

Mine Rescue 2.0: Enhancing Mine Rescue Communication

Jeff Brown, Focus FS & Tim Ebbinghaus, Ontario Mine Rescue
2017 Mining Health and Safety Conference

Sudbury, ON – April 20, 2017



Mine Rescue 2.0



1. Focus FS & Ontario Mine Rescue
2. Communication Challenges
3. System Overview
4. Mine Rescue Experiences
5. System Status
6. Questions

About Us...

Focus FS

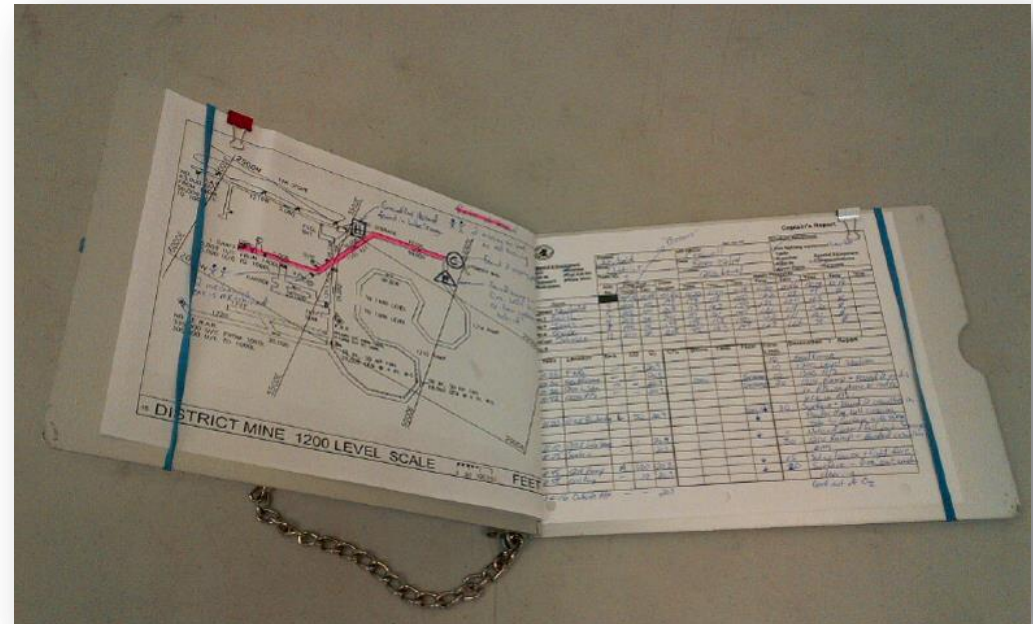
- Software company focused on industrial sector, mining
- Leverage today's digital/internet technologies to reduce risk profile and increase efficiency
- Systems focus on the safety and integrity of your people, processes, and things

Ontario Mine Rescue

- Creates, administers and evaluates mine rescue training and standards in Ontario
- Since its creation, OMR has been internationally lauded for its commitment to high standards in training, equipment and emergency response programs and industry leading mine rescue programs

Communication Challenges in Mine Rescue

- Radio-only communication
- Lack of visuals
- Paper maps
- Pen and paper notes
- Handover to another team
- Post incident debriefing



Background



- System designed in consultation with Ontario Mine Rescue beginning 2015
- Piloted at various mine sites, provincial competitions, and officially launched at International Mine Rescue Competition in 2016

Architecture



- Online and offline capability
- Runs on devices that communicate with each other
- Automatic updating of maps
- Designed user interface for optimal operation in:
 - Dim to dark settings
 - Smoke presence
 - Large buttons for gloves / fat-fingers

System Overview



- ✓ Equipment inventory and checks
- ✓ Oxygen levels and time under oxygen with alerts
- ✓ Digital maps for the entire mine
- ✓ Photo capability
- ✓ Notes and actions that are timed
- ✓ Post-incident reports
- ✓ System modes available: Live-incident, training, competition

Shift Rescue

Captain's Equipment

Back

Standard List

Auxiliary List

MX6 Gas Monitor

0

SSR 90M (Team Unit)

0

First Aid Kit

0

Kestrel

0

Chalk/Paint

0

Probe Stick

0

Whistles

0

Save

Jan 31 2017 | 11:39:26 | Connected to internet

Shift Rescue

Captain's Equipment

Back

Standard List

Auxiliary List

Fire Fighting Hose

0

Tools

0

Communications

0

Carevent

0

Other

0

BG4

0

Basket/Stretcher/KED

0

Level Plans

0

SSR 90M (RESCUE UNIT)

0

Fire Fighting Nozzle

0

Save

Jan 31 2017 | 11:40:15 | Connected to internet237 ms

Shift Rescue

Captain's Report (Design001)

Back

Time

Captain

No.2

No.3

No.4

V/Captain

No.6

11:47

200

198

04

Next Reading

10:52

Time Under O2: 00:00:09:09

Finalize Report

O2

Note

View Maps

Time

Location

Smk

CO

O2

CH4

12:40

Sample

Destination/Report

Edit

Oxygen Usage

Time: Jan-31-2017 12:44

Captain: 170

No.2: 171

No.3: 174

No.4: 173

V/Captain: 120

No.6: 173

Cancel

Next

Jan 31 2017 | 12:45:17 | Connected to internet99 ms

Shift Rescue

Captain's Report (Design001)

Back

Time

Captain

No.2

No.3

No.4

V/Captain

No.6

11:47

200

198

04

Next Reading

19:56

Time Under O2: 00:00:09:23

Finalize Report

O2

Note

View Maps

Time

Location

Smk

CO

12:40

Sample

Destination/Report

Edit

O2 Pressure

Oxygen Usage

Legend

Captain

No.2

No.3

No.4

V/Cap

No.6

Ok

Jan 31 2017 | 12:45:31 | Connected to internet99 ms



Captain's Report (MR Test 001)

[Back](#)

Time	Captain	No.2	No.3	No.4	V/Captain	No.6
16:03	200	198	203	196	201	205
16:07	195	190	191	192	189	193
16:20	180	178	182	189	177	186

Next Reading

19:54

Time Under O2: 00:00:16:49

[Finalize Report](#)[O2](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				10	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				10	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				11:52	20 minutes, fight fire	Edit



Captain's Report (MR Test 001)

[Back](#)

Time		Captain	No.2	No.3	No.4	V/Captain	No.6
16:03		200	198	203	196	201	205
16:07		195	190	191	192	189	193
16:20		180	178	182	189	177	186

Next Reading
19:54
Time Under O2: 00:00:16:49

[Finalize Report](#)[O2](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				10	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				10	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				11:52	20 minutes, fight fire	Edit



Captain's Report (MR Test 001)

[Back](#)

Time	Captain	No.2	No.3	No.4	V/Captain	No.6
16:03	200	198	203	196	201	205
16:07	195	190	191	192	189	193
16:20	180	178	182	189	177	186

Next Reading

19:54

Time Under O2: 00:00:16:49

[Finalize Report](#)[O2](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				10	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				10	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				11:52	20 minutes, fight fire	Edit



Captain's Report (MR Test 001)

[Back](#)

Time	Captain	No.2	No.3	No.4	V/Captain	No.6
16:03	200	198	203	196	201	205
16:07	195	190	191	192	189	193
16:20	180	178	182	189	177	186

Next Reading

19:54

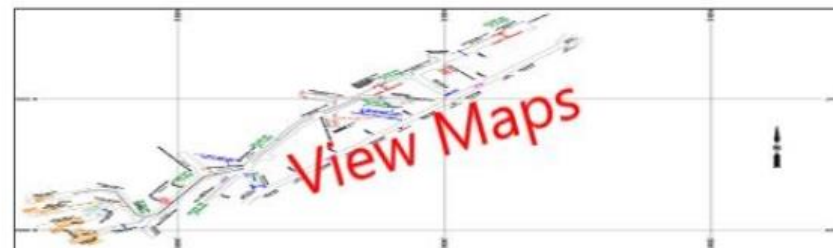
Time Under O2: 00:00:16:49

[Finalize Report](#)[O2](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				10	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				10	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				11:52	20 minutes, fight fire	Edit



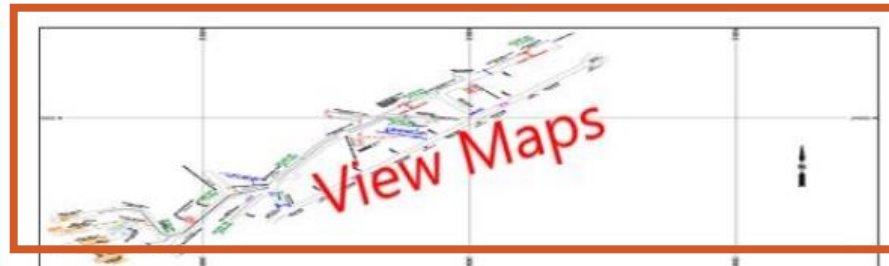
Briefing Officers Report (MR Test 001)

[Back](#)[Finalize Report](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				Limit (10) expired	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				Limit (10) expired	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				20	20 minutes, fight fire	Edit
16:21	Main Ramp	-	-	-	-					Fire extinguished	Edit
16:22	4530	L	-	20.9	-				01:49	Two men reported in refuge at 4380 #3 - Telephone services. Reported ok. Locate and bring to surface	Edit
16:25	4380 #3 RS	-	-	20.9	-					2 men located in RS. Both responsive. Breathing apparatus provided. Bringing to surface.	Edit



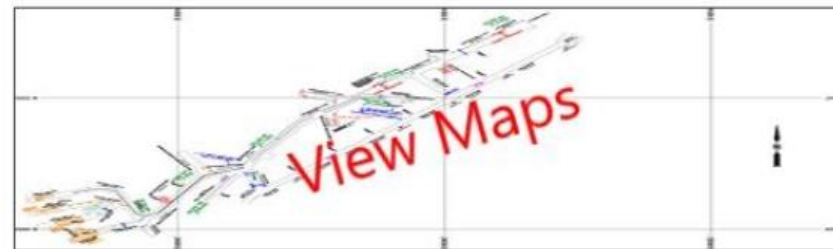
Briefing Officers Report (MR Test 001)

[Back](#)[Finalize Report](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				Limit (10) expired	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				Limit (10) expired	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				20	20 minutes, fight fire	Edit
16:21	Main Ramp	-	-	-	-					Fire extinguished	Edit
16:22	4530	L	-	20.9	-				01:49	Two men reported in refuge at 4380 #3 - Telephone services. Reported ok. Locate and bring to surface	Edit
16:25	4380 #3 RS	-	-	20.9	-					2 men located in RS. Both responsive. Breathing apparatus provided. Bringing to surface.	Edit



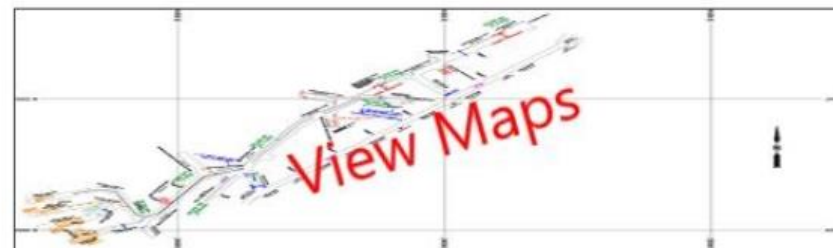
Briefing Officers Report (MR Test 001)

[Back](#)[Finalize Report](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				Limit (10) expired	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				Limit (10) expired	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				20	20 minutes, fight fire	Edit
16:21	Main Ramp	-	-	-	-					Fire extinguished	Edit
16:22	4530	L	-	20.9	-				01:49	Two men reported in refuge at 4380 #3 - Telephone services. Reported ok. Locate and bring to surface	Edit
16:25	4380 #3 RS	-	-	20.9	-					2 men located in RS. Both responsive. Breathing apparatus provided. Bringing to surface.	Edit



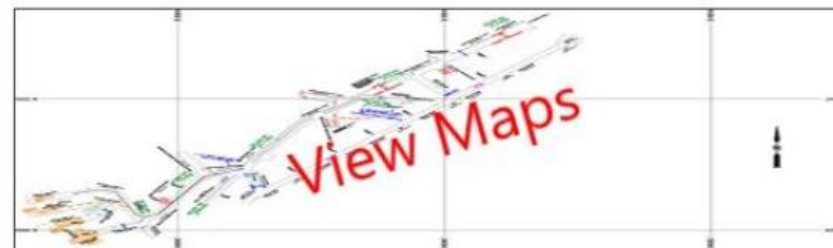
Briefing Officers Report (MR Test 001)

[Back](#)[Finalize Report](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				Limit (10) expired	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				Limit (10) expired	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				20	20 minutes, fight fire	Edit
16:21	Main Ramp	-	-	-	-					Fire extinguished	Edit
16:22	4530	L	-	20.9	-				01:49	Two men reported in refuge at 4380 #3 - Telephone services. Reported ok. Locate and bring to surface	Edit
16:25	4380 #3 RS	-	-	20.9	-					2 men located in RS. Both responsive. Breathing apparatus provided. Bringing to surface.	Edit

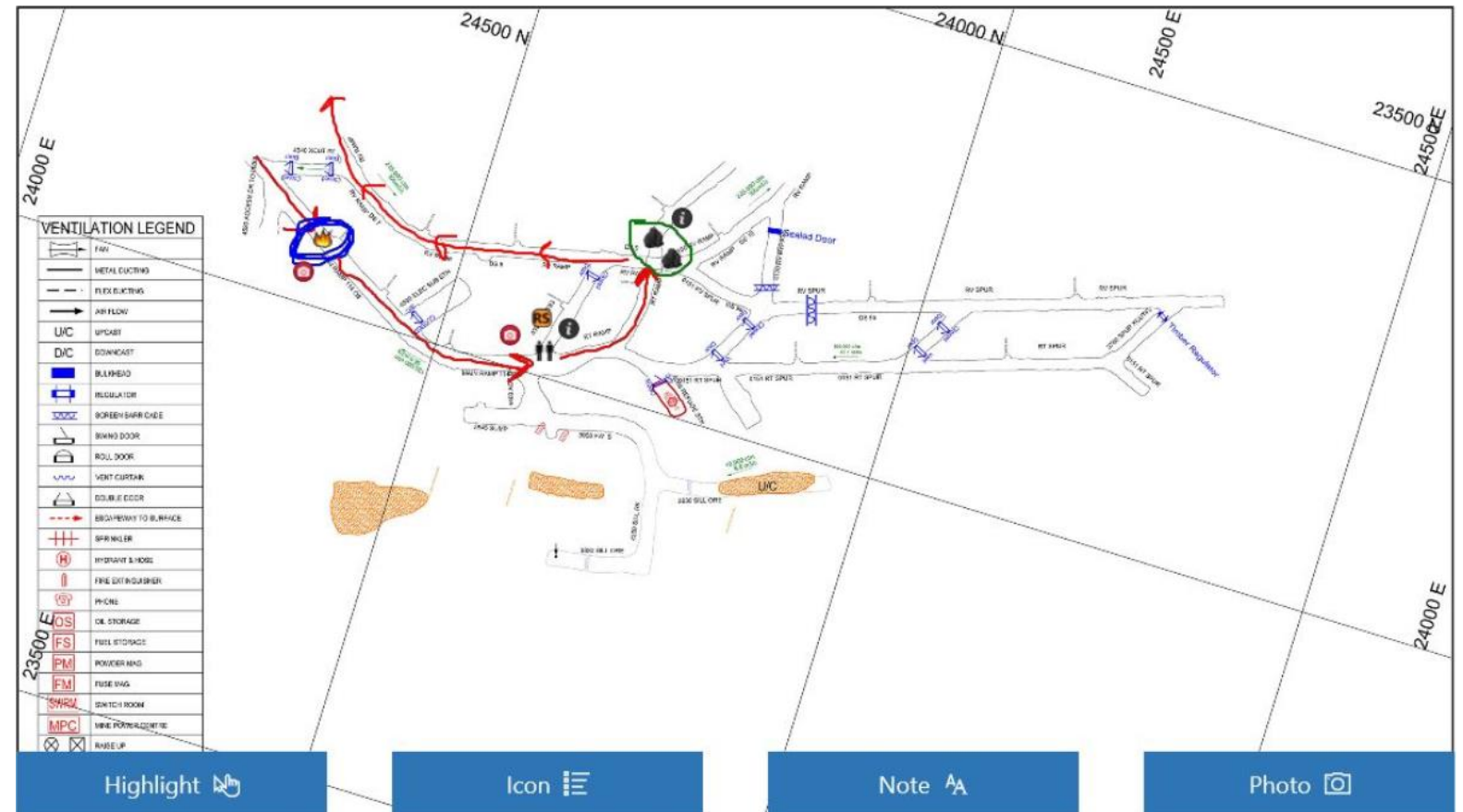


Briefing Officers Report (MR Test 001)

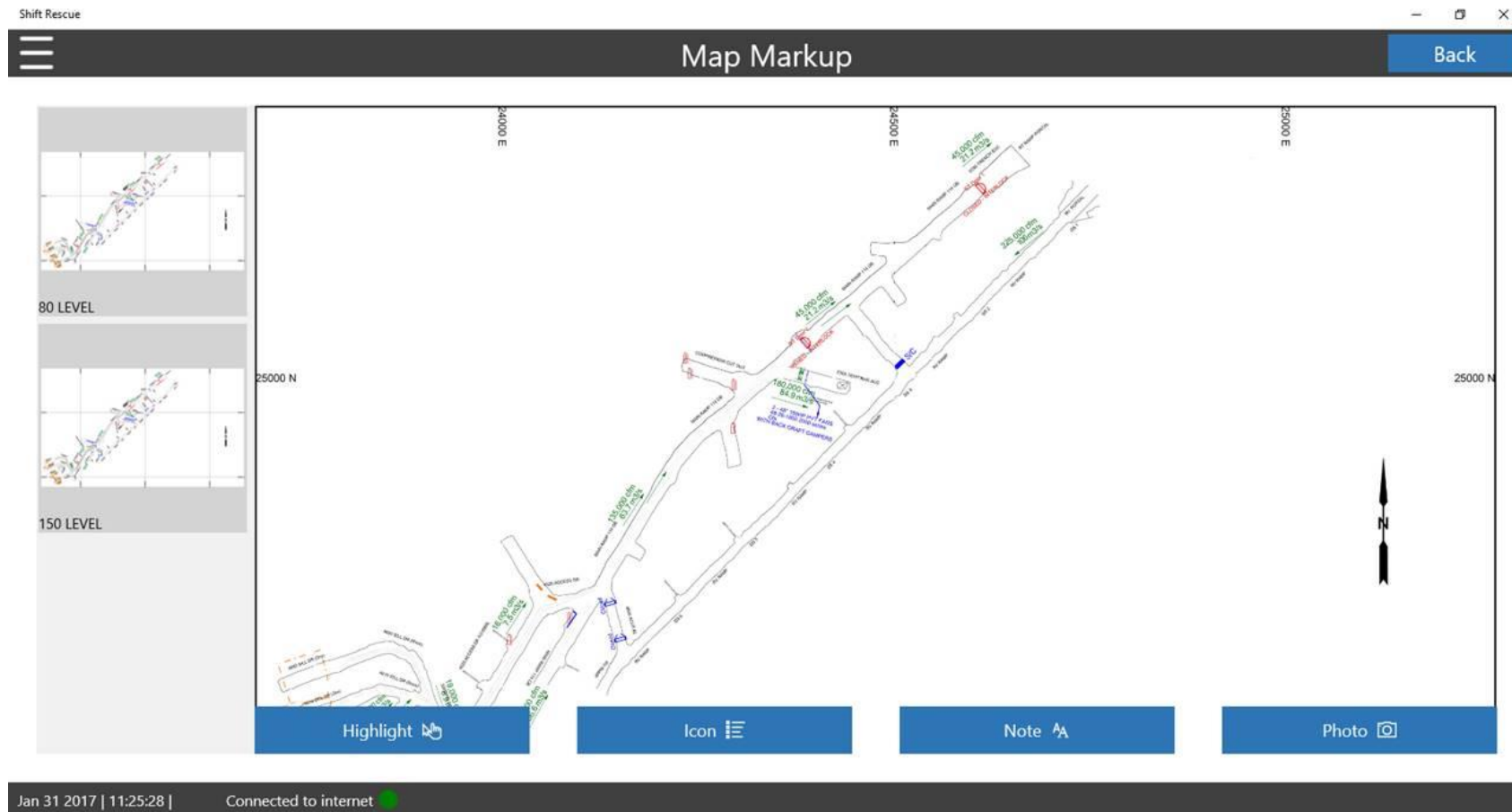
[Back](#)[Finalize Report](#)[Note](#)

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				Limit (10) expired	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				Limit (10) expired	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				20	20 minutes, fight fire	Edit
16:21	Main Ramp	-	-	-	-					Fire extinguished	Edit
16:22	4530	L	-	20.9	-				01:49	Two men reported in refuge at 4380 #3 - Telephone services. Reported ok. Locate and bring to surface	Edit
16:25	4380 #3 RS	-	-	20.9	-					2 men located in RS. Both responsive. Breathing apparatus provided. Bringing to surface.	Edit

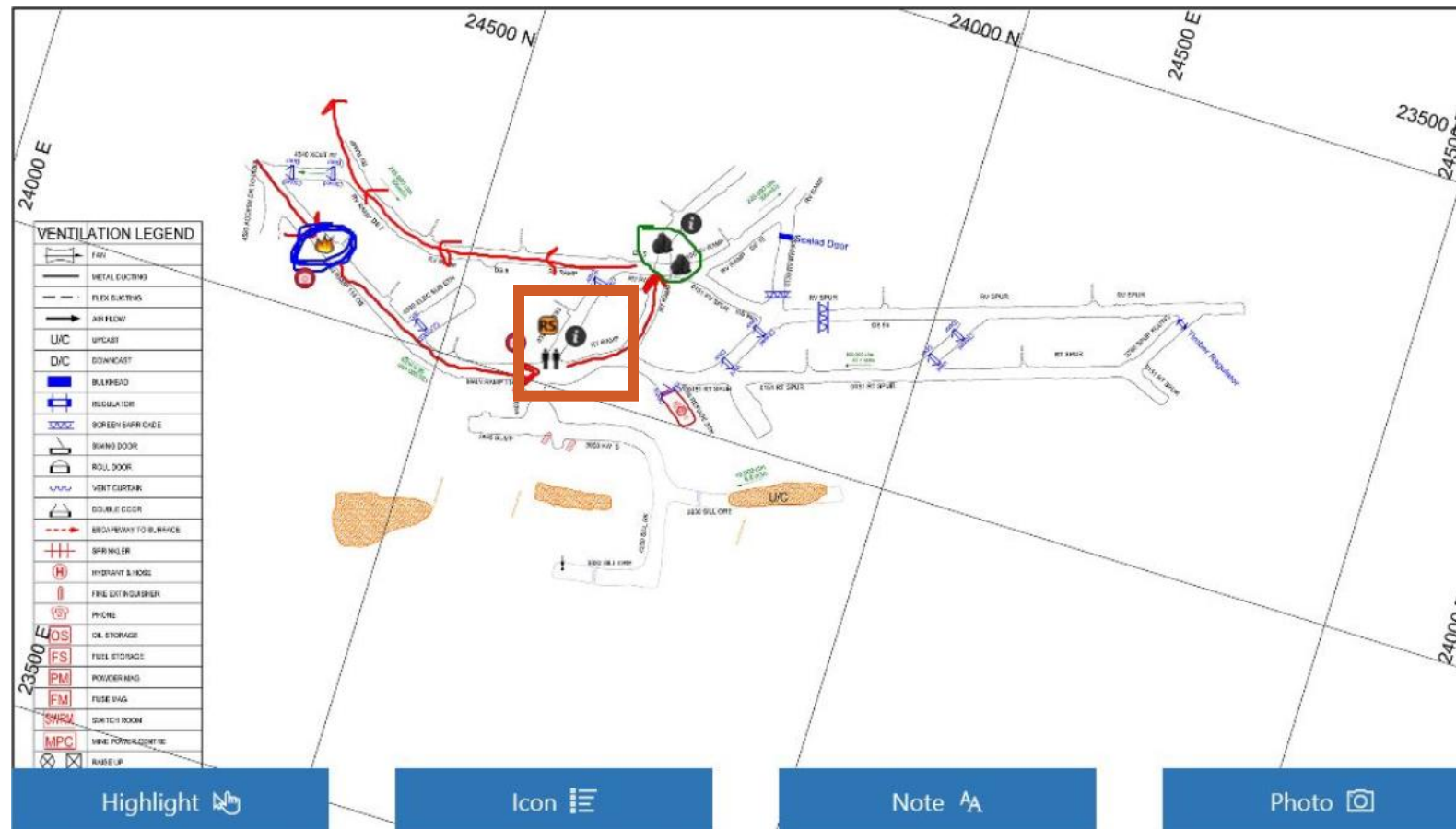
Experiences



During incident briefing, BO uses digital map to illustrate where they wanted team to proceed, Captain referred to map on their tablet



Captain feedback: *"The digital maps alone is a big improvement over paper maps. I can quickly scan through maps including maps of ground above and below where we are."*



Captain handed tablet to personnel located underground during incident, worker drew location where he last seen his partner. This assisted team in quickly locating injured worker.



BO requested better description of the scene where worker was injured; Captain sent a number of photos which better informed BO.

Captain's Report (MR Test 001)

Back

Time	Captain	No.2	No.3	No.4	V/Captain	No.6
16:03	200	198	203	196	201	205
16:07	195	190	191	192	189	193
16:20	180	178	182	189	177	186

Next Reading

19:54

Time Under O2: 00:00:16:49

Finalize Report

O2

Note

View Maps

Time	Location	Smk	CO	O2	CH4	Doors	Fans	Flow	Time Limit	Destination/Report	Edit
16:04	150 Level	M	-	20.9	-				10	Level 150 location of fire	Edit
16:06	150 Level	-	-	-	-				10	Fire located on Main Ramp 114 OB	Edit
16:11	Main Ramp	H	-	20.9	-					Fire located between 4520 ACCESS and 4530 ELEC SUB STN	Edit
16:12	Main Ramp	-	-	-	-				11:52	20 minutes, fight fire	Edit

Timers ensure Captain captures team O2 levels; data shared with BO

N 1	Need to build barricade
N 2	Haulage truck (From Team #1)
N 3	Temperature reading is Dry: 33 degrees Celcius & Wet bulb : 25 degree Celcius
N 4	Gas check #4, CO : 1100, O2 : 19.5%, CH4 : 0, Light smoke
N 5	Tools an equipment to build barricade (vent tubing, wood, etc.)
N 6	No flow once barricade was built. Conditions are the same.
N 7	Gas clear
N 8	Barricade
N 9	John informed us that his partner was impelled by rebar in the RV Ramp DS 7. John will remain in the Refuge station (Refuge is considered a barricade due to having no phone)
N 10	Vehicle is secured.
N 11	Casualty name is Matt, Conscious with bolt going through his mid section.
N 12	Truck wasn't here as per Team #1 info.
N 13	Hydraulic spreader/cutter is at this location
N 14	Scoop damage the RV, but is secured.
N 15	Gear left behind: cutters, hose & nozzle, neck collar.
N 16	Matt's conditions at the scene; breath rapid at 24 breath per minutes, pulse strong at 82 beats per minutes. Matt's condition on route; 24 breath per minutes, pulse strong at 84 beats per minutes
N 17	Heat exposure limit stopped here, 64 minutes left out of the original 84 minutes.



- Notes, photos, and equipment data used in post-incident report
- Workflow allows for post-incident feedback from BO, Captain, MRO, and any other incident official



System Status

1. System is deployment-ready
2. New release coming in May-2017 to apply enhancements and feedback from teams and MRO's during IMRC
3. OMR vision





Questions?

**53 Bond St. Suite 302
St. John's, NL, Canada
A1C 1S9
1 (709) 726-2500
jbrown@focusfs.com**

www.focusfs.com