

## Morenci Operations

## Standard Operating Procedure

<b>SOP Title:</b>	<b>Accessing Sulfuric Acid Addition/Dilution Sites - Personal Monitor (hazardous gas may be present)</b>
<b>Division/Area:</b>	<b>Leaching/Hydromet/Crush and Convey</b>

	<b>Name/Title:</b>	<b>Date:</b>
<b>Drafted/Revised By:</b>	The MX6 Gas Monitor Team	12/18/15
<b>Approving Superintendent:</b>	Rick Sanchez/Leaching Superintendent	12/18/15
<b>Approving Manager:</b>	Paul Cook/Leaching Manager	12/18/15

*SOPs must have Manager approval prior to distribution.*

### Required PPE

Hardhat, steel toe boots, safety vest, safety glasses, two-way radios (that monitor the FMI frequency), personal air monitors to monitor suspect gases NO<sub>2</sub> (Nitrogen Dioxide), SO<sub>2</sub> (Sulfur Dioxide), H<sub>2</sub>S (Hydrogen Sulfide), CO<sub>2</sub> (Carbon Dioxide) & O<sub>2</sub> (Oxygen), NH<sub>15</sub> escape respirator.

### Personnel Affected

All Leaching/Hydromet/Crush and Convey employees/contractors/vendors within areas designated on signage at each Sulfuric Acid Addition/Dilution sites. Leaching Stockpiles (MFL and ROM), Metcalf Booster, 4500 Stargo, Ponderosa & Leach Pads - Stackers.

### Sites Affected

1. Agglomeration Drums
2. Metcalf Booster
3. 4500 Stargo
4. Ponderosa
5. Leaching Stockpiles (MFL and ROM)
6. Leach pads - Stackers

### Environmental

Report all Environmental events. 928-865-7745

### Operating Procedure for ROM Stockpiles (Step/Control):

1. Task training will be given to all employees/contractors/vendors that will be working in one of the affected areas, task training will be a classroom setting by a trainer in the affected area.
2. Only Task Trained employees have permission to access the sites affected that are listed above.
3. ROM Stockpiles ONLY PIPED leach fields are controlled access not stripping fields, fields being dumped in, or roads and ramps.
4. Place windsocks at beginning of dump and all accesses of stockpile.
5. Place addition windsock in the center of the stockpile making it visible to all employees in affected area(s).
6. Contact Leaching Supervisor in the affected area prior to entry. Entry into the area is only permitted if and only if a business needs exists. If positive communication cannot be reached with Leaching Supervisor, contact Leaching Superintendent of the area prior to entry.



## Morenci Operations

## Standard Operating Procedure

<b>SOP Title:</b>	<b>Accessing Sulfuric Acid Addition/Dilution Sites - Personal Monitor (hazardous gas may be present)</b>
<b>Division/Area:</b>	<b>Leaching/Hydromet/Crush and Convey</b>

7. Evacuation – If Personal Monitor goes into alarm, check the reading on monitor to determine which gas is triggering an alarm. Move to higher ground and/or crosswind until the personal monitor indicates the air is safe. Contact area supervisor to notify of the alarm conditions. Follow the Alarm Response section below for further evacuation information.
8. Personal Monitors shall be worn one of two ways, either on the employees hip/belt area or on shoulder/chest area within 18in of employee's airway.
9. After required work is complete, make positive contact Control Room Operator or Area Supervisor upon leaving the area.

### Operating Procedure for MFL Stockpiles (Step/Control):

1. Task training will be given to all employees/contractors/vendors that will be working in one of the affected areas, task training will be a classroom setting by a trainer in the affected area.
2. Only Task Trained employees have permission to access the sites affected that are listed above.
3. On MFL and SWMFL the entire stockpile is controlled access because the acid is already on the ore as it is delivered, and the stripped areas are usually in the vicinity of the stacker.
4. Place windsocks at beginning of dump and all accesses of stockpile.
5. Place addition windsock in the center of the stockpile making it visible to all employees in affected area(s).
6. Contact Leaching Supervisor in the affected area prior to entry. Entry into the area is only permitted if and only if a business needs exists. If positive communication cannot be reached with Leaching Supervisor, contact Leaching Superintendent of the area prior to entry.
7. Evacuation – If Personal Monitor goes into alarm, check the reading on monitor to determine which gas is triggering an alarm. Move to higher ground and/or crosswind until the personal monitor indicates the air is safe. Contact area supervisor to notify of the alarm conditions. Follow the Alarm Response section below for further evacuation information.
8. Personal Monitors shall be worn one of two ways, either on the employees hip/belt area or on shoulder/chest area within 18in of employee's airway.
9. After required work is complete, make positive contact Control Room Operator & Area Supervisor upon leaving the area.



Morenci Operations

Standard Operating Procedure

<b>SOP Title:</b>	<b>Accessing Sulfuric Acid Addition/Dilution Sites - Personal Monitor (hazardous gas may be present)</b>
<b>Division/Area:</b>	<b>Leaching/Hydromet/Crush and Convey</b>

**Operating Procedure for Leach Pads - Stackers (Step/Control):**

1. Task training will be given to all employees/contractors/vendors that will be working in one of the affected areas, task training will be a classroom setting by a trainer in the affected area.
2. Only Task Trained employees have permission to access the sites affected that are listed above.
3. Windsocks will be placed along the access areas to the Leach pads
4. Contact Stacker Operator or Stacker Supervisor in the area prior to entry. Entry into the area is only permitted if and only if a business needs exists. If positive communication cannot be reached with Stacker Operator or Stacker Supervisor, contact CP2 Control Room Operator of the area prior to entry.
5. Evacuation – If Personal Monitor goes into alarm, check the reading on monitor to determine which gas is triggering an alarm. Move to higher ground, to an upwind location. Contact area supervisor of the alarm conditions. Follow the Alarm Response section below for further evacuation information.
6. Personal Monitors shall be worn one of two ways, either on the employees hip/belt area or on shoulder/chest area within 18in of employee's airway.

Determine and understand evacuation muster point based on windsock and uphill conditions. Signage posted will give evacuation muster point locations.



MX6



NH15 Escape Hood



Wind Sock



## Morenci Operations

## Standard Operating Procedure

<b>SOP Title:</b>	<b>Accessing Sulfuric Acid Addition/Dilution Sites - Personal Monitor (hazardous gas may be present)</b>
<b>Division/Area:</b>	<b>Leaching/Hydromet/Crush and Convey</b>

### Operating Procedure for Alarm Responses in affected areas (Step/Control):

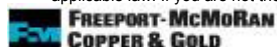
#### If any fixed or personal monitor alarms while in the area:

##### Low Alarm Response:

1. Check reading on personal monitor to determine which gas is triggering an alarm, and what the level(s) is/are. Low level alarm sound will be a slower beep frequency/The Higher level alarm sound will be a fast pace beep frequency. The faster pace that the alarm sounds, the higher the alarm level will be.
2. Check wind direction, and where necessary, move to crosswind location
3. Continue to move away from the alarm location to a point that the personal monitor indicates gas level(s) below the low alarm point for each gas
4. Monitor wind socks to detect shift in wind direction that may necessitate a change in location
5. Contact Area Supervisor and the Control Room Operator of the alarm conditions.
6. Wait a minimum of 10 minutes after the alarm has cleared, for the gas to clear prior to re-entry
7. At this time you may return to the initial work location, monitoring readings on your monitor as you return to the work area. Continue observing the personal monitor to verify that no increase in gas level(s) is/are occurring (if yes, do not proceed further; if no, continue on, then resume work)
8. If alarm condition repeats or persists, go to a safe location and evaluate potential causes and take preventive steps to control/eliminate the problem where possible. Area Supervisor will determine if the Morenci Fire Dept will need to be called to clear the area or not.

##### High Alarm Response:

1. Check reading on personal monitor to determine which gas is triggering an alarm, and what the level(s) is/are. Low level alarm sound will be a slower beep frequency/The Higher level alarm sound will be a fast pace beep frequency. The faster pace that the alarm sounds, the higher the alarm level will be.
2. Check wind direction, and where necessary, move to crosswind location
3. Continue to move away from the alarm location to a point that the personal monitor indicates gas level(s) below the low alarm point for each gas
4. Monitor wind socks to detect shift in wind direction that may necessitate a change in location
5. Contact Area Supervisor and the Control Room Operator of the alarm conditions.
6. If the High alarm is NOT CO<sub>2</sub> or O<sub>2</sub> then use the escape respirator and immediately evacuate to a safe location where the personal monitor reading drops below the low alarm(s) for each gas triggering a response. If the High alarm is CO<sub>2</sub> or O<sub>2</sub>, DO NOT use the escape respirator to evacuate.



## Morenci Operations

## Standard Operating Procedure

<b>SOP Title:</b>	<b>Accessing Sulfuric Acid Addition/Dilution Sites - Personal Monitor (hazardous gas may be present)</b>
<b>Division/Area:</b>	<b>Leaching/Hydromet/Crush and Convey</b>

- Maintain this perimeter until emergency response personnel arrive. Note wind direction and direct any personnel to approach from the upwind side. **DO NOT RE-ENTER AREA!**
- Notify the Control Room and Area Supervisor immediately of the situation, if the alarm is on a personal monitor only no one else will know of the High level alarm in effect. Keep everyone clear from the area.
- Initiate a May-Day, per site described methods, to bring in emergency response personnel; responders will be supplied a personal monitor by the area supervisor to monitor gases in the area.
- Site Health & Safety is to be contacted by supervisor to work together to understand root cause of release and remedial actions required. Re-entry is not permitted until the area has been cleared by the Morenci Fire Dept.
- Any High level alarm exposure will require the exposed individual to visit the clinic for an evaluation.

Sensor	Abbreviation	Instrument Alarm Settings	
		LOW	HIGH
Oxygen	O <sub>2</sub>	19.50%	23.50%
Hydrogen Sulfide	H <sub>2</sub> S	10 ppm	20 ppm
Carbon Dioxide	CO <sub>2</sub>	0.5% VOL	3.0% VOL
Sulfur Dioxide	SO <sub>2</sub>	2 ppm	5 ppm
Nitrogen Dioxide	NO <sub>2</sub>	3 ppm	5 ppm

- Anytime you have an Oxygen alarm whether it is a High or Low alarm it will be treated as a HIGH ALARM RESPONSE (Follow the procedure for High Alarm Response)
- If the Oxygen alarm is a low alarm (19.50% or lower) you will follow the high alarm response and DO NOT use your NH15 Evacuation Respirator when exiting the affected area.
- If the Oxygen alarm is a high alarm (23.50% or higher) you will follow the high alarm response and DO NOT use your NH15 Evacuation Respirator when exiting the affected area.

### References/Other Information

If you observe anyone go down or you feel an unsafe condition exists, press the orange button on any FMI radio, or call 928-865-6600. Immediate medical attention may be required.

Corporate Policy – Hazardous Gas Policy (FCX-17, GSR)

Can be found on the FM Web at:

<https://fmweb.fmi.com/sites/HSPro/Policies%20%20Guidelines/Forms/AllItems.aspx>



## Morenci Operations

## Standard Operating Procedure

<b>SOP Title:</b>	<b>Accessing Sulfuric Acid Addition/Dilution Sites - Personal Monitor (hazardous gas may be present)</b>
<b>Division/Area:</b>	<b>Leaching/Hydromet/Crush and Convey</b>

### Hazards for the Suspect Gases

**NO<sub>2</sub> (Nitrogen Dioxide)** – Can affect you when breathed in. It is a dark brown to yellowish liquid or reddish-brown gas with a strong odor. Breathing Nitrogen Dioxide can irritate the nose and throat, it can irritate the lungs causing coughing and/or shortness of breath. High levels can cause headache, fatigue, dizziness and a blue color to the skin and lips.

- OSHA: Legal airborne permissible exposure limit is 5ppm, not to exceed at any time.

**SO<sub>2</sub> (Sulfur Dioxide)** – is one of the most common gases released in volcanic eruptions. SO<sub>2</sub> is hazard to humans in its gaseous form and also because it oxidizes to form sulfate aerosol. Sulphur Dioxide is a colorless gas with a characteristic and irritating smell. It is perceptible at different levels depending on the individual's sensitivity, it is easily noticeable at 3 ppm. It is more than twice as dense as ambient air. SO<sub>2</sub> is irritating to eyes, throat and respiratory tract. Asthmatic individuals are especially sensitive to SO<sub>2</sub>.

- SO<sub>2</sub> can be perceived between 0.3-1.4ppm, but 3-5 ppm is easily noticeable

**H<sub>2</sub>S (Hydrogen Sulfide)** – Hydrogen Sulfide is primarily exposed to workers by breathing it. The effects of H<sub>2</sub>S depends on how much you breathe in and for how long. Exposure to very high concentrations can quickly lead to death. Exposure may cause nausea, tearing of the eyes, headaches, or loss of sleep. Around 20ppm, possible fatigue, loss of appetite, poor memory and dizziness. H<sub>2</sub>S is a highly flammable, explosive gas.

- 3-5ppm the smell is noticeable as a rotten egg smell to some, above 30ppm the odor is described as a sweet or sickeningly sweet smell.

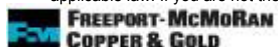
**CO<sub>2</sub> (Carbon Dioxide)** – CO<sub>2</sub> is naturally present in the air we breathe at a concentration of about 0.037%, and is not harmful at low concentrations. CO<sub>2</sub> is a colorless and odorless gas, it is not flammable, and it is also heavier than air. Carbon Dioxide is colder than the surrounding air as well. As CO<sub>2</sub> concentration rises it can cause headaches, dizziness, confusion and loss of consciousness.

- Long Term exposure limit: (8hr reference period) of 0.5%
- Short Term Exposure Limits: (15 minutes of reference period) of 1.5%

**O<sub>2</sub> (Oxygen)** - is a colorless, odorless gas, liquid Oxygen has a light blue color and is also odorless. Breathing pure O<sub>2</sub> at high pressures can cause nausea, dizziness, muscle twitching, vision loss, convulsions and loss of consciousness. Higher exposures can cause a build-up of fluid in the lungs, with a severe shortness of breath.

- O<sub>2</sub> is naturally present at a concentration of 21% in the air we breathe.
- Oxygen levels are considered LOW at less than 19.5% and are considered HIGH at 23.50%. Health effects listed above may occur when Oxygen concentration is greater than 40%, or when breathing *pure* Oxygen.



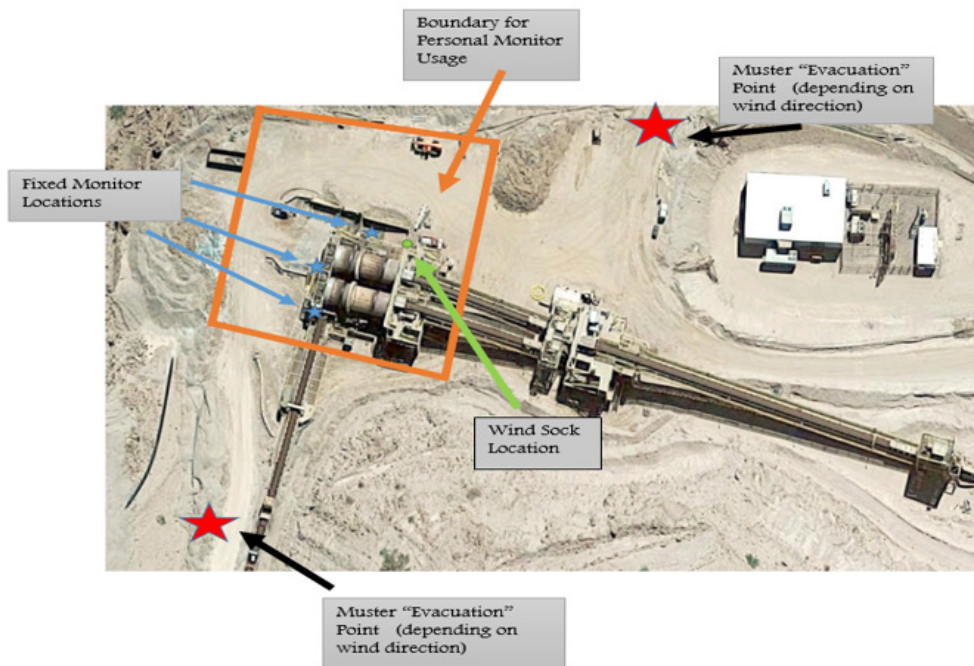


## Morenci Operations

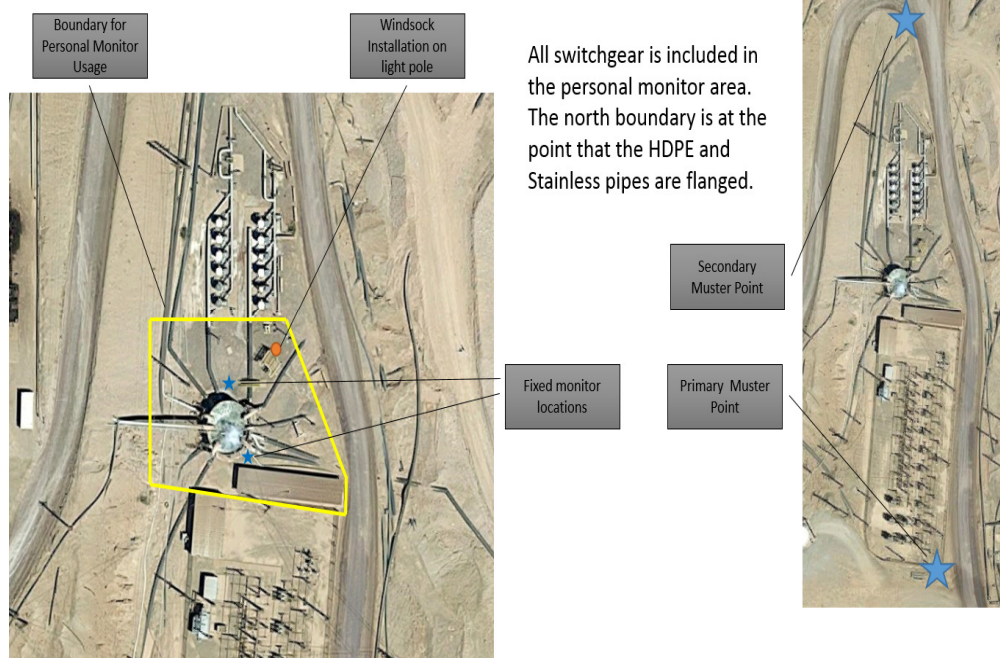
## Standard Operating Procedure

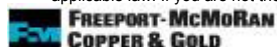
<b>SOP Title:</b>	<b>Accessing Sulfuric Acid Addition/Dilution Sites - Personal Monitor (hazardous gas may be present)</b>
<b>Division/Area:</b>	<b>Leaching/Hydromet/Crush and Convey</b>

### Crush & Convey Agglomeration Drum Area:



### METCALF BOOSTER:





## Morenci Operations

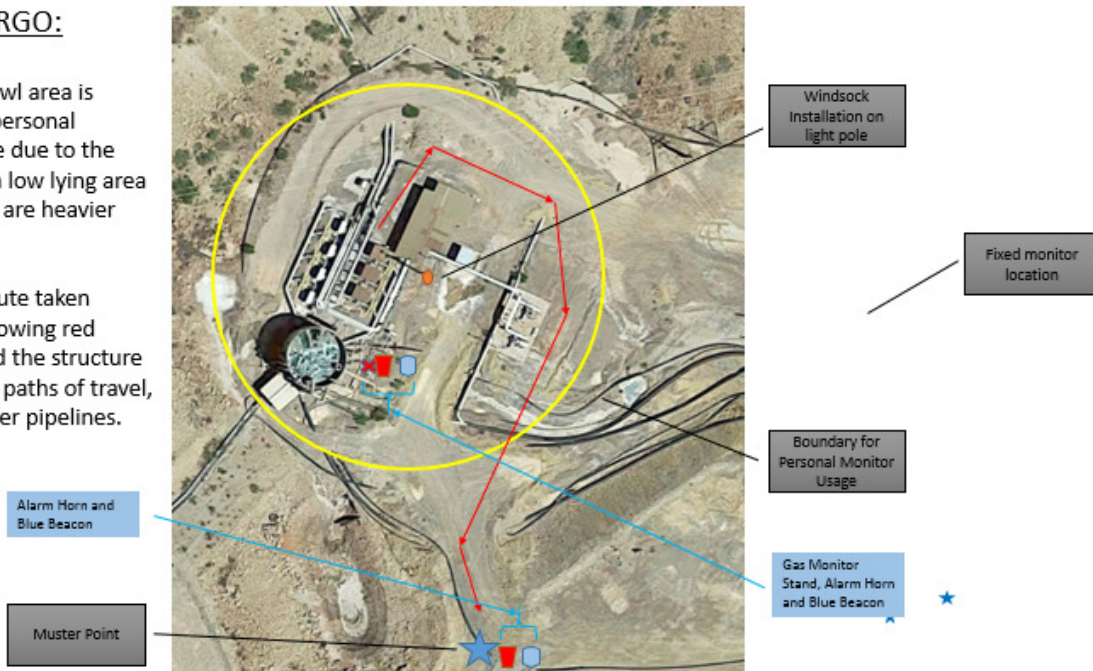
## Standard Operating Procedure

<b>SOP Title:</b>	<b>Accessing Sulfuric Acid Addition/Dilution Sites - Personal Monitor (hazardous gas may be present)</b>
<b>Division/Area:</b>	<b>Leaching/Hydromet/Crush and Convey</b>

### 4500 STARGO:

This whole bowl area is identified as personal monitor usage due to the fact that it is a low lying area and the gases are heavier than air.

Evacuation route taken should be following red arrows around the structure through open paths of travel, not up and over pipelines.



### Ponderosa:

The area with the pumps is lower than the tank and should be included in the evacuation if the fixed monitor is alarming.

