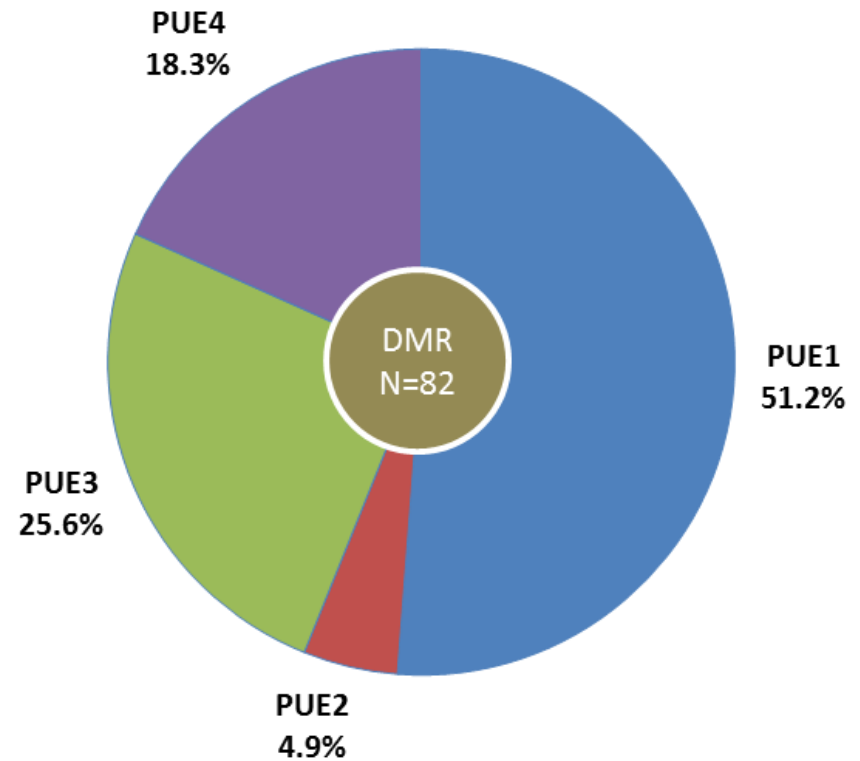
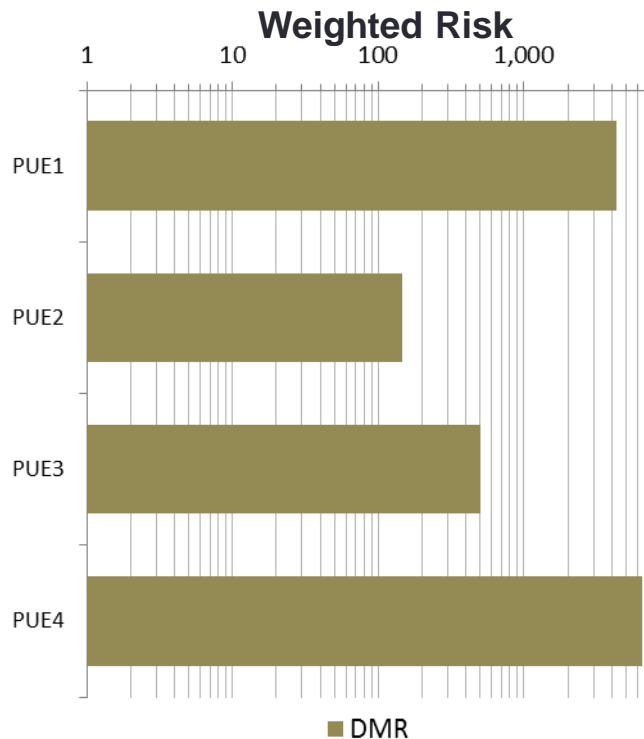
UG Diesel - Factor

Factor	Description
FACTOR1	Not checking for changed conditions / hazards
FACTOR2	Operating in hazardous road conditions
FACTOR3	Not checking / misjudged clearances
FACTOR4	Machine not in safe state for operation / park up
FACTOR5	Operating outside the equipment limitations
FACTOR6	Not aware of personnel in immediate area
FACTOR7	Not aware of other vehicle
FACTOR8	Non-observance of established procedure / practices
FACTOR9	Over-reliance on safety systems / complacency
FACTOR10	Insufficient experience / competence / training
FACTOR11	Poor/obstructed operator visibility



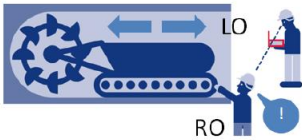
UG Diesel - Unwanted Event

PUE	Object Code
PUE1	Equipment to Person Interaction
PUE2	Equipment to Equipment Interaction
PUE3	Equipment to Infrastructure Collision
PUE4	Uncontrolled Equipment / Attachment
PUE5	Equipment in Unstable Ground



UG Diesel - Scenarios

P1-Person (direct)



P3-Person (indirect)



P4-Access & Egress



L1-Head-on



L2-Reverse-on



L3-Backup



L4-Dovetailing



L5-Passing Head-on



L6-Passing Reverse-on



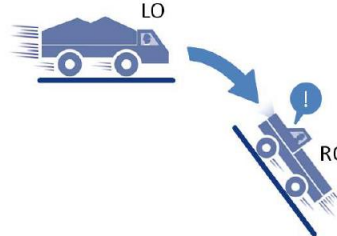
L7-Overtaking



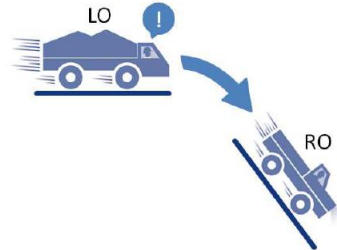
L8-Blind Approach



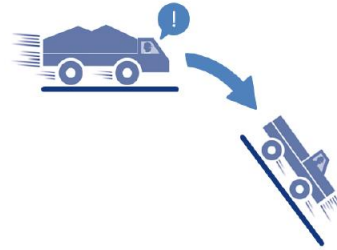
C1-Curving Head-on



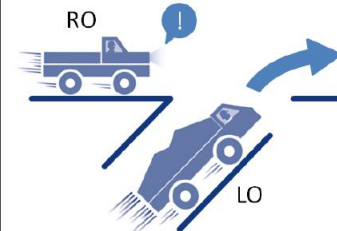
C2-Curving Dovetail



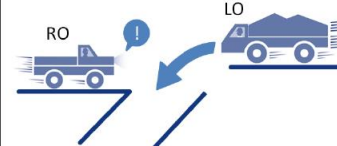
C3-Curving Reverse-on



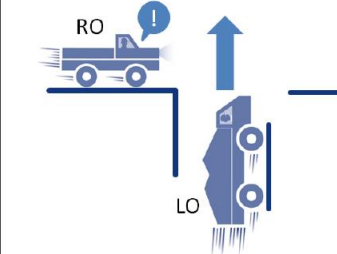
T1-Merge



T2-Crossover



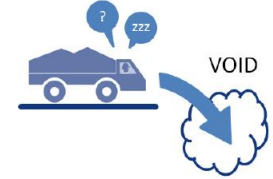
T3-Intersection



O1-Obstacle



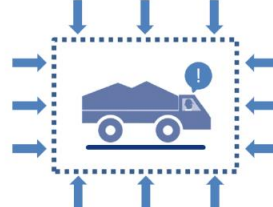
V1-Void



V4-Loss of Control



V6-Congested Area



R1-Swing

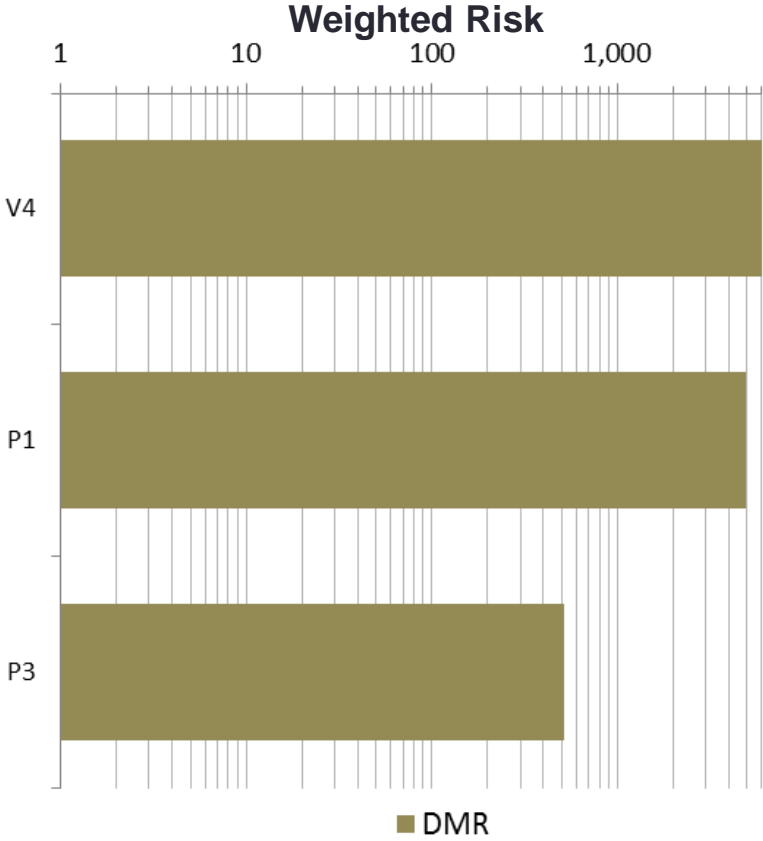
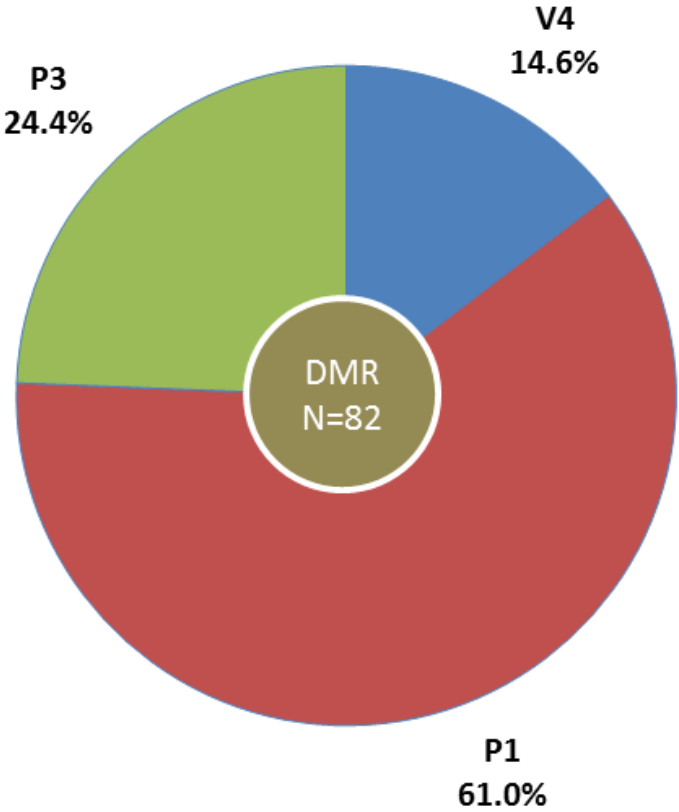


R2-Drop



UG Diesel - Scenarios

Scenario
V4-Loss of Control
P1-Person (direct)
P3-Person (indirect)



SURFACE MOBILE EQUIPMENT

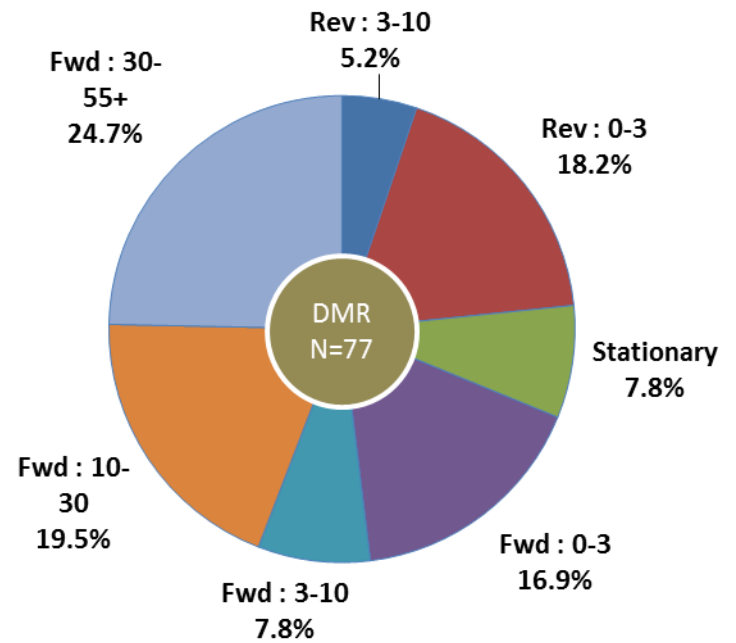
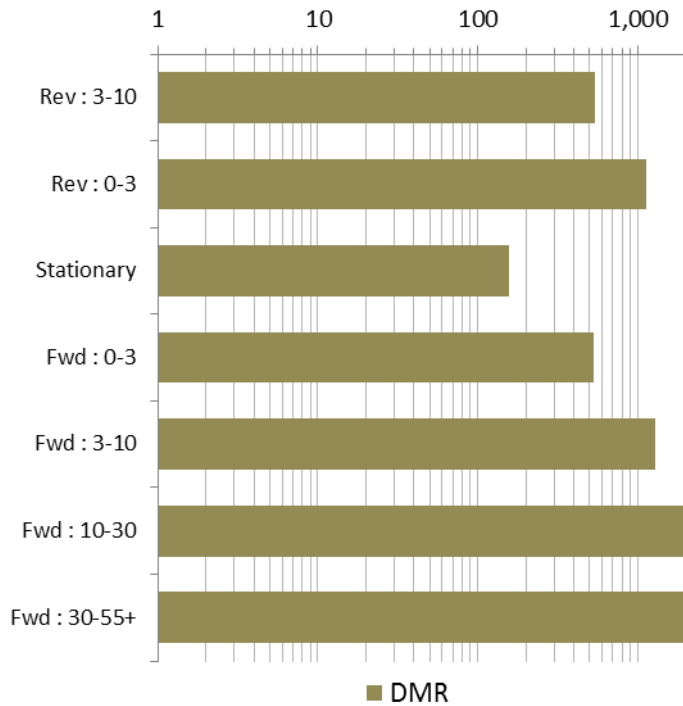
SAMRAS Codes

- Data compiled from DMR reportable incidents 2010 to 2014

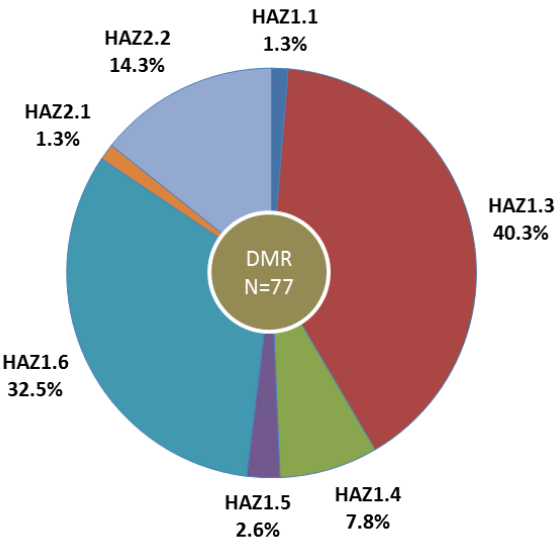
SAMRAS	Vehicle	Incidents
		77
0308C3	20-99 ton Haultruck	24
0307C1	Excavator	4
0307F1	Front end loader	12
0309A2	LDV	11
0309C1	Trucks (excluding haultruck)	8
0310A1	Mobile crane	1
0308C4	100-199 ton Haultruck	6
0308C5	200-299 ton Haultruck	5
0308C6	>300 ton Haultruck	2
0312A1	Bulldozer	4

Surface Diesel - Local Object Speed

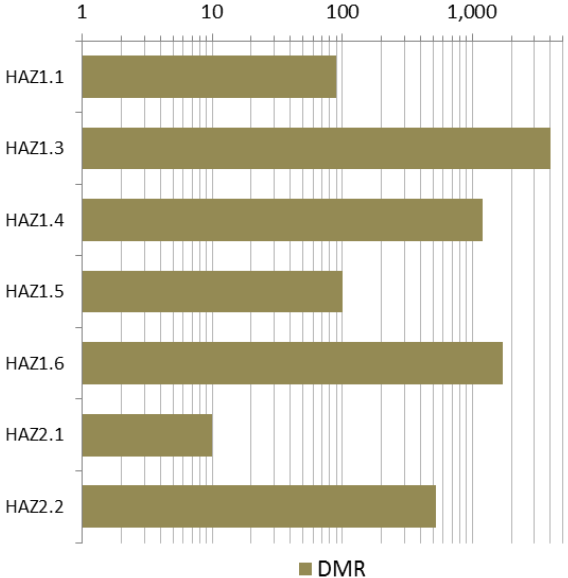
Weighted Risk



Surface Diesel - Hazard



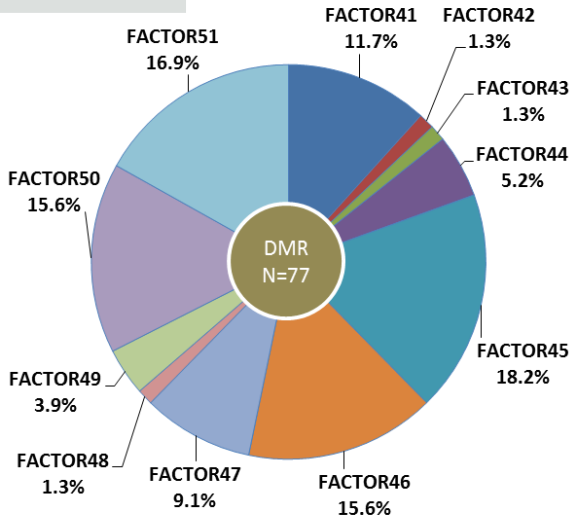
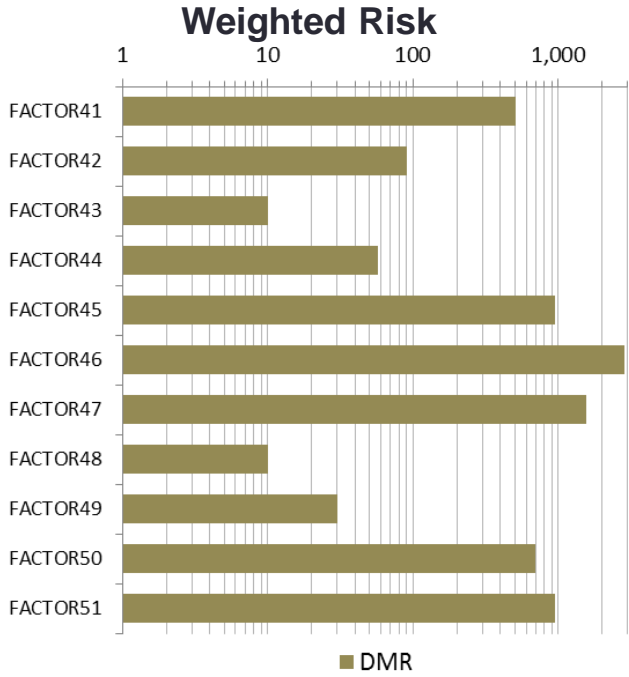
Weighted Risk



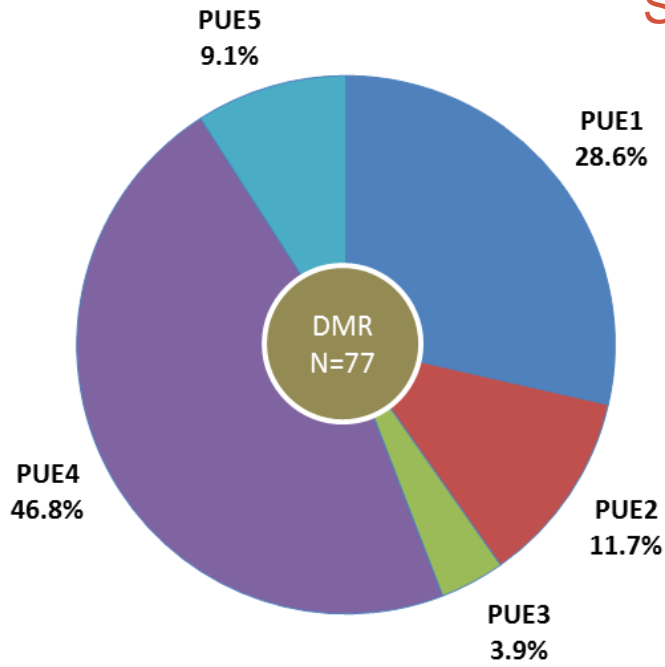
Hazard	Description
HAZ1.1	Stationary object in interaction zone
HAZ1.2	Potential hazard of another vehicle
HAZ1.3	Loss of control of vehicle
HAZ1.4	Moving into another vehicle's interaction zone
HAZ1.5	Machine left in unstable / unsafe state
HAZ1.6	Person in interaction zone
HAZ2.1	Falling object
HAZ2.2	Unstable / uneven ground / void / no-go area
HAZ3.1	Energised cable

Surface Diesel - Factor

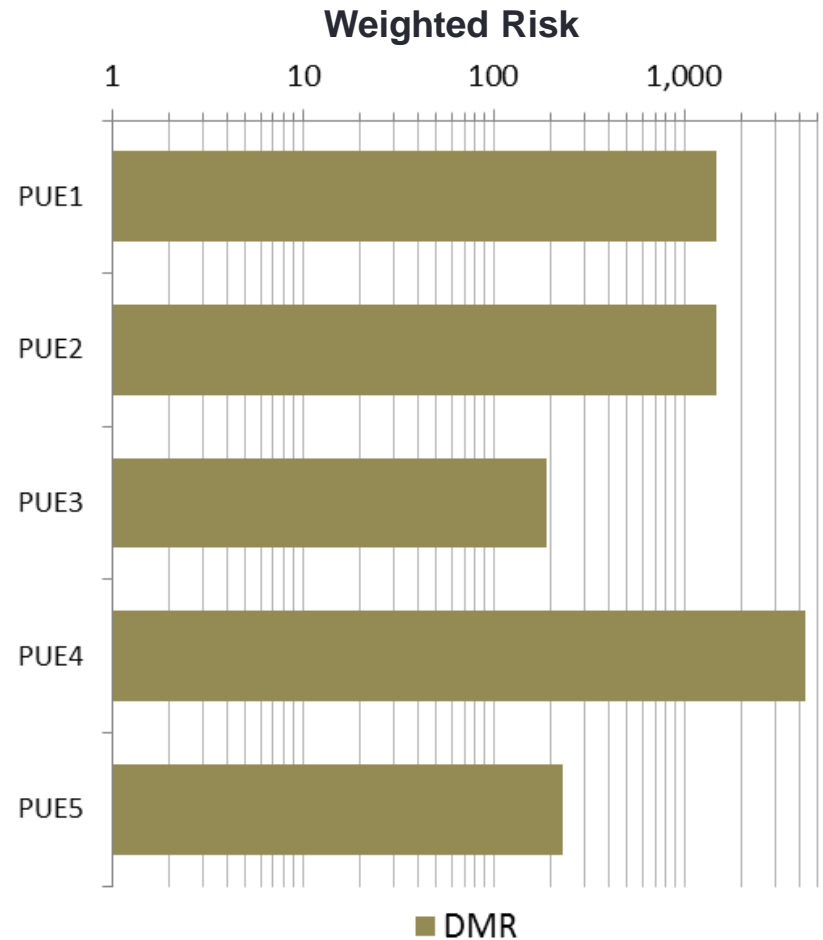
Factor	Description
FACTOR41	Non-compliance of standard
FACTOR42	Insufficient guarding / protection
FACTOR43	Competence for operating equipment
FACTOR44	Area / vehicle inspection inadequate
FACTOR45	Positioned in the line of fire
FACTOR46	Driver fatigue / alertness / incapacity
FACTOR47	Driver distraction or lack of awareness
FACTOR48	Operating outside equipment limitations
FACTOR49	Not checking / misjudged clearances
FACTOR50	Deviation from standards and procedures
FACTOR51	Behaviour of operator



Surface Diesel - Unwanted Event

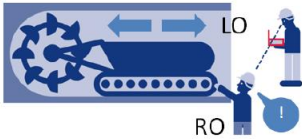


PUE	Object Code
PUE1	Equipment to Person Interaction
PUE2	Equipment to Equipment Interaction
PUE3	Equipment to Infrastructure Collision
PUE4	Uncontrolled Equipment / Attachment
PUE5	Equipment in Unstable Ground



Surface Diesel - Scenarios

P1-Person (direct)



P3-Person (indirect)



P4-Access & Egress



L1-Head-on



L2-Reverse-on



L3-Backup



L4-Dovetailing



L5-Passing Head-on



L6-Passing Reverse-on



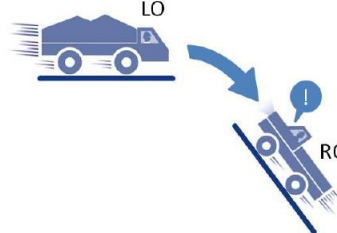
L7-Overtaking



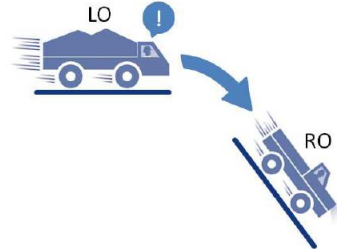
L8-Blind Approach



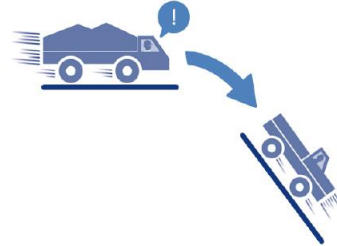
C1-Curving Head-on



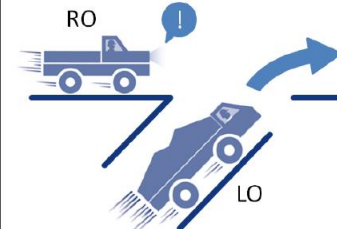
C2-Curving Dovetail



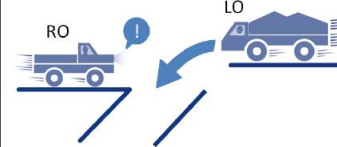
C3-Curving Reverse-on



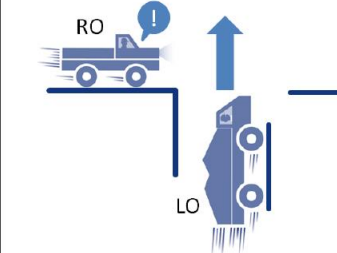
T1-Merge



T2-Crossover



T3-Intersection



O1-Obstacle



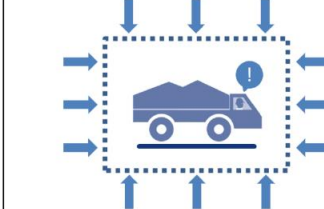
V1-Void



V4-Loss of Control



V6-Congested Area



R1-Swing

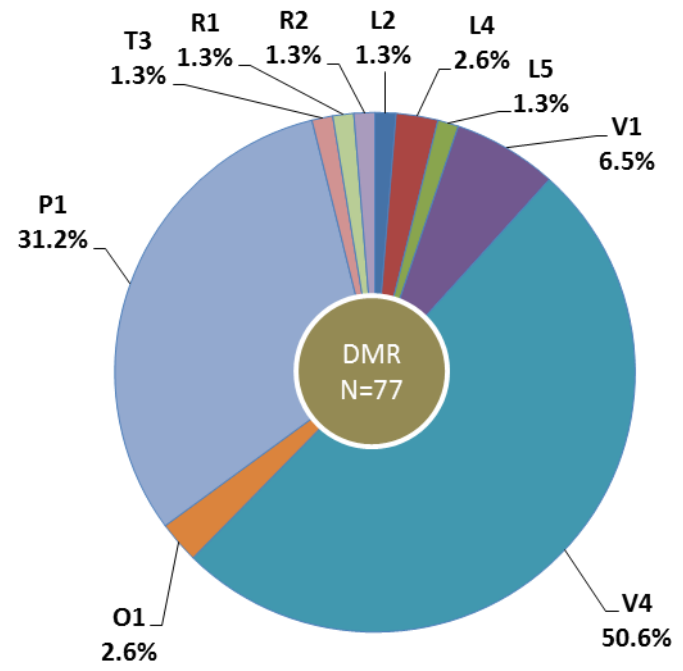
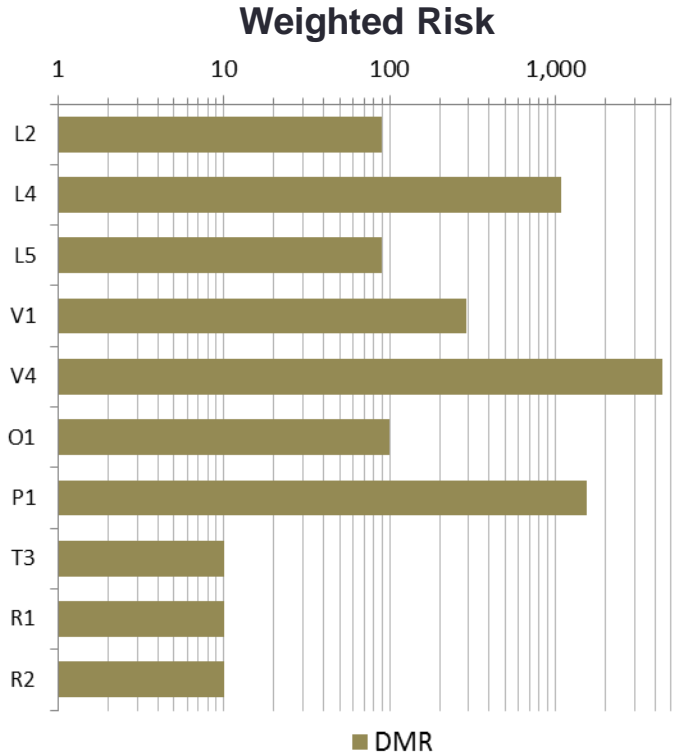


R2-Drop



Surface Diesel - Scenarios

Scenario
L2-Reverse-on
L4-Dovetailing
L5-Passing Head-on
V1-Void
V4-Loss of Control
O1-Obstacle
P1-Person (Direct)
T3-Intersection
R1-Swing
R2-Drop



THANK YOU
