2014 Northern Regional Mine Rescue Contest

JUDGES' PACKET
Field Competition

June 18, 2014
Findley Lake, New York

Table of Contents

Page

Mine Information 1

Team Briefing Statement 3

Team & Fresh Air Base Instructions 5

Problem Orientation 6

Problem Solution 7

Placard Key 22

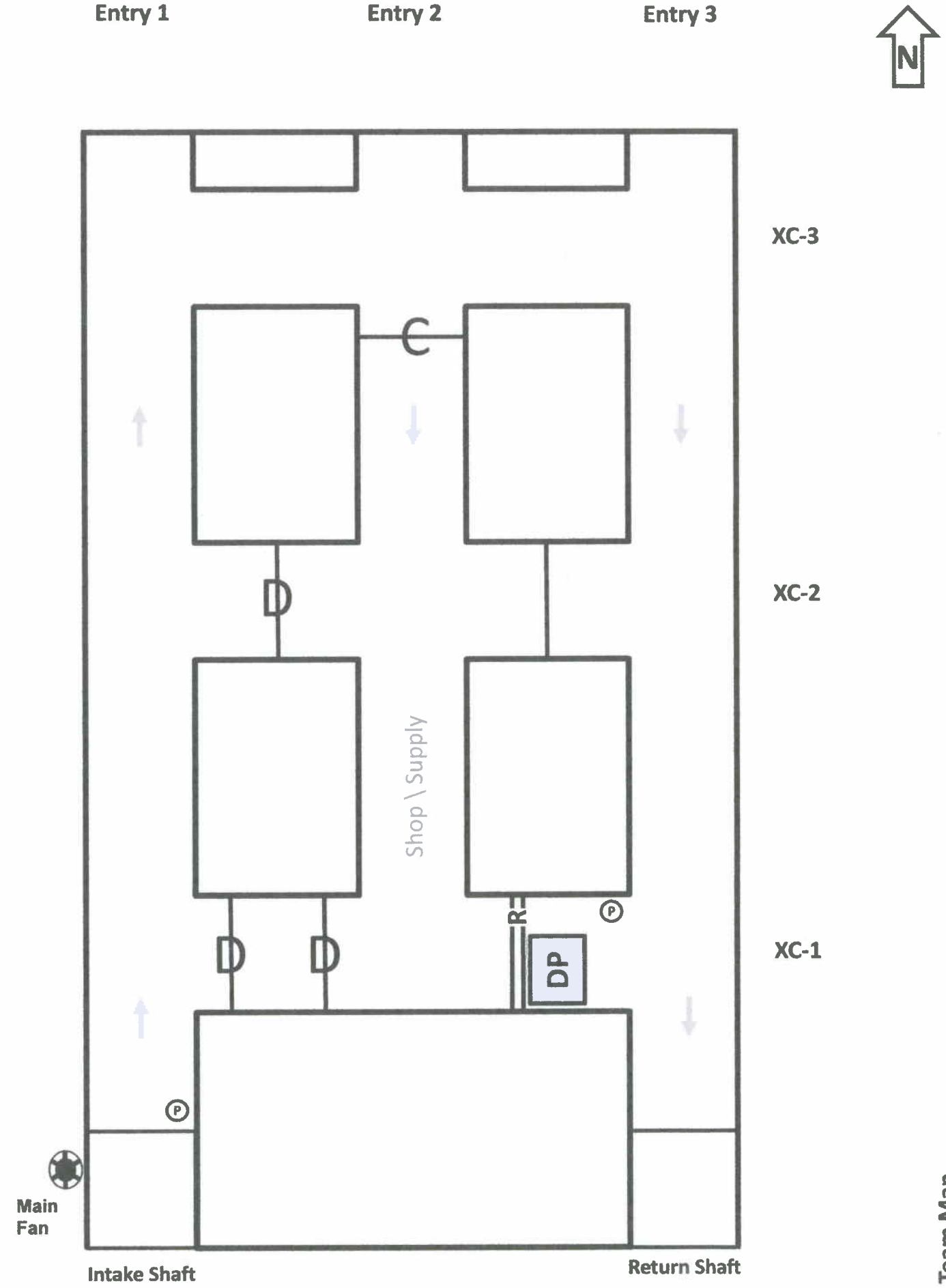
Map Legend 24

Team Map 25

Fresh Air Base Map 26

Fresh Air Base Map (Alternate) 27

Field Construction Map 28


Entry 1
Entry 2
Entry 3
N
XC-3
XC-2
XC-1
Shop \ Supply
R
P
DP
P
Main
Fan
Intake Shaft
Return Shaft

Team Map

Mine Information Sheet
Peak Mining Co. – Mountain Run Mine

Mining & Equipment:
The single-level mine uses a conventional room and pillar method to extract ore. The broken ore is loaded using load-haul-dumps (LHDs) and then transported to the shaft dump pocket located in Entry 3. The ore is then hoisted to the surface via production skips in the Return Shaft. The entries are initially driven 8 feet high and 10 feet wide. Typical pillar dimensions are 15 feet by 20 feet (W x L). All underground mobile equipment (including the LHDs, face drills, roof bolting machines, and transport jeeps) is diesel-powered.

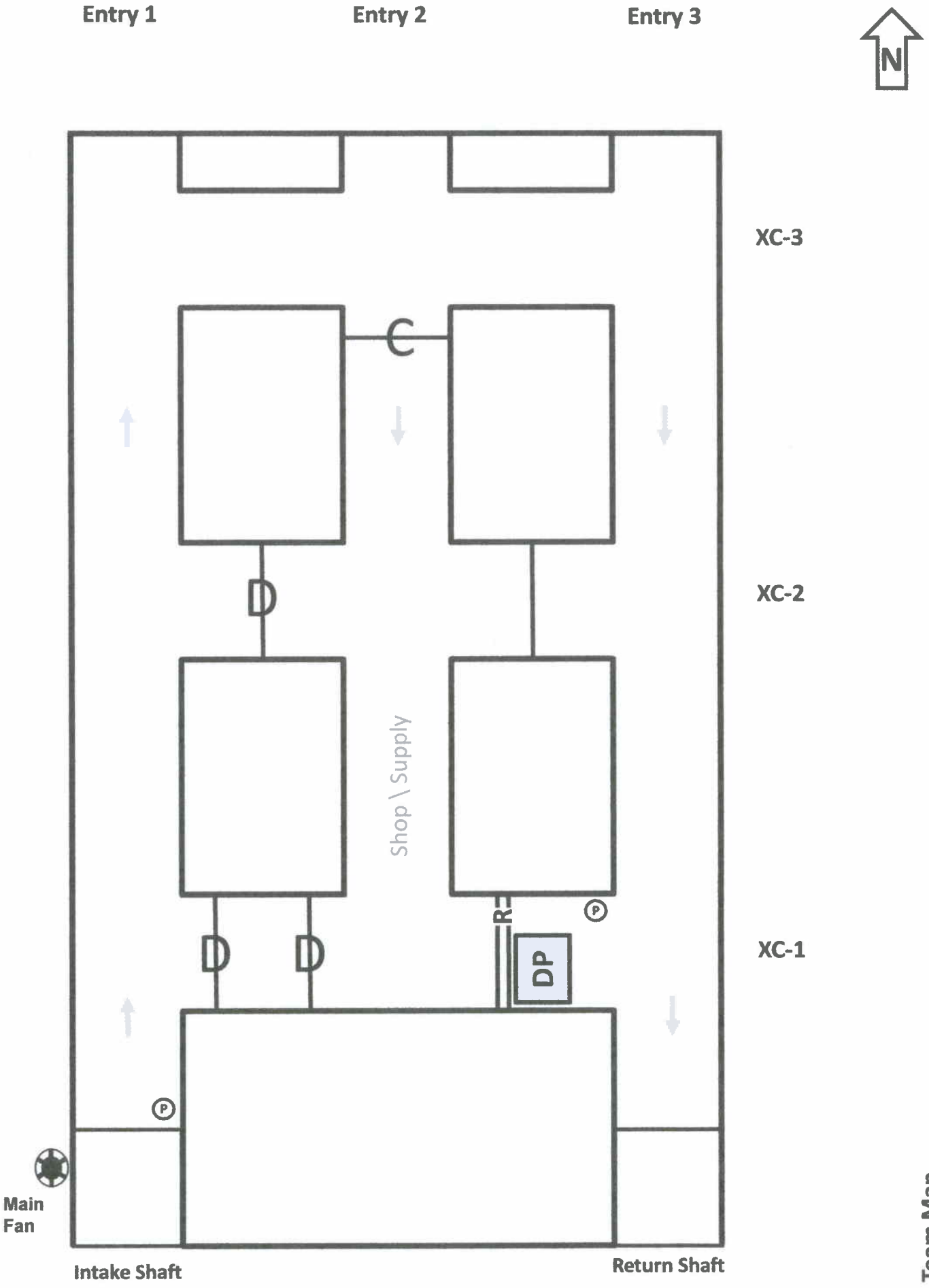
Mine Classification:
In accordance with Title 30 CFR § 57.22003, the mine was classified as a Category IV mine, that is, any methane concentrations liberated are not explosive and are not capable of forming explosive mixtures with air, based on the geological area in which the mine is located. Historical hygiene data from the mine, both MSHA and Company's samples, have indicated the presence of methane in trace amounts.

Mine Openings:
The mine is opened by two 18-foot diameter shafts approximately 1,750 feet deep. The Intake Shaft is equipped with a service hoist used to transport people and to convey supplies. The shaft also serves as the primary escapeway from the mine. The Return Shaft which is equipped with production skips, as well as an escape compartment which can be used to hoist a maximum of eight persons to the surface.

Ventilation:
The 6-ft. diameter blowing Main Fan is located on the surface at the Intake Shaft. The fan is <u>not</u> reversible. The fan produces approximately 100,000 cfm and operates in the stable portion of its performance curve. The electrical power to the fan is on and the fan is operating. The air enters the mine through the Intake Shaft and exhausts from of the Return Shaft. Air is directed to the faces using permanent (concrete block) and temporary (brattice cloth) ventilation controls. The typical airflow direction is marked on the Team and Fresh Air Base Maps.

Water:
The mine has no history of water problems in the active workings.

Pumps:
Each shaft is equipped with a ten-foot deep sump. The main water pumps, located on the surface, can easily handle the volume of water produced in the shafts. The main water pumps have been activated along with the power to the shafts.


Entry 1
Entry 2
Entry 3
N
XC-3
XC-2
XC-1
Shop \ Supply
R
DP
P
P
Main Fan
Intake Shaft
Return Shaft

Team Map

Mine Information Sheet (continued)
Peak Mining Co. – Mountain Run Mine

Ground/Rib and Roof Control:
The immediate roof, or back, is supported by six-foot rock bolts. The back is fairly competent, but problem areas are supported by wooden posts or stacked crib blocks.

Explosives:
Explosives are available and stored on the surface. They are used during the mining cycle and blasting is conducted at the end of each shift while all persons are out of the mine. Only enough explosives for a day's use are stored in day boxes on the blaster's jeep.

Electric Power:
The electrical power to the shafts and the surface pumping station has been restored; however, all power to the underground has been de-energized, locked out, and guarded.

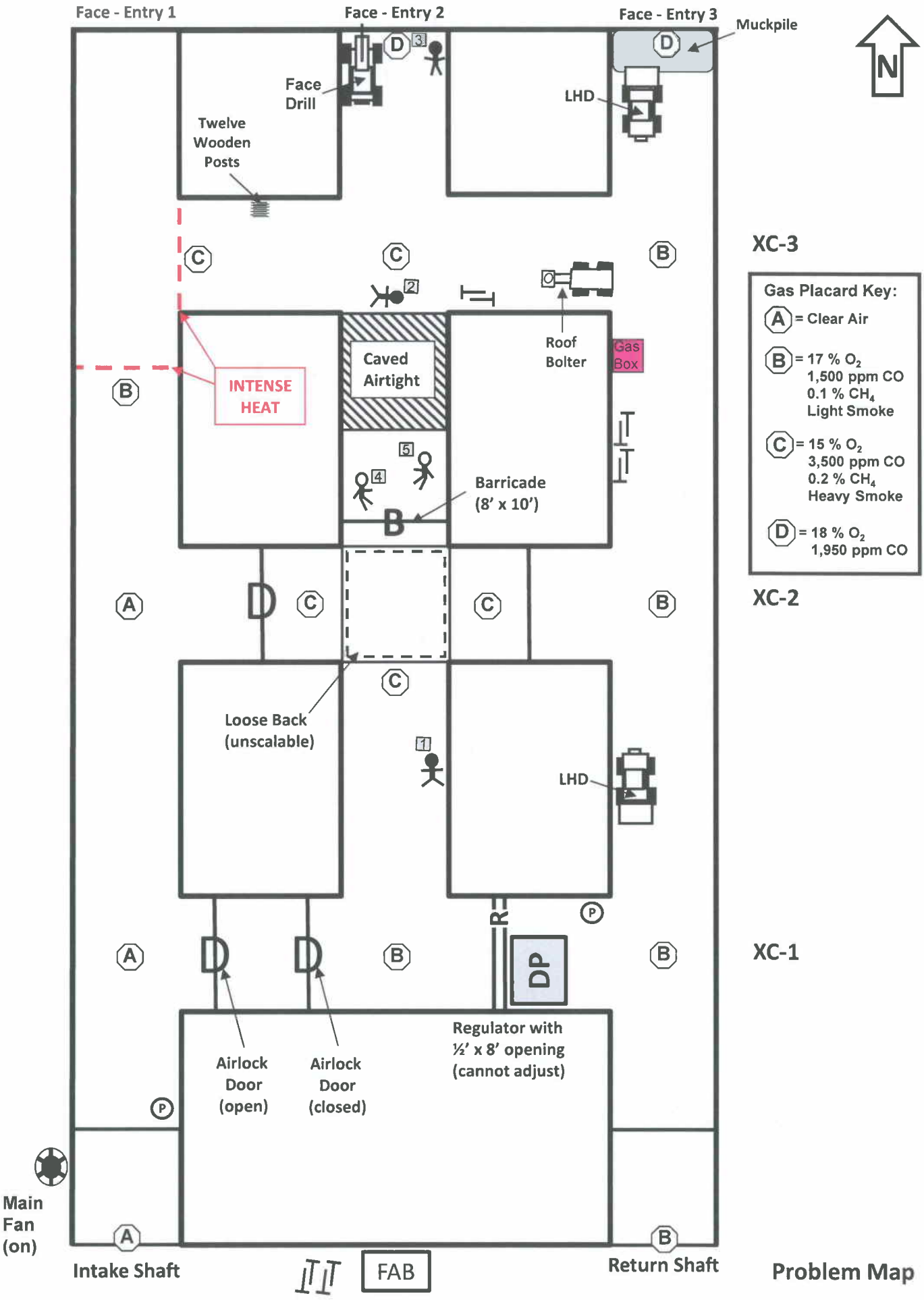
Mine Map:
The mine map was updated on June 11, 2014 by the onsite Engineering Department.

Other Mines:
There are several known mines, active and abandoned, in Findley Lake, New York. At this time, the Mountain Run Mine is not connected to any of these mines.

Materials:
Most available equipment and materials to work the problem are located in the mine and are identified with placards. The materials are stored in several areas underground and can be readily located if needed. If there is something else deemed necessary by the team, upon request, it can be delivered in a reasonable amount of time.

> **Note: The new brattice material available for use by the team is relatively lightweight and compact (10-foot strips of brattice cloth with a clip on each end). For the sake of realism, the team will only be allowed to carry two sets of material at any one given time.**

Communications:
Two pager phones are available in the mine for contact with the surface. The current phone locations are marked on the mine map. At this time, we do not know the status of the communication system, because there has been no contact with the missing miners.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2
1,500 ppm CO
0.1 % CH4
Light Smoke
C = 15 % O2
3,500 ppm CO
0.2 % CH4
Heavy Smoke
D = 18 % O2
1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
XC-2
Loose Back (unscalable)
LHD
DP
XC-1
Airlock Door (open)
Airlock Door (closed)
Regulator with ½' x 8' opening (cannot adjust)
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Problem Map

Team Briefing Statement

You are located at the surface of the Peak Mining Company's Mountain Run Mine. The mine started production on January 3, 2013. It is a single-level underground mine opened by two shafts approximately 1,750 feet deep. Air enters the mine through the Intake Shaft which is equipped with a service hoist used to transport people and to convey supplies. This shaft serves as the primary escapeway from the mine. Air exhausts from the Return Shaft which is equipped with production skips, as well as an escape compartment which can be used to hoist a maximum of eight persons to the surface. The mine is ventilated by the surface-mounted blowing Main Fan operating at the Intake Shaft which produces 100,000 cfm for the mine. The Main Fan cannot be reversed.

Ore is mined by the traditional room and pillar method. The entries are initially driven 8-feet high and 10-feet wide. Pillars dimensions are typically 15-feet by 20-feet (W x L). The immediate roof, or back, is supported by six-foot rock bolts. The back is fairly competent, but problem areas are supported by wooden posts or stacked crib blocks. The mine has no history of water problems in the active workings.

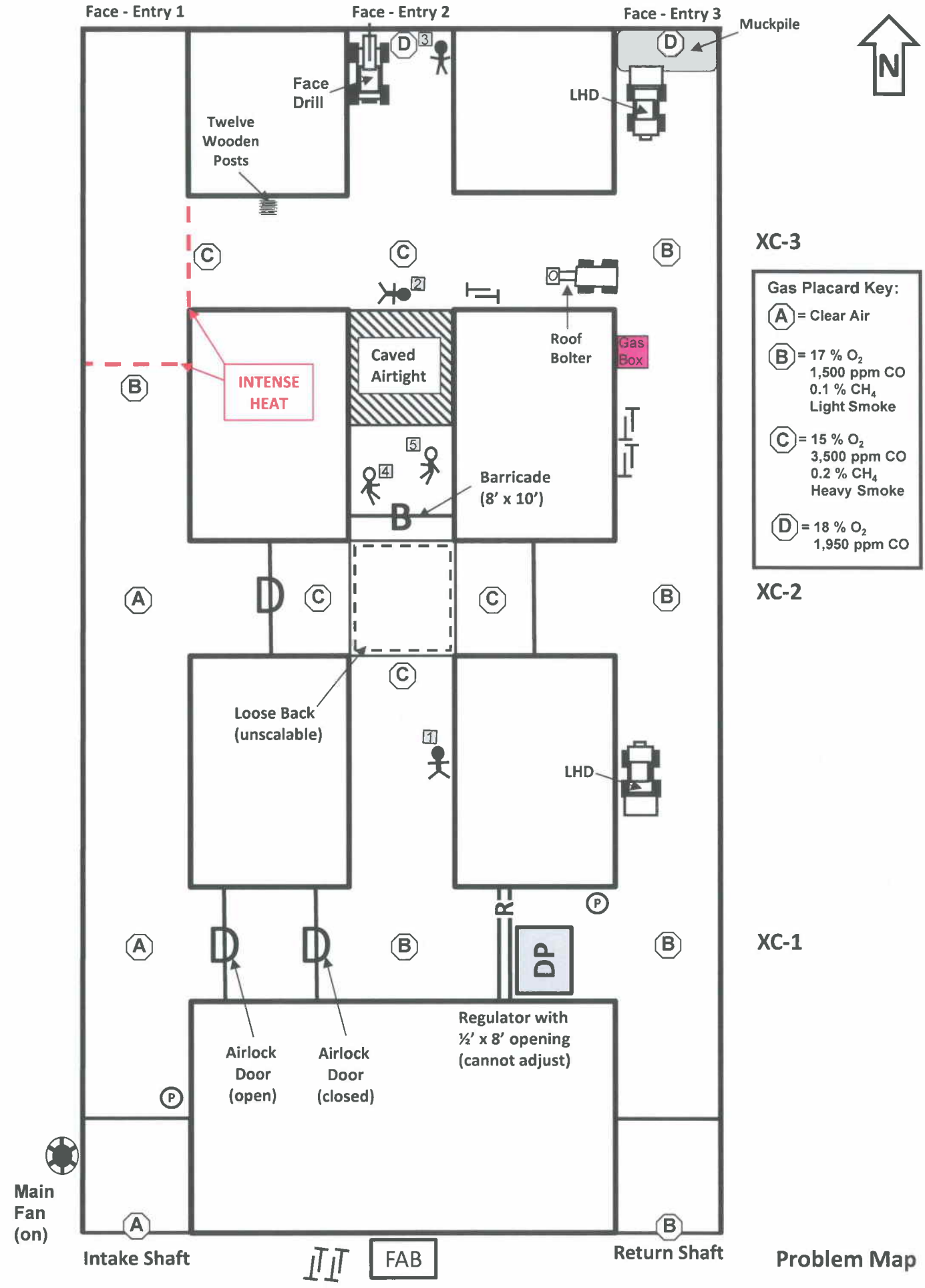
This morning at 5:00 a.m., a five-person crew went underground to start their shift. At about 6:45 a.m., one crew member called out from the shaft dump pocket and informed the hoist engineer that there was a fire burning in the face areas and dark black smoke was filling the mine. He was returning to the faces in order to help fight the fire. At that time, communication was lost. The engineer called the superintendent who immediately gave the order to activate the stench warning system to evacuate the mine. Since that time, no one has entered or exited the mine. We do not know the status of the communication system, because there has been no further contact with the missing miners.

All power to the underground has been de-energized, locked out, and guarded. Both hoists are operational and the Main Vent Fan is operating. Continuous gas monitoring has been established at both shafts. The latest readings show "clear air" at the Intake Shaft and 17 % oxygen (O_2), 1,500 ppm carbon monoxide (CO), and 0.1 % methane (CH_4) with heavy smoke at the Return Shaft.

We have called all of the government agencies for help. Guards have been posted at the shafts and at the main fan. There is a fully equipped mine rescue team located on the surface and they are ready to serve as your team's backup.

If your team is willing to help, we would like you to account for all missing miners; bring any live miners to the surface; extinguish or seal any fires; and explore and map all accessible areas of the mine. **Another team will be sent into the mine to replace you after 90 minutes.**

All available equipment and materials to work the problem are located in the mine and are identified with placards. The materials are stored in several areas underground and


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
XC-2
Loose Back (unscalable)
LHD
DP
XC-1
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (open)
Airlock Door (closed)
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Problem Map

can be readily located if needed. If there is something else deemed necessary by the team, upon request, it can be delivered in a reasonable amount of time.

When you reach the mine rescue course, the Mine Manager will introduce you to the judges. Once the Team Captain has started the timer, the Mine Manager will provide you with any changes to the briefing information that you have received. The Mine Manager will not answer any additional questions concerning the team briefing statement. However, if you do not understand a term, it will be defined. The Manager will only respond to questions allowed by the rules while you are working the problem.

The fresh air base attendant and alternate will be assigned a location where they can study the team briefing information, mine information, and map. Only one attendant or alternate will be allowed to assist at the fresh air base. This fresh air base attendant can assist the team and communicate with them while they advance past the fresh air base using the wire communication system. He must maintain an accurate map indicating all initial information that the team relays to him. He may also assist the team by relaying information to the mine manager when required by the problem. He may also assist the team when they retreat to the fresh air base.

The fresh air base attendant and mine rescue team alternate are not allowed to speak to anyone during the working of the problem except their team members, the mine manager, and the judging officials.

GOOD LUCK!

Team Instructions

- Explore and map all accessible areas of the mine;
- Extinguish or seal any fires;
- Account for the four missing miners;
- If necessary, re-ventilate the mine; and
- Bring any live miners to the surface.

Fresh Air Base Instructions

- The fresh air base attendant and alternate will be assigned a location where they can study the team briefing information, mine information, and map.
- Only one attendant or alternate will be allowed to assist at the fresh air base. This person can assist the team and answer any questions the team may ask.
- The fresh air base attendant and mine rescue team alternate are not allowed to speak to anyone during the working of the problem except their team members, mine manager, and the judging officials.

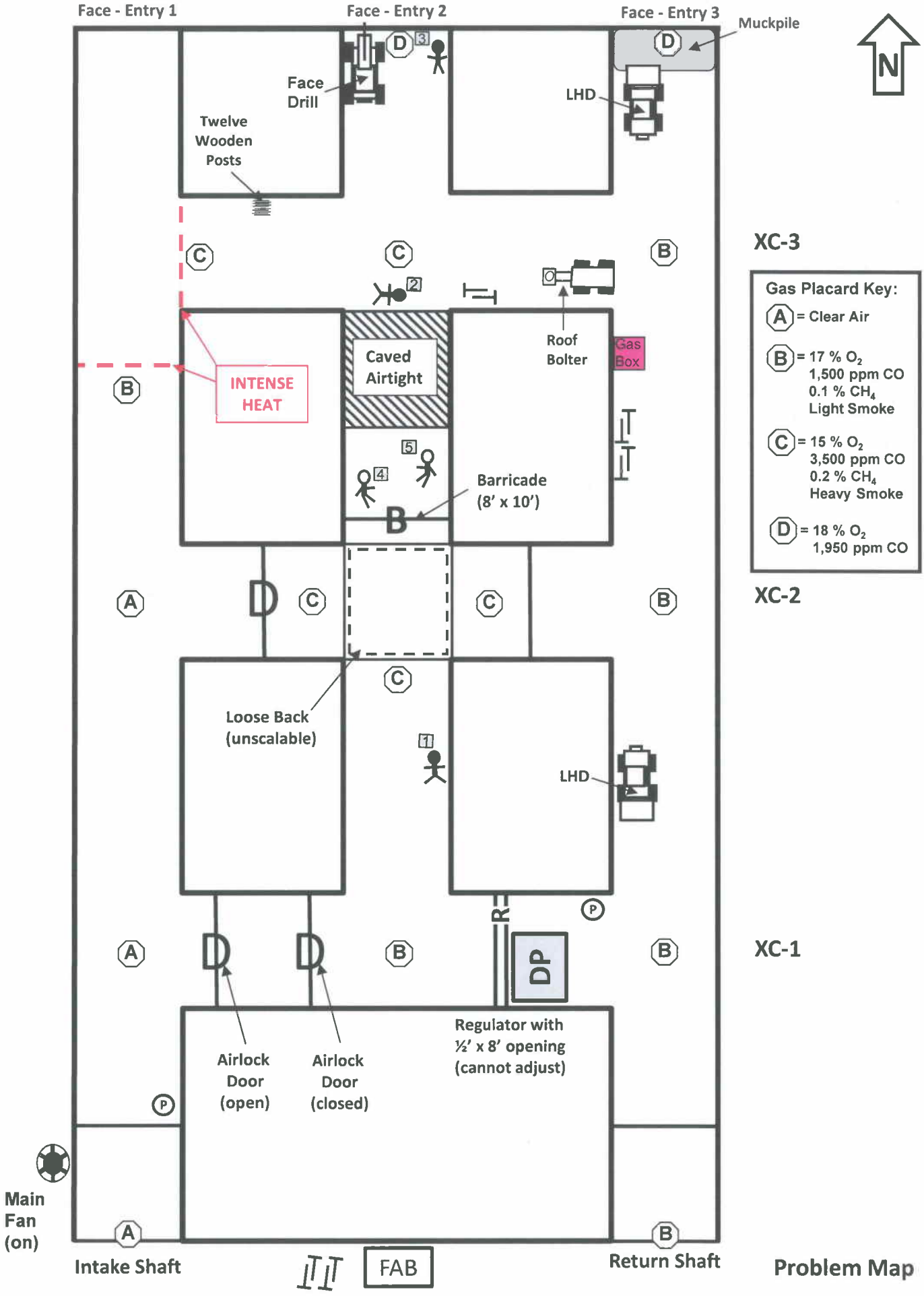
Problem Orientation

Introduce yourself to the team as the "Mine Manager." Then, introduce the #1, and #2 Judges. The team has been briefed on the problem and the mine information, and been provided with the mine maps in isolation. Read the following instructions to the team:

> **At this time, I have no new information for your team. During the working of the problem, I will answer any question that you may have; however, by problem design, my response may be limited in scope. The fresh air base attendant and mine rescue team alternate must remain at the surface fresh air base. Only the attendant can speak with the team via the communication system to discuss the rescue activities performed or proposed. If the team returns to the fresh air base, only the attendant or alternate will be allowed to assist them. However, neither the attendant nor the alternate can physically go beyond the fresh air base to assist the team unless he/she becomes a team member when someone drops out.**
>
> **After the team has completed its 50 foot check, they will not be allowed to physically compare the team map with the fresh air base attendant's map or the team alternate's map. No side by side comparison will be allowed and no changes (edits) can be made to any map while the team is at the surface fresh air base.**
>
> **The fresh air base attendant or team alternate is not allowed to speak with anyone <u>except</u> the team members, the mine manager, or the judges.**
>
> **At the end of the problem, both the team map and the fresh air base attendant's map will be collected and scored. All map editing must take place prior to stopping the clock. The alternate's map will also be collected at this time but it will not be scored.**
>
> **Do you understand these instructions?**

When they verify understanding the instructions, have the Team Captain start the clock and hand the team their copies of the Team Briefing Information, the Mine Information Sheets, and the <u>three</u> mine maps.

Remember to add: **"Good Luck!"**


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2
1,500 ppm CO
0.1 % CH4
Light Smoke
C = 15 % O2
3,500 ppm CO
0.2 % CH4
Heavy Smoke
D = 18 % O2
1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
XC-2
Loose Back (unscalable)
LHD
DP
XC-1
Airlock Door (open)
Airlock Door (closed)
Regulator with ½' x 8' opening (cannot adjust)
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Problem Map

Problem Solution

DISCLAIMER:
There are many ways to successfully solve this problem. The following outlines one possible way for use during MSHA field judges' training.

Each team received a briefing in isolation. At that time, each team was allowed to review the team briefing statement, mine information sheet, mine maps, and instructions for rescue teams and fresh air base attendants. However, copies of these documents and maps were collected at the conclusion of the briefing session.

Upon arrival at the fresh air base, the team will meet the Mine Manager and will be introduced to the judges. The Mine Manager will read the Problem Orientation and update the team with any information obtained since their briefing. Questions will be answered only as required by the rules or to explain the meaning of a term.

When the team verifies that they understand the instructions, the captain immediately starts the official clock. He writes the month, day, year, and the team position number on the sign-in board (or sheet).

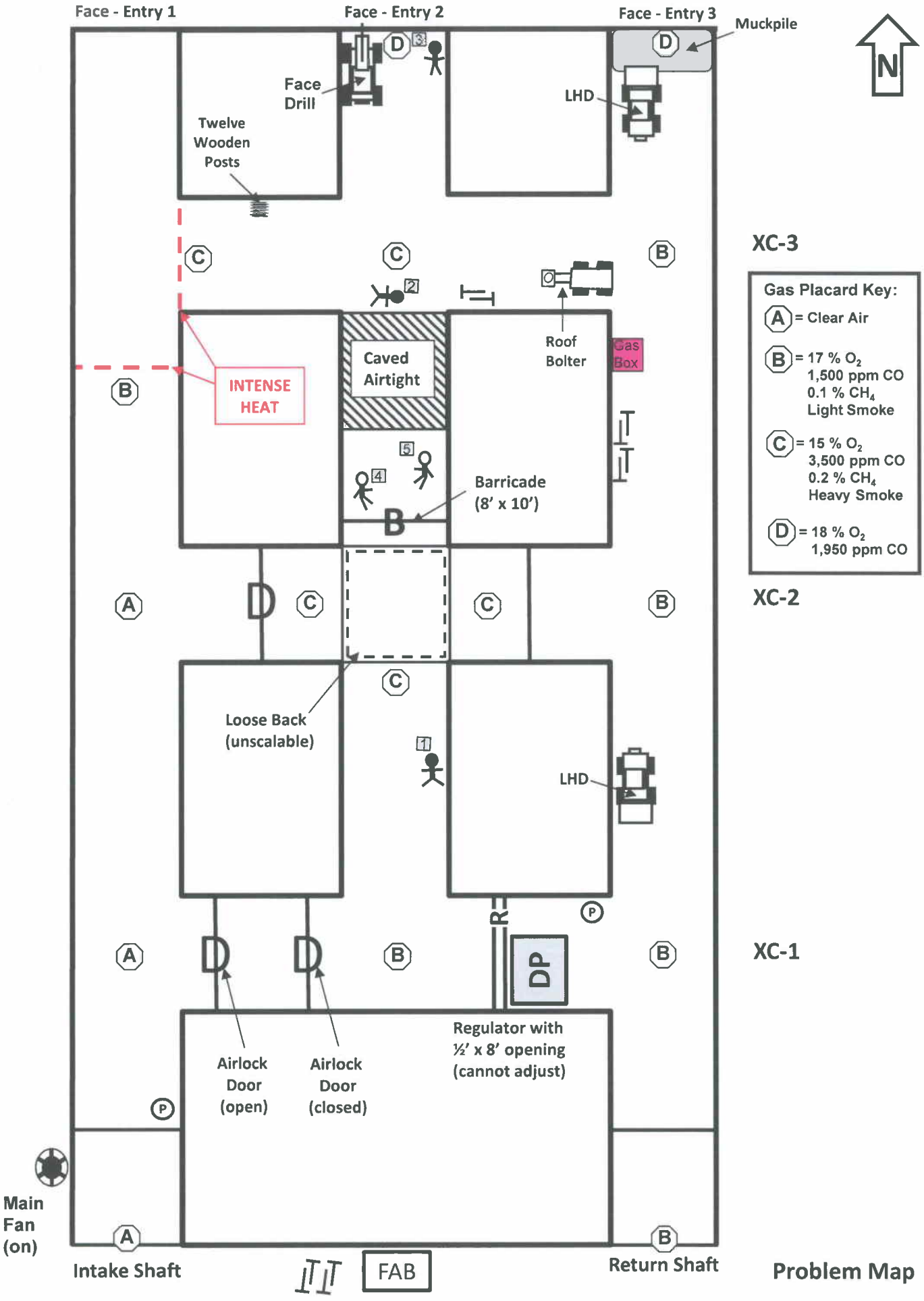
After receiving the information from the Mine Manager, the team may discuss the conditions presented by the problem and the map. The team is not required to check their equipment again. These equipment checks were conducted prior to reporting to the field and the team is fully equipped, physically fit, and ready to go. However, deficiencies with the team's equipment, identified by the judges during the working of the problem, should be discounted appropriately.

Due to the presence of methane in the mine atmosphere, the team must use non-sparking tools to work the problem. They must notify the judges that they are using such tools. If the team does not have non-sparking tools and requests them from the official in charge, the tools that they brought with them will be deemed non-sparking. Failure to use and notify or request non-sparking tools will result in a team endangerment discount.

The team will find that there are two sets of brattice material at the fresh air base to be used as needed during the working of the problem. The team may elect to take these along with them during exploration of the mine.

Note: The new brattice material available for use by the team is relatively lightweight and compact (10-foot strips of brattice cloth with clips on each end). Therefore, for the sake of realism, the team will only be allowed to carry two sets of material at any one given time. This information was provided to the team on the Mine Information Sheet.

When ready, the team must examine the mine openings. Both shafts must be examined while under oxygen. In air clear of smoke, these checks may be made without a lifeline, provided the entire team does not go into the entrance.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
XC-2
Loose Back (unscalable)
LHD
DP
XC-1
Airlock Door (open)
Airlock Door (closed)
Regulator with ½' x 8' opening (cannot adjust)
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Problem Map

Intake Shaft checks reveal:

A placard at the shaft shows "Clear Air." The conveyance will be at the top of the shaft and the team will place combustible material on the cage and send it down, using the posted Nevada hoisting signal codes. The team must then signal the cage to return to the surface. When the material is checked, it will be intact and dry.

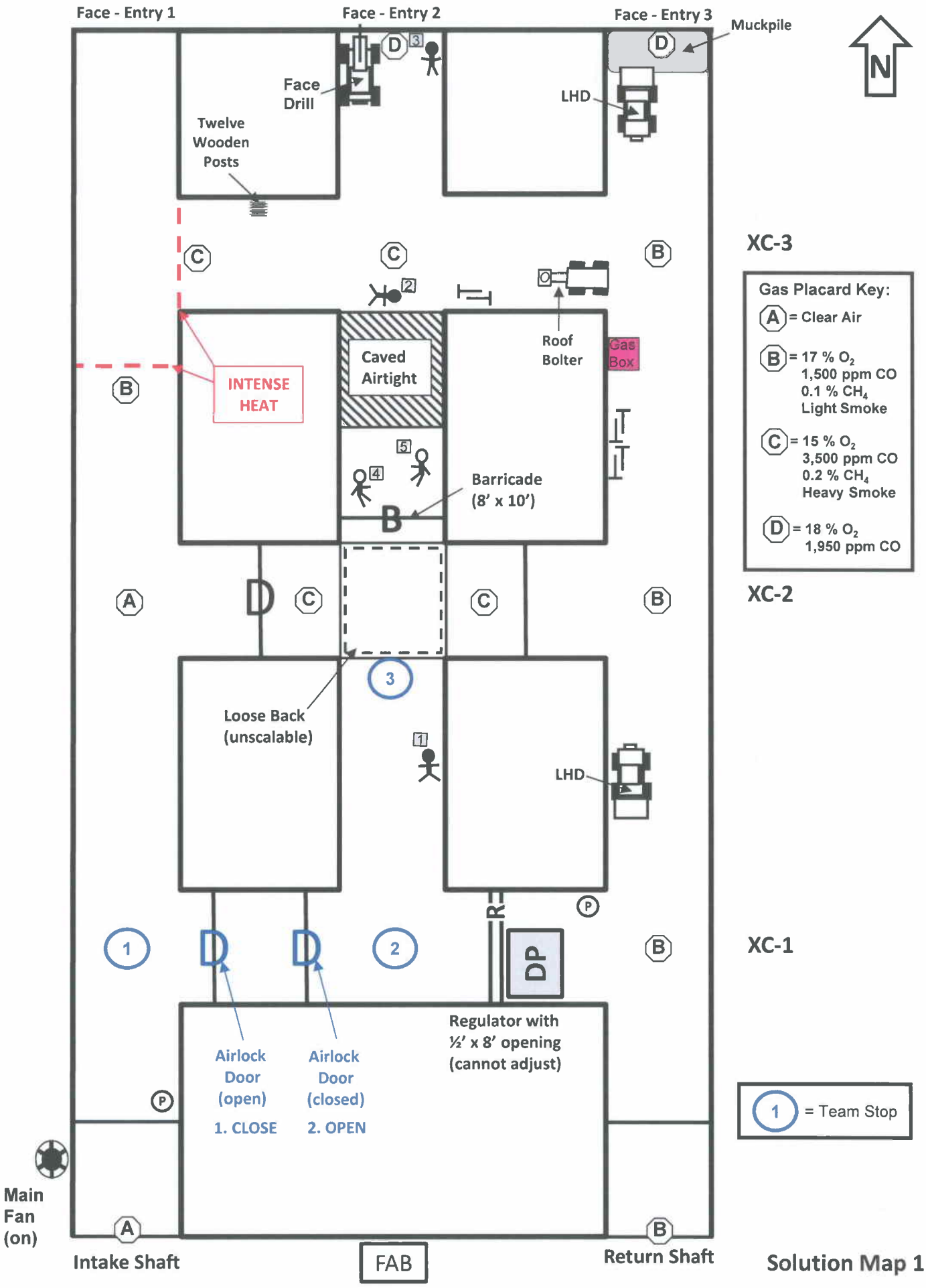
Note: Judge No. 1 will allow 10 seconds for the conveyance to travel in each direction.

Return Shaft checks reveal:

A placard at the shaft shows 17 % oxygen (O_2), 1,500 ppm carbon monoxide (CO), and 0.1 % methane (CH_4) with heavy smoke The conveyance will be at the top of the shaft and the team will place combustible material on the cage and send it down, using the posted Nevada hoisting signal codes. The team must then signal the cage to return to the surface. When the material is checked, it will be intact and dry.

Note: Judge No. 1 will allow 10 seconds for the conveyance to travel in each direction.

Note: The same concentrations found on the placard at this shaft had been reported to the team during their briefing. Therefore, the team must perform an apparatus and personnel check before entering smoke at this location. They must also be attached to their lifeline.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
XC-2
Loose Back (unscalable)
LHD
R
P
DP
XC-1
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (open)
1. CLOSE
Airlock Door (closed)
2. OPEN
1 = Team Stop
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 1

Note: Team Stop Nos. 1 - 3 (see Solution Map 1)

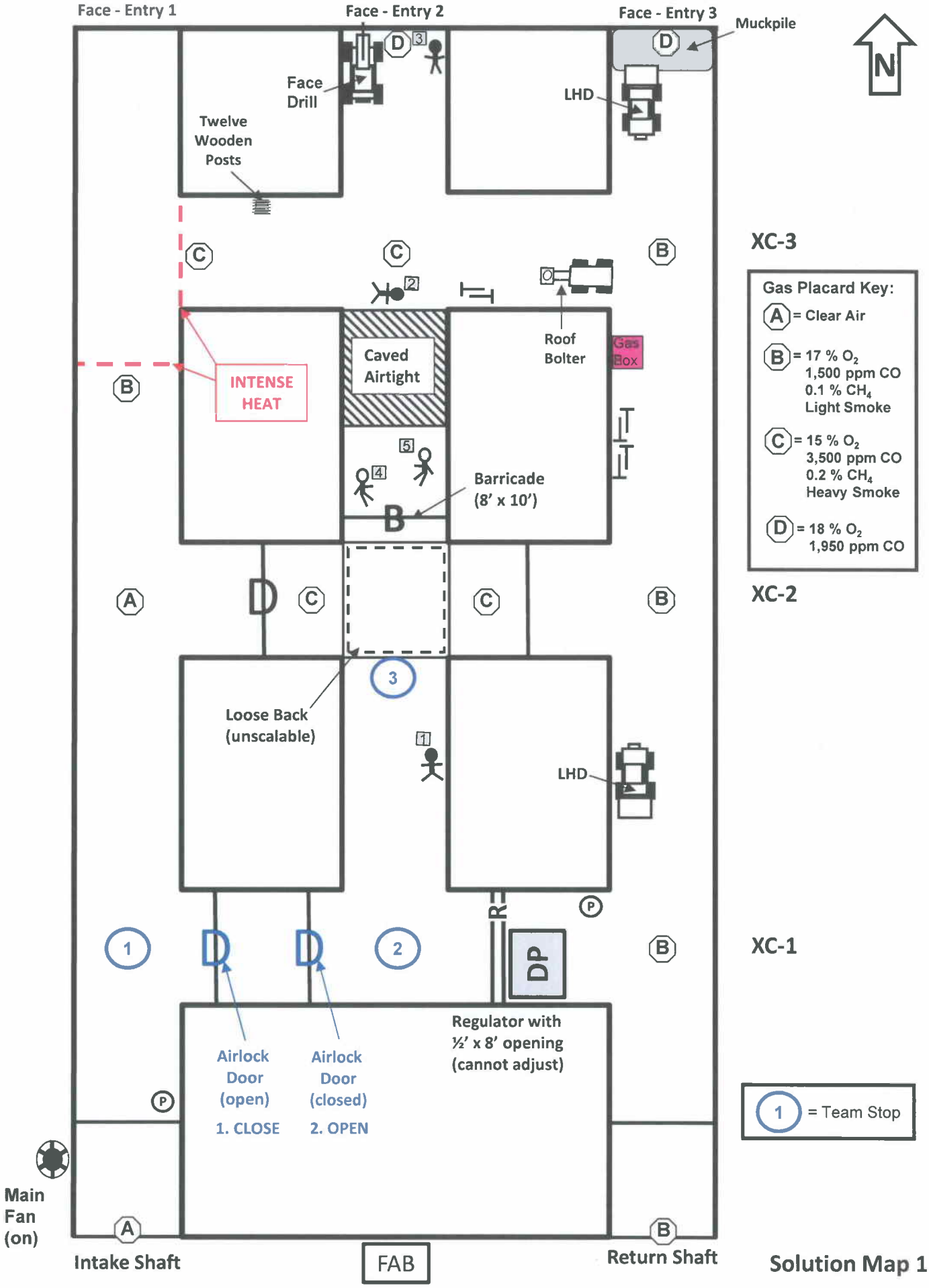
Team Stop No. 1
The team must count off before entering the cage (first time they go underground). Team will descend to the Intake Shaft station. Before exiting the cage the captain must check for loose roof in front of the cage. A gas check will show "clear air." At the shaft station, the team will find a working mine phone. The team can advance northward in Entry 1 to the intersection with Crosscut 1 (designated as XC-1 on the team and fresh air base maps). At the intersection, the captain performs roof or back checks and the team will conduct necessary gas checks. The drift is open to the north and the western airlock door in the XC-1 is open. The team can stretch eastward to the second airlock door and find it closed.

Note: After advancing into the mine, not more than fifty (50) feet from the shaft, the captain must give a signal for the team to stop. At this team stop, all team members and their apparatus must be checked. After the first 50 feet apparatus check, the team is required to conduct apparatus examinations not exceeding 20-minute intervals while working the problem. Additionally, apparatus removed in order to enter a confined area or apparatus that has sustained possible damage must be checked before continuing.

Note: No physical comparison of the fresh air base map and team map will be allowed after this initial entry into the mine. No changes can be made to any map while the team is at the surface fresh air base.

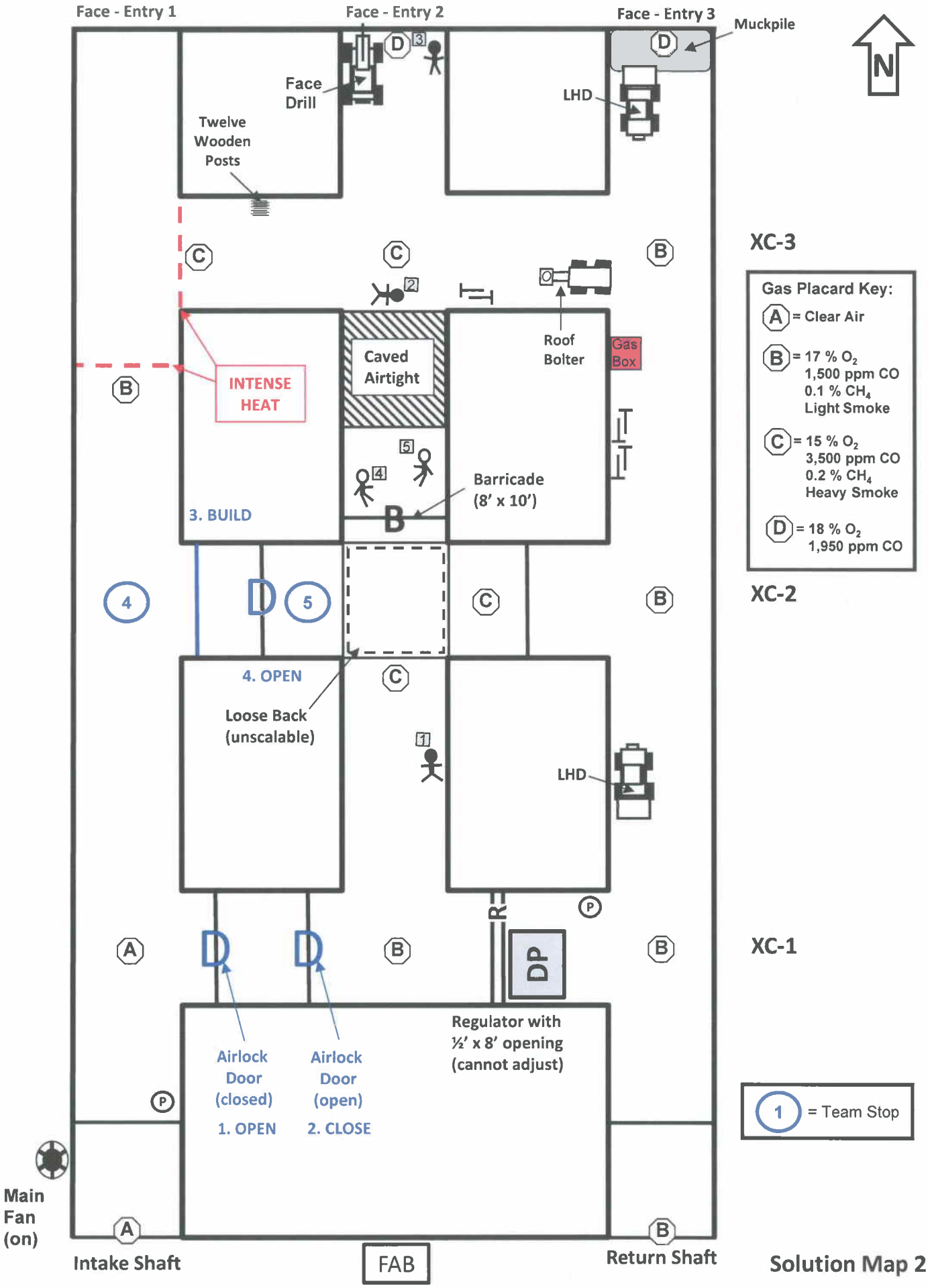
Team Stop No. 2
The team can travel through the existing airlock to access Entry 2. In order to prevent an unintentional ventilation change, the team must close the first airlock door behind them. Then, they can open the second airlock door and advance to the entry. At the intersection, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will find 17 % O_2, 1,500 ppm CO, 0.1 % CH_4 with light smoke. The entry to the north is open. The team can stretch eastward to the permanent stopping. After again checking the roof or back and taking necessary gas tests, the captain must D&I the stopping as their furthest point of advance in this direction. They will also find that the regulator has a ½-foot by 8-foot opening which cannot be adjusted.

Note: the team must perform an apparatus and personnel check before entering smoke at this location. They must also be attached to their lifeline.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
XC-2
Loose Back (unscalable)
LHD
XC-1
DP
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (open) 1. CLOSE
Airlock Door (closed) 2. OPEN
1 = Team Stop
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 1

Team Stop No. 3
The team can advance northward in the drift toward XC-2. As they travel, they will find the first missing miner (Miner #1) laying along the eastern rib and unresponsive. The team captain must perform necessary roof or back checks over the miner. After a primary assessment, the #1 Judge will hand the team member a placard which reads: **"The miner exhibits no vital signs. The miner is dead."** The captain must D&I the location of the body.

Afterward, the team can advance toward the intersection. They will find the southern extent of an area of loose unscalable back stretching rib-to-rib which is blocking access to the intersection. The captain must warn the rest of the team members to avoid this hazard. At this point, the team has not located any posts or cribbing materials to support it. **If the team asks the mine manager for posts, they will be told that all materials needed to work the problem can be found on the field. Additional posts have been ordered and a shipment is expected to arrive at the mine by 6:00 p.m.** At the loose back, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will find 15 % O_2, 3,500 ppm CO, 0.2 % CH_4 with heavy smoke. The captain must remember to D&I the loose back as their furthest point of advance in this direction.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2
1,500 ppm CO
0.1 % CH4
Light Smoke
C = 15 % O2
3,500 ppm CO
0.2 % CH4
Heavy Smoke
D = 18 % O2
1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
3. BUILD
XC-2
4. OPEN
Loose Back (unscalable)
LHD
R
P
DP
XC-1
Airlock Door (closed)
1. OPEN
Airlock Door (open)
2. CLOSE
Regulator with ½' x 8' opening (cannot adjust)
1 = Team Stop
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 2

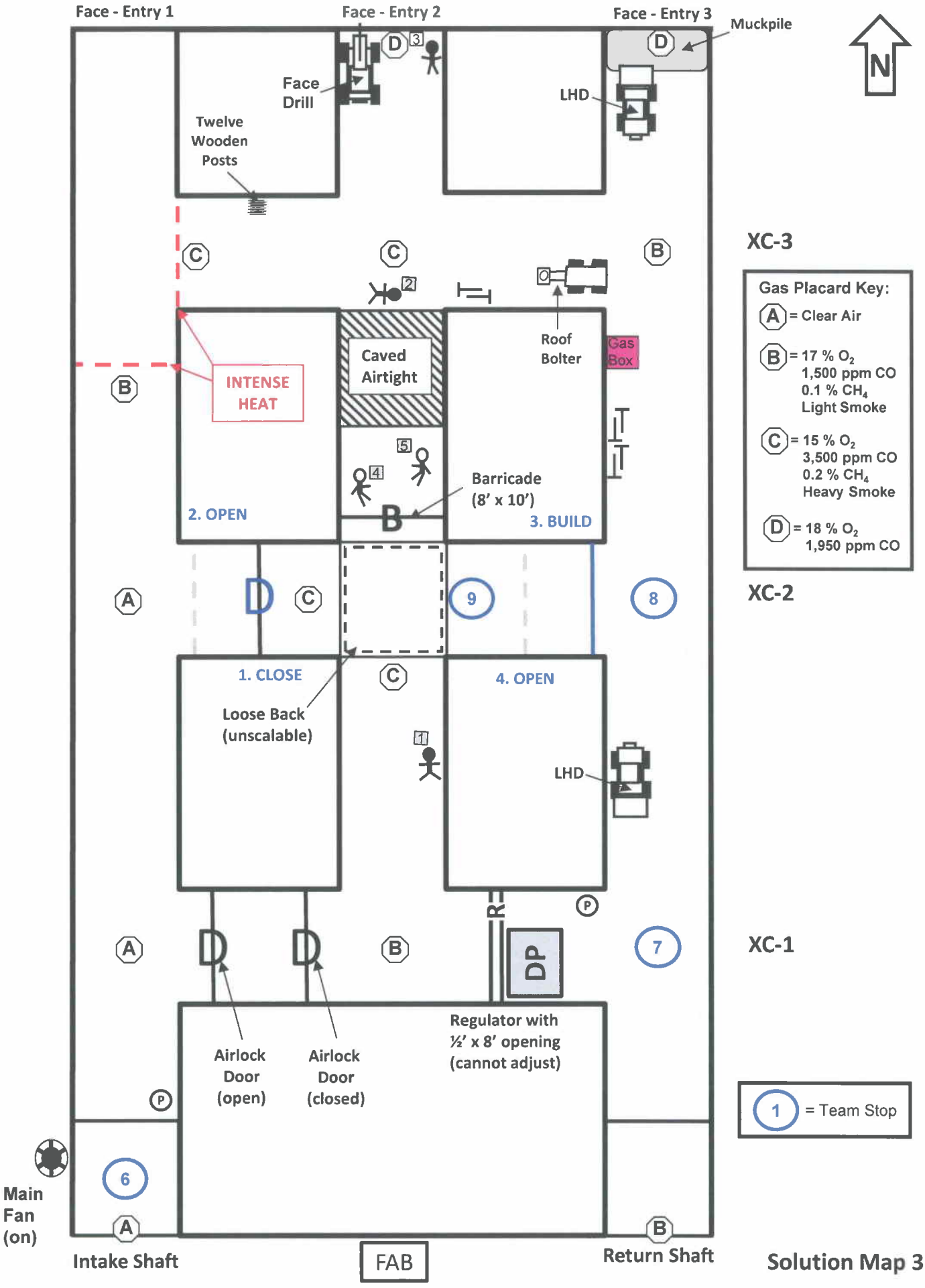
Note: Team Stop Nos. 4 - 5 (see Solution Map 2)

Team Stop No. 4
Now, the team can retreat to XC-1 and proceed through the open eastern door into the airlock. In order to prevent an unintentional ventilation change, the team must close the door behind them. Then, they can open the western airlock door and access Entry 1.

Now, the team can continue systematic exploration by advancing northward to XC-2. At the intersection, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will clear air. The drift is open to the north and the door in XC-2 to the east is closed.

Note: the team cannot advance beyond 3 feet past XC-2, because they have not tied-in the entries behind them.

Team Stop No. 5
In order to continue eastward and avoid an unintentional ventilation change, the team must construct a temporary stopping in XC-2 before opening the door. Once the temporary stopping has been erected, the team can open the door and proceed through toward Entry 2. They will find the western extent of the area of loose unscalable back stretching rib-to-rib which is blocking access to the intersection. The captain must warn the rest of the team members to avoid this hazard. Again, the team has not located any posts or cribbing materials to support it. **If the team asks the mine manager for posts, they will be reminded that all materials needed to work the problem can be found on the field and additional posts will arrive at the mine by 6:00 p.m.** At the loose back, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will find 15 % O_2, 3,500 ppm CO, 0.2 % CH_4 with heavy smoke. The captain must remember to D&I the loose back as their furthest point of advance in this direction.



Solution Map 3

Note: Team Stop Nos. 6 - 9 (see Solution Map 3)

Team Stop No. 6
The team can retreat to Entry 1 through the open door. In order to prevent an unintentional air change, they must close the door behind them. Then, they can tear down the temporary stopping that they had previously erected and return to Entry 1. They can take the stopping material with them for future use. Now, to continue systematic exploration, they must exit the mine by first returning to the Intake Shaft station and then signaling the hoist engineer. Once they have been hoisted to the surface, they can travel to the Return Shaft and descend in the shaft via the escape hoist.

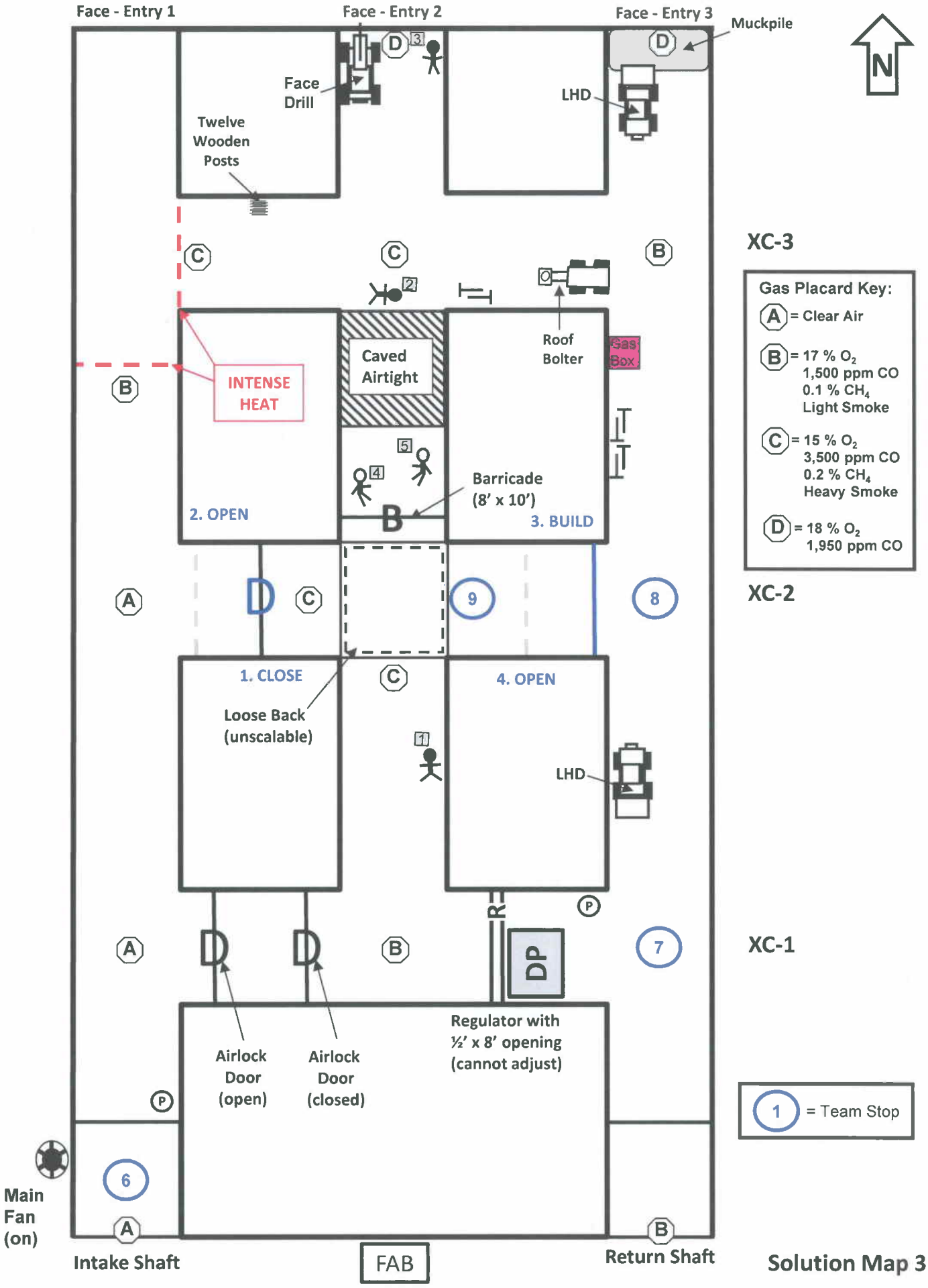
Note: the team must perform an apparatus and personnel check before entering smoke at this location. They must also be attached to their lifeline.

Note: No physical comparison of the fresh air base maps and team map will be allowed at this time. That is, no changes can be made to any map while the team is at or near the surface fresh air base.

Team Stop No. 7
Before exiting the escape hoist cage the captain must check for loose roof. The team can advance northward in Entry 3. At the intersection with XC-1, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will find 17 % O_2, 1,500 ppm CO, 0.1 % CH_4 with light smoke. The entry to the north is open. The team can stretch westward in XC-1 toward the permanent stopping. Along the way, they will find a working mine phone along the northern rib and the shaft dump pocket to the south. The captain must warn the rest of the team members to avoid the fall of person hazard at this location. At the permanent stopping, the captain will check the roof or back and the team will conduct necessary gas tests. The captain must D&I the stopping and the dump pocket as their furthest points of advance in this direction. They will also find that the regulator (½-foot by 8-foot opening) cannot be adjusted.

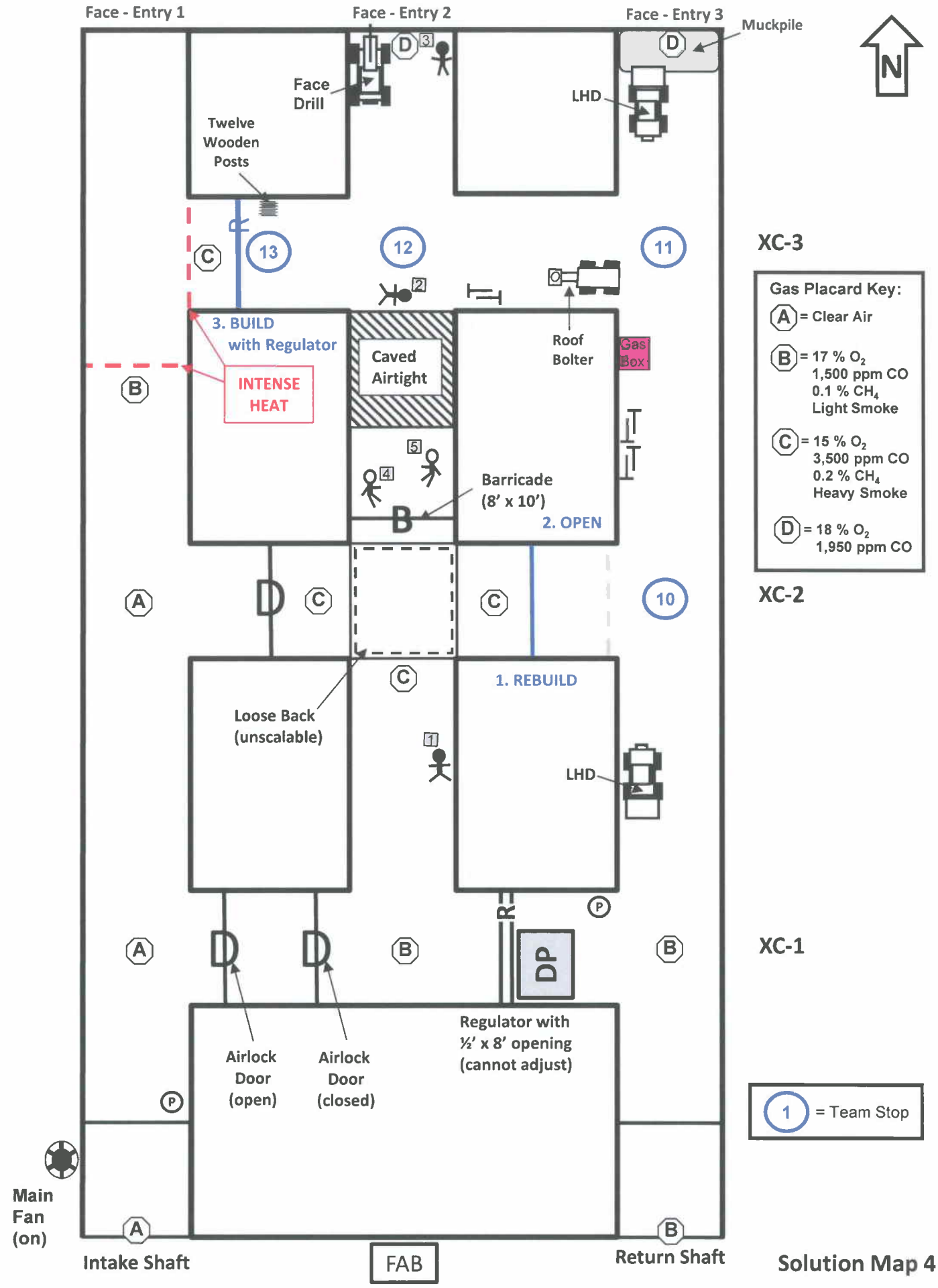
Team Stop No. 8
The team can continue advancing northward in Entry 3 toward XC-2. They will find a load-haul-dump (LHD) parked along the western rib. At the intersection, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will find that the gas concentrations have not changed from their previous location. The entry to the north is open and the temporary stopping to the west in XC-2 is intact.

Note: the team cannot advance beyond 3 feet past XC-2, because they have not tied-in the entries behind them.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2
1,500 ppm CO
0.1 % CH4
Light Smoke
C = 15 % O2
3,500 ppm CO
0.2 % CH4
Heavy Smoke
D = 18 % O2
1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
2. OPEN
3. BUILD
XC-2
1. CLOSE
Loose Back (unscalable)
4. OPEN
LHD
DP
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (open)
Airlock Door (closed)
XC-1
1 = Team Stop
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 3

Team Stop No. 9
In order to tie-in, the team must explore westward in XC-2 to Entry 2. To do this, they will need to go through the existing temporary stopping located between Entry 3 and Entry 2. However, to avoid an unintentional air change, they must first erect a temporary stopping behind them before opening the existing stopping.

Afterward, the team can travel toward Entry 2. The team will find the eastern extent of the area of loose unscalable back stretching rib-to-rib which is blocking access to the intersection. The captain must warn the rest of the team members to avoid this hazard. Again, the team has not located any posts or cribbing materials to support it. **If the team asks the mine manager for posts, they will be reminded that all materials needed to work the problem can be found on the field or they can wait until 6:00 p.m.** At the loose back, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will find 15 % O_2, 3,500 ppm CO, 0.2 % CH_4 with heavy smoke. The captain must remember to D&I the loose back as their furthest point of advance in this direction.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
13
12
11
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
3. BUILD with Regulator
INTENSE HEAT
Caved Airtight
Roof Bolter
Gas Box
Barricade (8' x 10')
2. OPEN
10
XC-2
Loose Back (unscalable)
1. REBUILD
LHD
DP
XC-1
Airlock Door (open)
Airlock Door (closed)
Regulator with ½' x 8' opening (cannot adjust)
1 = Team Stop
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 4

Note: Team Stop Nos. 10 - 13 (see Solution Map 4)

Team Stop No. 10
After retreating eastward in XC-2, the team will need to rebuild the temporary stopping that they had previously taken down. Then, the team can tear down the temporary stopping that they had previously erected and return to Entry 3. They can take the stopping material with them for future use.

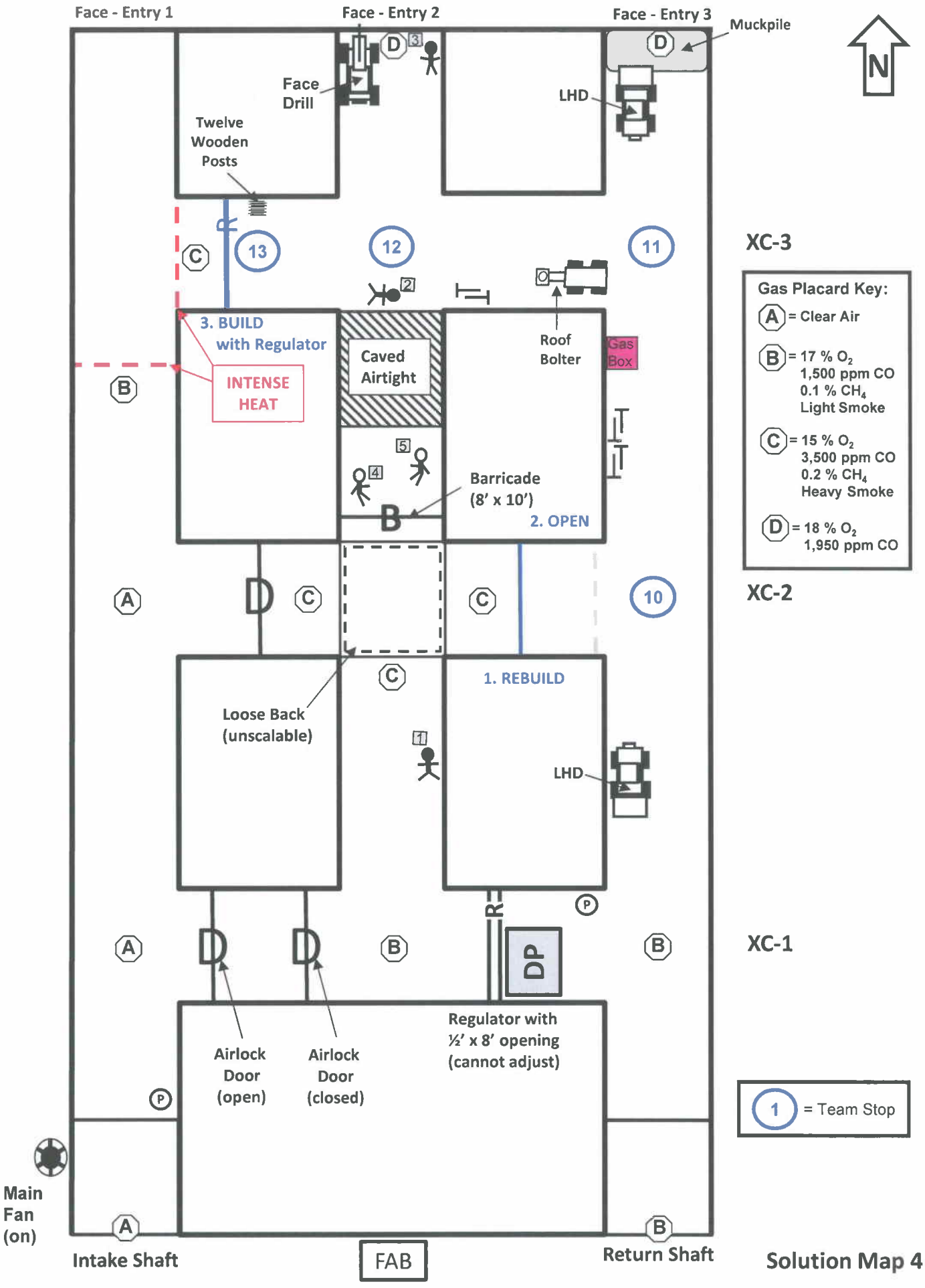
Team Stop No. 11
Now, to continue systematic exploration, the team can advance northward in the entry toward XC-3. As they travel, they will find two sets of brattice material lying along the western rib. The team will also find the gas testing box located along the western rib about 5 feet south of XC-3. **A team member must use the team's multi-gas instrument to determine the gas concentrations in the unknown mixture. Judge No. 2 will assess the team's measurements and, if warranted, apply appropriate discounts (Judge 2 – UG Rule #4).**

Afterward, at the intersection, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will find 17 % O_2, 1,500 ppm CO, 0.1 % CH_4 with light smoke. The entry to the north and the crosscut to the west are open.

Note: In order to explore systematically, the team cannot advance 3 feet past the intersection to the north until they explore the open XC-3 across to Entry 2 and Entry 1 and tie-in behind.

Team Stop No. 12
The team must travel westward in XC-3 to Entry 2. As they travel, they will locate a roof bolter parked along the southern rib. Just before reaching the intersection, they will also find an additional set of brattice material lying along the same rib. At the intersection, the captain performs roof or back checks and the team will conduct necessary gas checks. The team will find 15 % O_2, 3,500 ppm CO, 0.2 % CH_4 with heavy smoke. The entry is open to the north and the crosscut to the south is blocked by an airtight cave stretching rib-to-rib. They will also find the second missing miner (Miner #2) laying near the cave and unresponsive. The team captain must perform necessary roof or back checks over the miner. After a primary assessment, the #1 Judge will hand the team member a placard which reads: **"The miner exhibits no vital signs. The miner is dead."** The captain must D&I the location of the body. The captain must also D&I the cave as their furthest point of advance in this direction.

Note: In order to explore systematically, the team cannot advance 3 feet past the intersection to the north until they explore the open XC-3 to Entry 1 and tie-in behind.

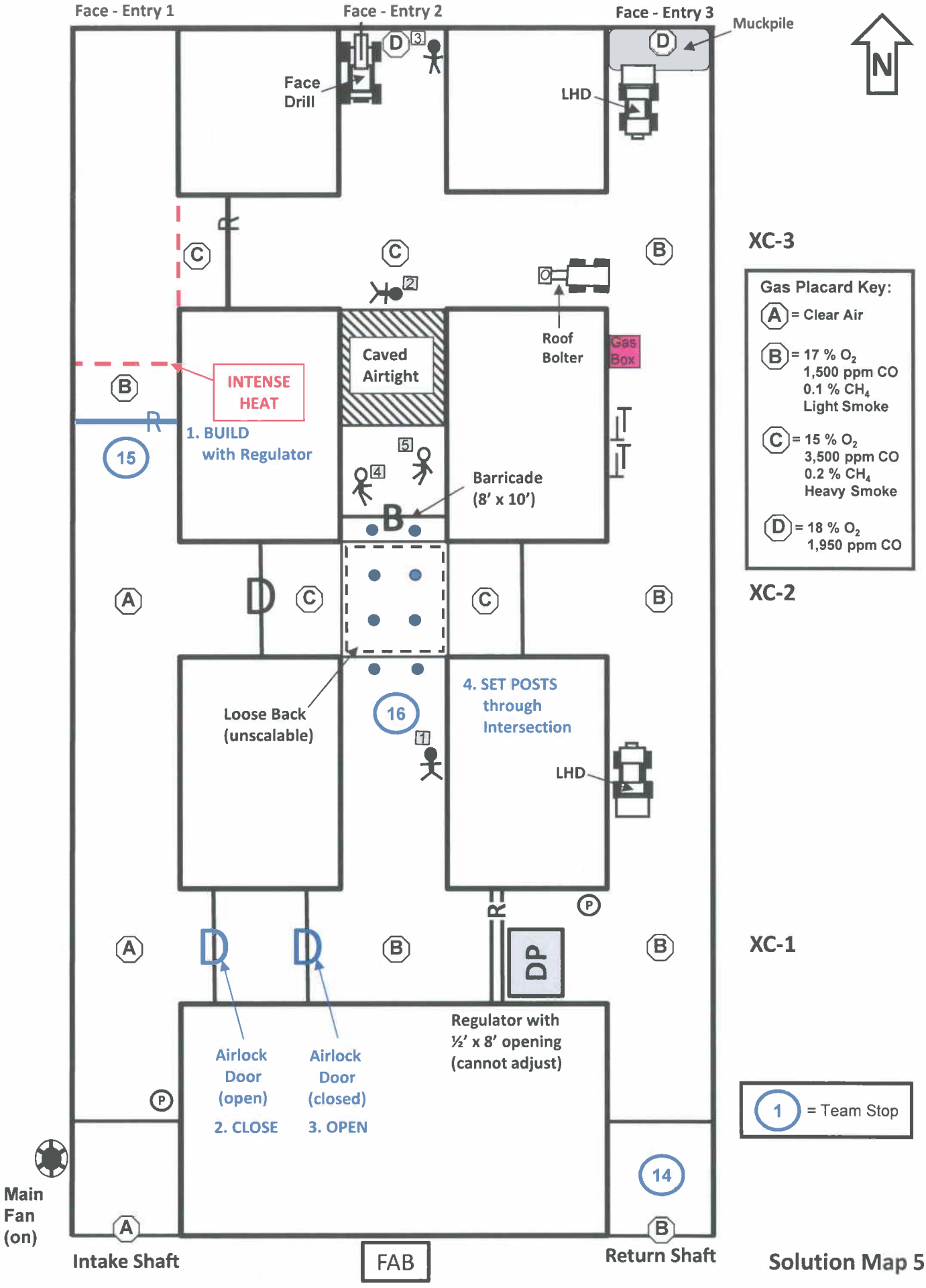

Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
13
12
11
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
3. BUILD with Regulator
INTENSE HEAT
Caved Airtight
Roof Bolter
Gas Box
Barricade (8' x 10')
2. OPEN
10
XC-2
Loose Back (unscalable)
1. REBUILD
LHD
DP
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (open)
Airlock Door (closed)
XC-1
1 = Team Stop
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 4

Team Stop No. 13

The team can continue advancing westward in XC-3 toward Entry 1. As they travel, the team will find twelve wooden posts lying along the northern rib. When the team reaches the intersection, they will find a placard indicating "intense heat." At this time, the team must use one set of brattice material to seal the fire (leaving a regulator because of the potential for an explosive air/gas mixture presented in the problem). Before erecting the seal, the captain must check the roof or back above the proposed seal location. After the seal is built, the captain must D&I the seal as their furthest point of advance in this direction. **Once this is done, without undue delay, the team must find and seal all other approaches to the fire.** As they travel eastward in XC-3, they can pick up an additional set of brattice material for future use.

Note: sealing the fire does not relieve the team of the responsibility of systematic exploration.

Note: At this location, the team has finally found the means to support the area of loose unscalable back located at the intersection of Entry 2 and XC-2.

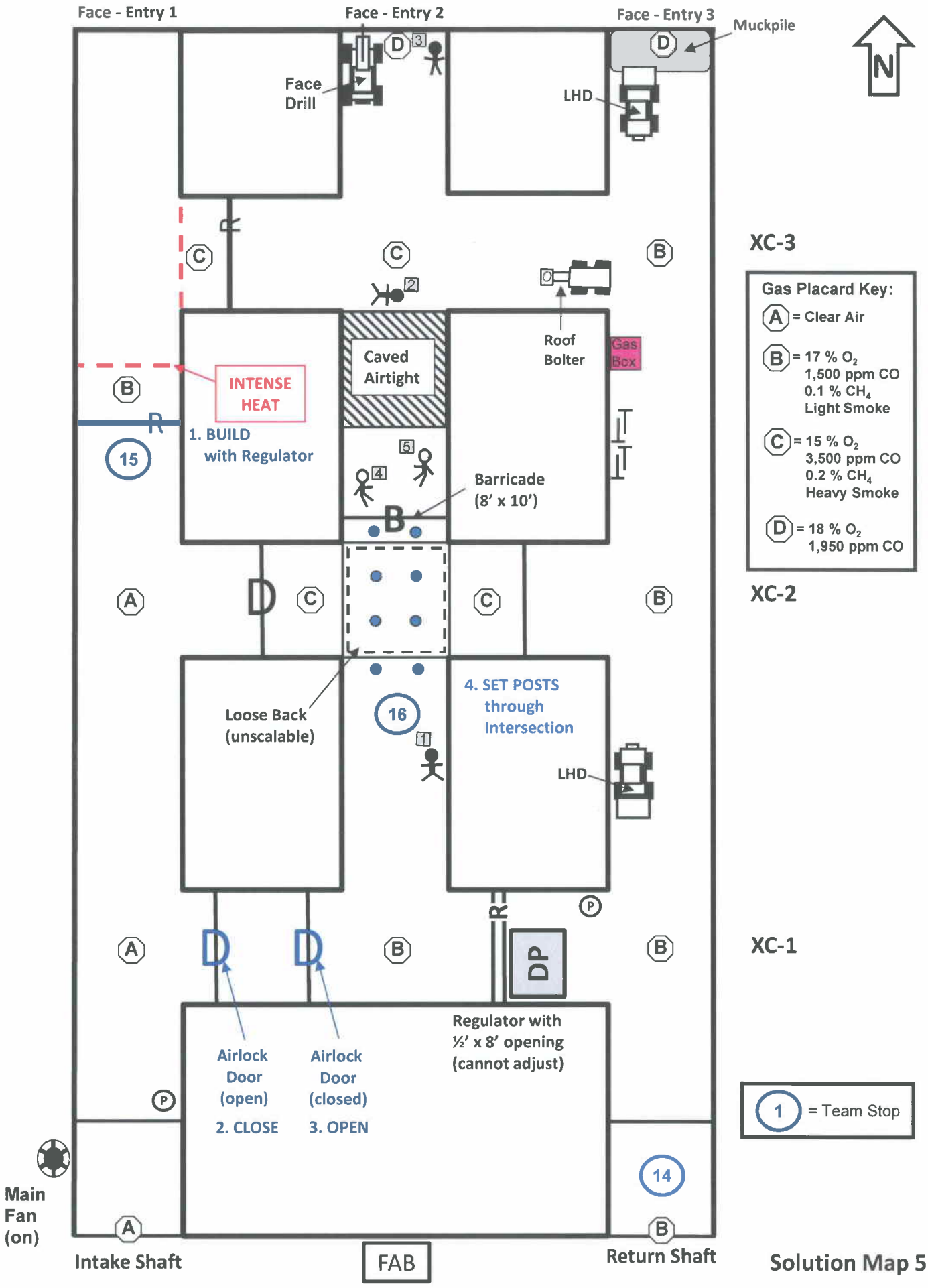

Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
Caved Airtight
Roof Bolter
Gas Box
INTENSE HEAT
1. BUILD with Regulator
15
Barricade (8' x 10')
XC-2
Loose Back (unscalable)
16
4. SET POSTS through Intersection
LHD
XC-1
DP
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (open)
2. CLOSE
Airlock Door (closed)
3. OPEN
1 = Team Stop
14
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 5

Note: Team Stop Nos. 14 - 16 (see Solution Map 5)

Team Stop No. 14
To find the second approach to the fire in Entry 1, the team must retreat to the Return Shaft station and then signal the hoist engineer. Once they have been hoisted to the surface, they can travel to the Intake Shaft and descend in the shaft via the service hoist.

Note: No physical comparison of the fresh air base maps and team map will be allowed at this time. That is, no changes can be made to any map while the team is at or near the surface fresh air base.

Team Stop No. 15
When they have reached the mine level, they can exit the cage and advance northward in Entry 1 toward XC-3. About 10 feet north of XC-2 intersection, the team will find a placard indicating "intense heat." At this time, the team must use one set of brattice material to seal the fire (leaving a regulator because of the potential for an explosive air/gas mixture presented in the problem). Before erecting the seal, the captain must check the roof or back above the proposed seal location. After the seal is built, the captain must D&I the seal as their furthest point of advance in this direction. **At this point, the fire has been controlled.**


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2
1,500 ppm CO
0.1 % CH4
Light Smoke
C = 15 % O2
3,500 ppm CO
0.2 % CH4
Heavy Smoke
D = 18 % O2
1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
INTENSE HEAT
1. BUILD with Regulator
15
Barricade (8' x 10')
XC-2
Loose Back (unscalable)
16
4. SET POSTS through Intersection
LHD
DP
XC-1
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (open)
2. CLOSE
Airlock Door (closed)
3. OPEN
1 = Team Stop
14
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 5

Team Stop No. 16
The team can now resume systematic exploration. Since they have found twelve wooden posts, the team can return to Entry 2 and support the area of loose unscalable back at the XC-2 intersection. This will enable them to explore to the north and tie-in the entry between XC-2 and XC-3.

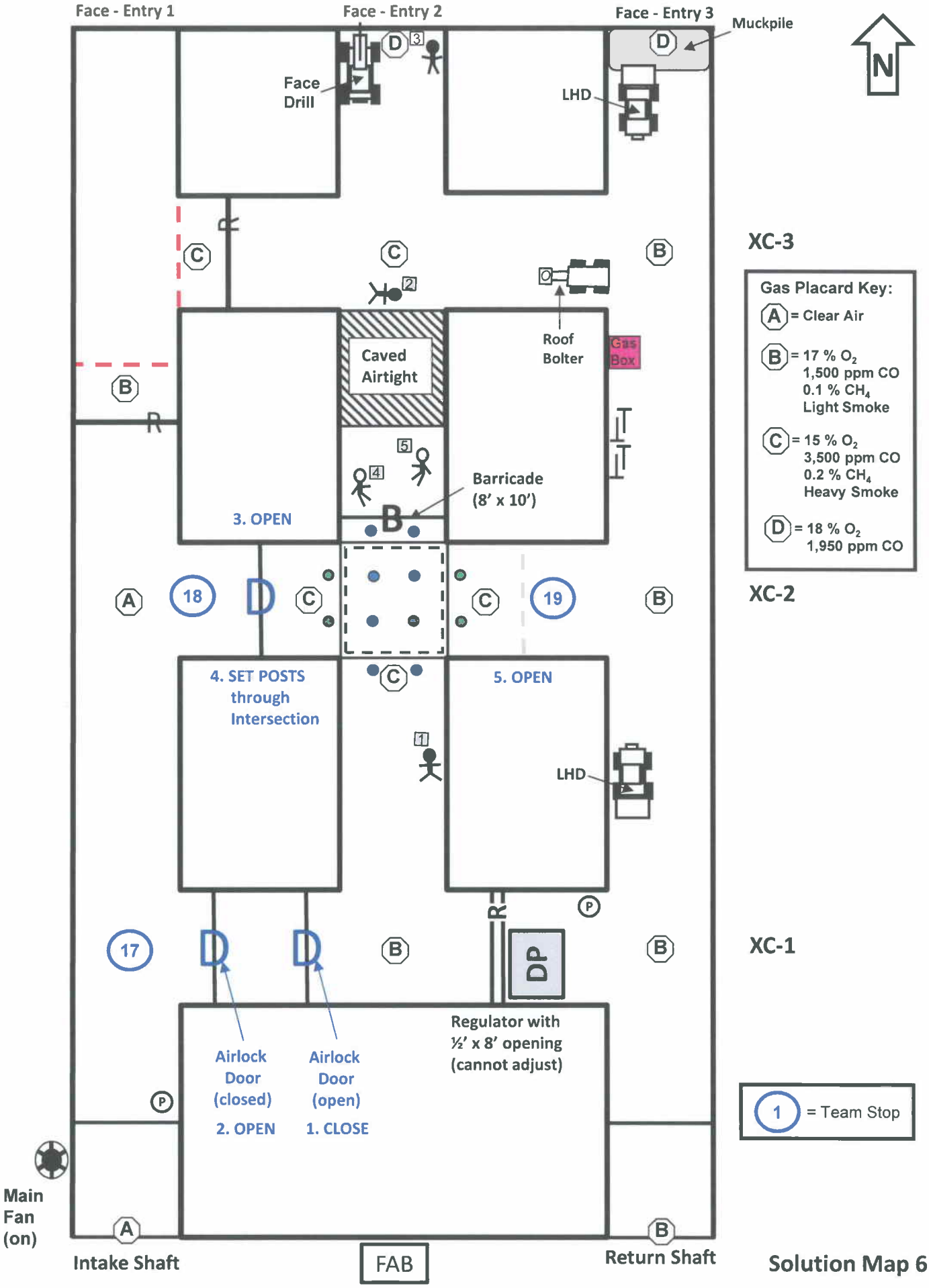
The team can retreat to XC-1 and enter the open eastern airlock door. When they close the door behind them, the team can open the second door and travel into Entry 2. Now, they can advance northward to XC-2.

Note: The team should follow the example shown in Figure 3 on page 36 of the 2014 Metal and Nonmetal Mine Rescue Contest Rules booklet.

When they post their way through the area, the team will find an 8-feet by 10-feet brattice cloth barricade stretching from rib-to-rib across the entry about 2 feet inby the intersection. There is a response from inside. The No. 1 judge will hand the team a placard with the following statement:

> "We are Miner #4 and Miner #5. We went to the supply area looking for fire extinguishers to help put out the fire. When we came through the check curtain, the entry fell in behind us. We decided to barricade because it looked like XC-2 was also going to cave. We are O.K., just get us out of here."

Because of the high concentrations of contaminants in the area, the team cannot open the barricade. The team can instruct the two miners to stay inside the barricade until XC-2 has been cleared of toxic and poisonous gases for their safe evacuation.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2
1,500 ppm CO
0.1 % CH4
Light Smoke
C = 15 % O2
3,500 ppm CO
0.2 % CH4
Heavy Smoke
D = 18 % O2
1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
Barricade (8' x 10')
3. OPEN
18
19
XC-2
4. SET POSTS through Intersection
5. OPEN
LHD
17
DP
XC-1
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (closed)
2. OPEN
Airlock Door (open)
1. CLOSE
1 = Team Stop
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 6

Note: Team Stop Nos. 17 - 19 (see Solution Map 6)

At this point, a ventilation change is necessary to clear the area in front of the barricade. The team must confer with the mine manager through their fresh air base coordinator by using the communication line, or by returning to the surface.

Since there is no safe way to install a wing curtain outby the barricade to direct airflow toward the barricade, the team must make changes to send a significant amount of fresh air through XC-2 to clear the high concentrations of CO from the area. There are two ways to accomplish this:

Method #1:

1) Open the door in XC-2 between Entry 1 and Entry 2;
2) Install 4 additional posts (shown in "**green**" on the **Solution Map 6**) in the intersection of Entry 2 and XC-2;
3) Open the temporary stopping in XC-2 between Entry 2 and Entry 3.

Note: These three changes will allow the team to remain in the mine while airflows through XC-2 and flushes away the contaminants.

Method #2:

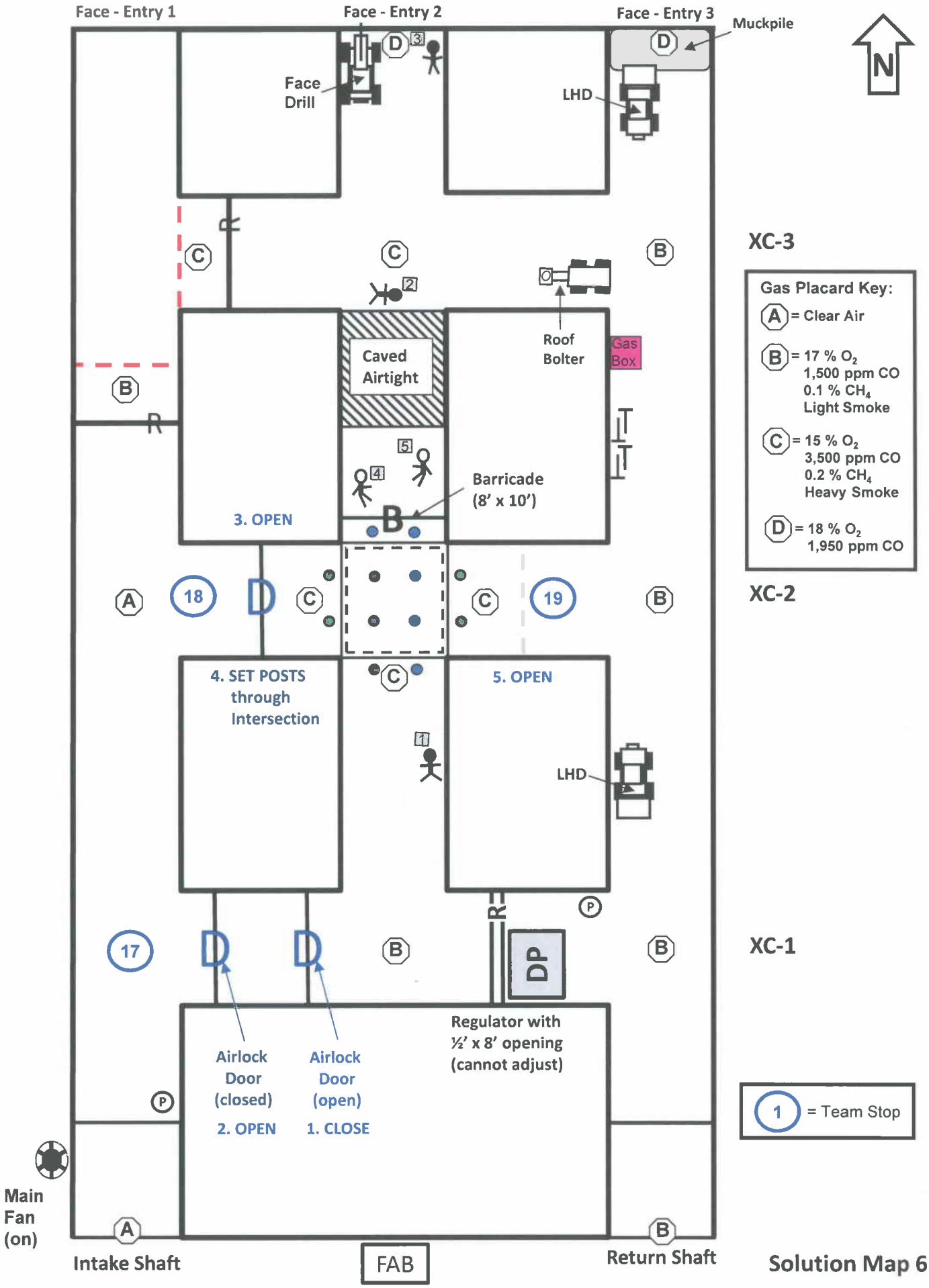
1) Open both airlock doors in XC-1 between Entry 1 and Entry 2;
2) Build a temporary stopping in XC-1 between Entry 1 and Entry 2 to block off the regulator and force airflow northward in Entry 2; and
3) Open the temporary stopping in XC-2 between Entry 2 and Entry 3.

Note: In order to implement Item 3, the team would need to exit the mine, reenter through the Return Shaft, and travel northward in Entry 3 to XC-2.

In either case, the team must explain the necessary ventilation changes prior to implementing them. For the purposes of this problem solution, the following steps will be taken by the team to implement Method #1.

Team Stop No. 17
The team will retreat to XC-1 and enter the open eastern airlock door and close it behind them. Afterward, the can open the second door and enter Entry 1.

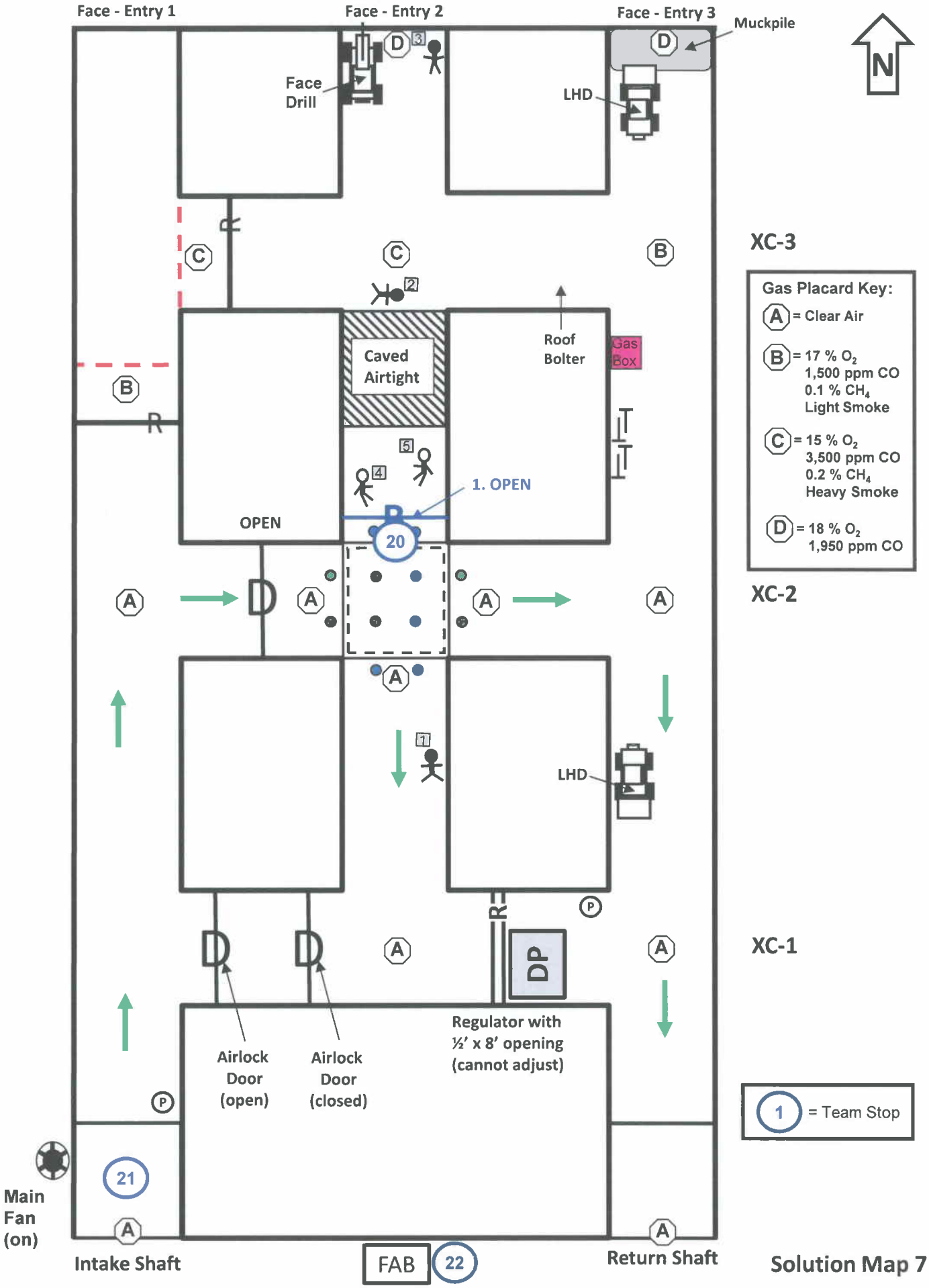
Team Stop No. 18
The team will advance northward in Entry 1 and return to the door separating Entry 1 and Entry 2.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2
1,500 ppm CO
0.1 % CH4
Light Smoke
C = 15 % O2
3,500 ppm CO
0.2 % CH4
Heavy Smoke
D = 18 % O2
1,950 ppm CO
Roof Bolter
Gas Box
Caved Airtight
Barricade (8' x 10')
3. OPEN
XC-2
18
19
4. SET POSTS through Intersection
5. OPEN
LHD
17
DP
XC-1
Regulator with ½' x 8' opening (cannot adjust)
Airlock Door (closed)
2. OPEN
Airlock Door (open)
1. CLOSE
1 = Team Stop
Main Fan (on)
Intake Shaft
FAB
Return Shaft
Solution Map 6

Team Stop No. 19
The team will open the door and travel eastward in XC-2 to Entry 2. They can install four additional posts in the intersection to allow safe passage from east to west. Afterward, they can open the temporary stopping in XC-2 between Entry 2 and Entry 3.

At this time, airflow will travel across XC-2 toward Entry 3 and southward in Entry 2. The gas placards will quickly revert to clear air in both entries leading to the Return Shaft.

Note: If the team uses Method #2, the gas placards will also revert to clear air in both entries leading to the Return Shaft.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
Caved Airtight
Roof Bolter
Gas Box
1. OPEN
OPEN
20
XC-2
LHD
DP
XC-1
Airlock Door (open)
Airlock Door (closed)
Regulator with ½' x 8' opening (cannot adjust)
1 = Team Stop
21
Main Fan (on)
Intake Shaft
FAB
22
Return Shaft
Solution Map 7

Note: Team Stop Nos. 20 - 22 (see Solution Map 7)

Team Stop No. 20

Once the gas concentrations are swept from the entries and the placards have been flipped to show "clear air," the team can open the barricade. Inside they will find Miner #4 and Miner #5. Team members can assess their condition and find that they are not injured and able to walk out with the team. Before leaving the area, the captain can perform back checks and the team can conduct necessary gas tests. The captain must D&I the airtight cave as the team's furthest point of advance in this direction, as well as the location of the miners.

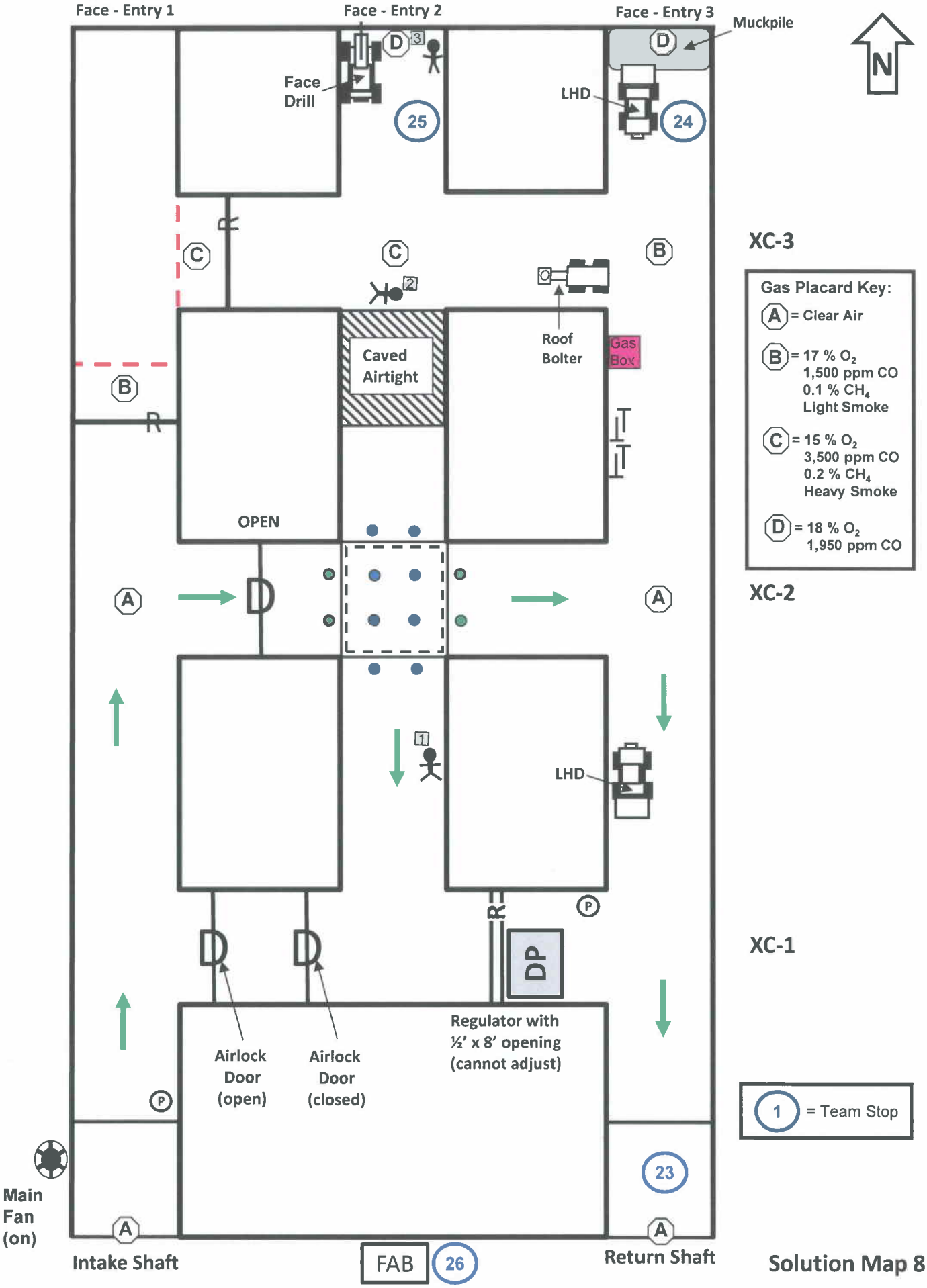
Team Stop No. 21

The team will escort Miner #4 and Miner #5 to the Intake Shaft station. Then, they will signal the hoist engineer and ride the cage to the surface.

Note: Since the ventilation had been restored and the air is clear, the survivors will not need to wear apparatuses. However, to ensure the safety of the survivors, all areas that had been cleared of smoke or toxic or dangerous gases must be gas tested along the route that they traveled.

Team Stop No. 22

The team can bring the two survivors to the fresh air base and arrange for any follow-up medical treatment.


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
25
24
XC-3
Gas Placard Key:
A = Clear Air
B = 17 % O2
1,500 ppm CO
0.1 % CH4
Light Smoke
C = 15 % O2
3,500 ppm CO
0.2 % CH4
Heavy Smoke
D = 18 % O2
1,950 ppm CO
Caved Airtight
Roof Bolter
Gas Box
OPEN
XC-2
LHD
DP
XC-1
Airlock Door (open)
Airlock Door (closed)
Regulator with ½' x 8' opening (cannot adjust)
1 = Team Stop
Main Fan (on)
23
Intake Shaft
FAB
26
Return Shaft
Solution Map 8

Note: Team Stop Nos. 23 - 26 (see Solution Map 8)

Team Stop No. 23
At this point, the team has not completed the exploration of the mine nor located the fifth missing miner. Therefore, they will reenter the mine using the Return Shaft escape hoist.

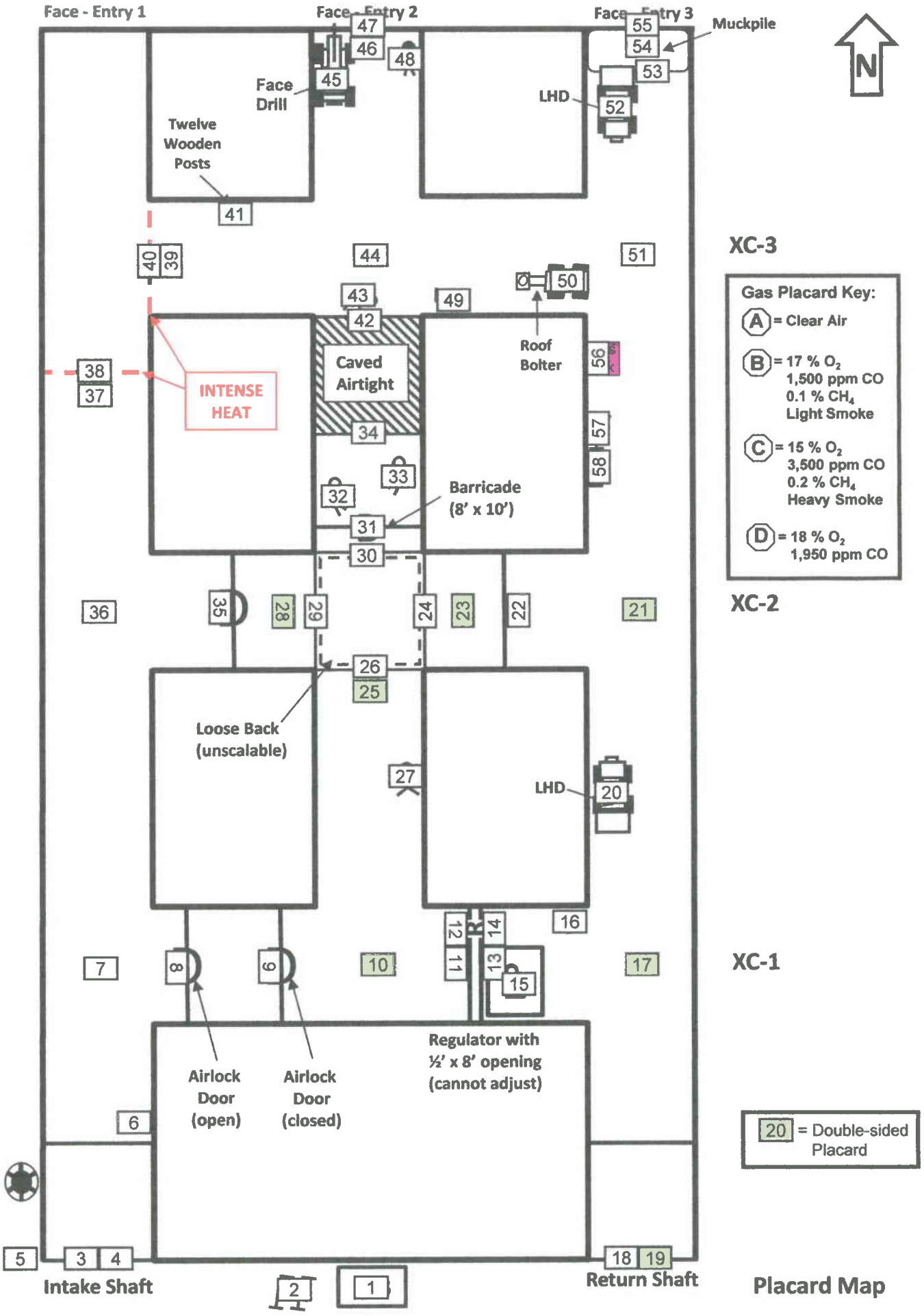
Team Stop No. 24
Once underground, they can advance northward in Entry 3 to XC-3. Then, they can advance northward to the face of the entry. They will find an LHD parked near the left rib. They will also find a muckpile stretching rib-to-rib and extending four feet outby the face. The captain can perform roof or back checks and the team will conduct necessary gas checks. The team will find 18 % O_2 and 1,950 ppm CO. The captain can traverse the muckpile to D&I the face as their furthest point of advance in this direction.

Team Stop No. 25
Afterward, the team can retreat to XC-3 and travel westward in the crosscut to Entry 2. At the intersection, they can advance northward to the face of the entry. They will find a face drill parked on the left side of the entry. They will also find the last missing miner (Miner #3) laying along the right rib and unresponsive. The team captain must perform necessary roof or back checks over the miner. After a primary assessment, the #1 Judge will hand the team member a placard which reads: **"The miner exhibits no vital signs. The miner is dead."** The captain must D&I the location of the body. Then, the team can conduct necessary gas tests and find 18 % O_2 and 1,950 ppm CO. The captain must remember to D&I the face as their furthest point of advance in this direction.

Team Stop No. 26
Now, that the team has completed the exploration of the mine and has found the last missing miner, they can return to the Return Shaft, signal the hoist engineer, ride the escape hoist to the surface, and return to the fresh air base.

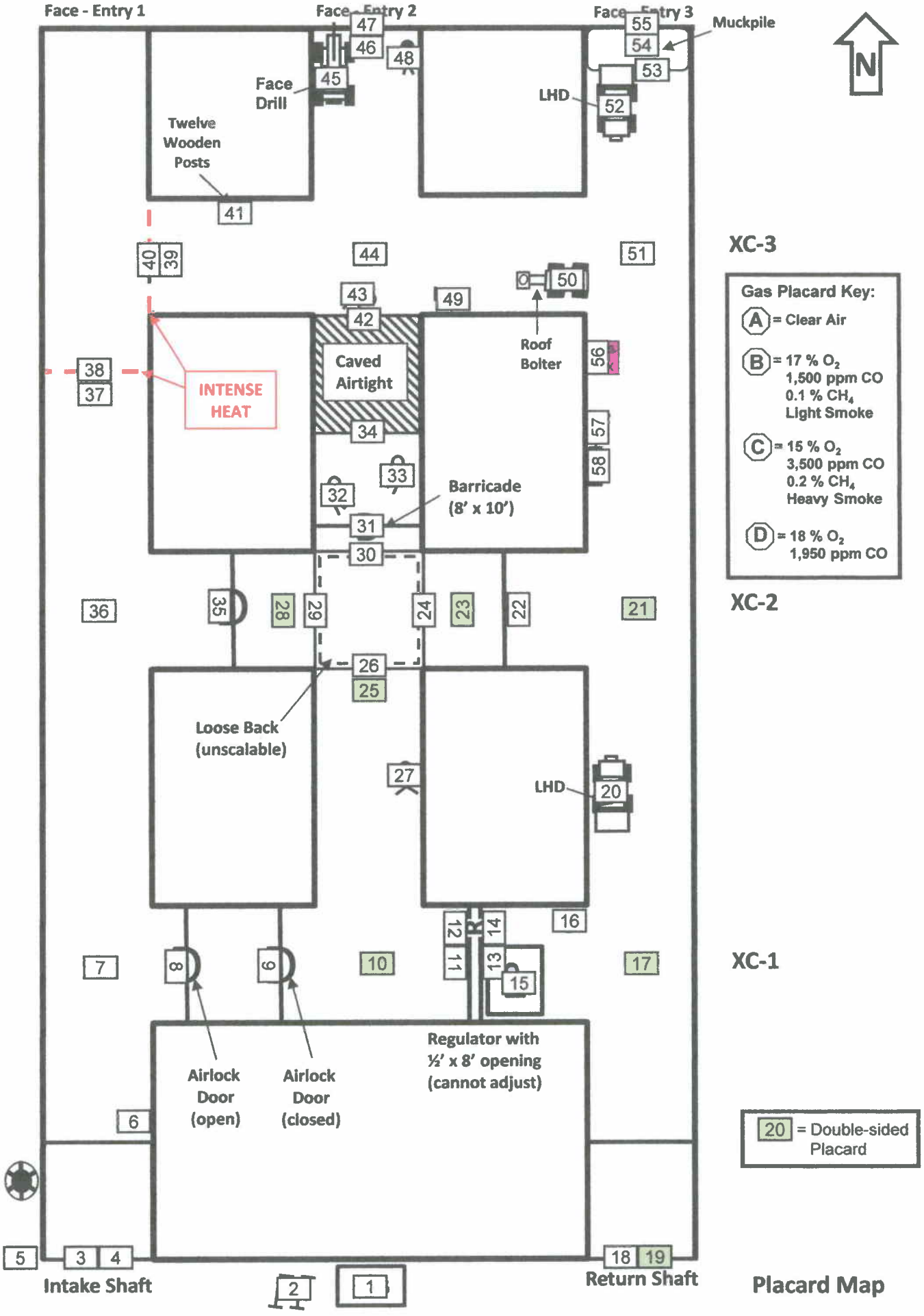
Afterward, the captain can state that the team has completed their mission. That is, they have explored all accessible areas of the mine, sealed the fire, located the five missing miners, and brought two of them out alive.

***** THE END *****


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
Roof Bolter
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
Loose Back (unscalable)
LHD
Airlock Door (open)
Airlock Door (closed)
Regulator with ½' x 8' opening (cannot adjust)
Intake Shaft
Return Shaft
XC-3
XC-2
XC-1
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
20 = Double-sided Placard
Placard Map

Placard Key

1. Fresh Air Base
2. Brattice Material (two sets)
3. Intake Shaft
4. Clear Air
5. Main Fan (on)
6. Mine Phone (operable)
7. Clear Air
8. Airlock Door (open)
9. Airlock Door (closed)
10. 17 % O_2
    1,500 ppm CO
    0.1 % CH_4
    Light Smoke
11. Permanent Stopping
12. Regulator with ½' x 8' Opening (cannot adjust)
13. Permanent Stopping
14. Regulator with ½' x 8' Opening (cannot adjust)
15. Shaft Dump Pocket
16. Mine Phone (operable)
17. 17 % O_2
    1,500 ppm CO
    0.1 % CH_4
    Light Smoke
18. Return Shaft
19. 17 % O_2
    1,500 ppm CO
    0.1 % CH_4
    Light Smoke
20. LHD
21. 17 % O_2
    1,500 ppm CO
    0.1 % CH_4
    Light Smoke
22. Temporary Stopping
23. 15 % O_2
    3,500 ppm CO
    0.2 % CH_4
    Heavy Smoke
24. Loose Back (unscalable)
25. 15 % O_2
    3,500 ppm CO
    0.2 % CH_4
    Heavy Smoke
26. Loose Back (unscalable)
27. Miner #1
28. 15 % O_2
    3,500 ppm CO
    0.2 % CH_4
    Heavy Smoke
29. Loose Back (unscalable)
30. Loose Back (unscalable)
31. Barricade (8' by 10')
32. Miner #4


Face - Entry 1
Face - Entry 2
Face - Entry 3
Muckpile
N
Face Drill
LHD
Twelve Wooden Posts
Roof Bolter
Caved Airtight
INTENSE HEAT
Barricade (8' x 10')
Loose Back (unscalable)
LHD
Airlock Door (open)
Airlock Door (closed)
Regulator with ½' x 8' opening (cannot adjust)
Intake Shaft
Return Shaft
XC-3
XC-2
XC-1
Gas Placard Key:
A = Clear Air
B = 17 % O2 1,500 ppm CO 0.1 % CH4 Light Smoke
C = 15 % O2 3,500 ppm CO 0.2 % CH4 Heavy Smoke
D = 18 % O2 1,950 ppm CO
20 = Double-sided Placard
Placard Map

33. Miner #5

34. Caved Airtight

35. Door (closed)

36. Clear Air

37. 17 % O_2
    1,500 ppm CO
    0.1 % CH_4
    Light Smoke

38. Intense Heat

39. 15 % O_2
    3,500 ppm CO
    0.2 % CH_4
    Heavy Smoke

40. Intense Heat

41. Twelve Wooden Posts

42. Caved Airtight

43. Miner #2

44. 15 % O_2
    3,500 ppm CO
    0.2 % CH_4
    Heavy Smoke

45. Face Drill

46. 18 % O_2
    1,950 ppm CO

47. Face – Entry 2

48. Miner #3

49. Brattice Material (one set)

50. Roof Bolter

51. 17 % O_2
    1,500 ppm CO
    0.1 % CH_4
    Light Smoke

52. LHD

53. Muckpile

54. 18 % O_2
    1,950 ppm CO

55. Face – Entry 3

56. Gas Box Test Station

57. Brattice Material (one set)

58. Brattice Material (one set)

Note:
Seven gas placards (10, 17, 19, 21, 23, 25, and 28) are double-sided. The backside will indicate "Clear Air" when changes have been made by the team to successfully ventilate these areas.

Peak Mining Co.
Mountain Run Mine
I.D. No. 30-02014
Clymer, NY

Updated June 11, 2014
Approx. Scale 1 in . = 10 ft.

Map Legend:

Shaft Dump Pocket

Pager Phone

Temporary Stopping


Permanent Stopping


Airlock

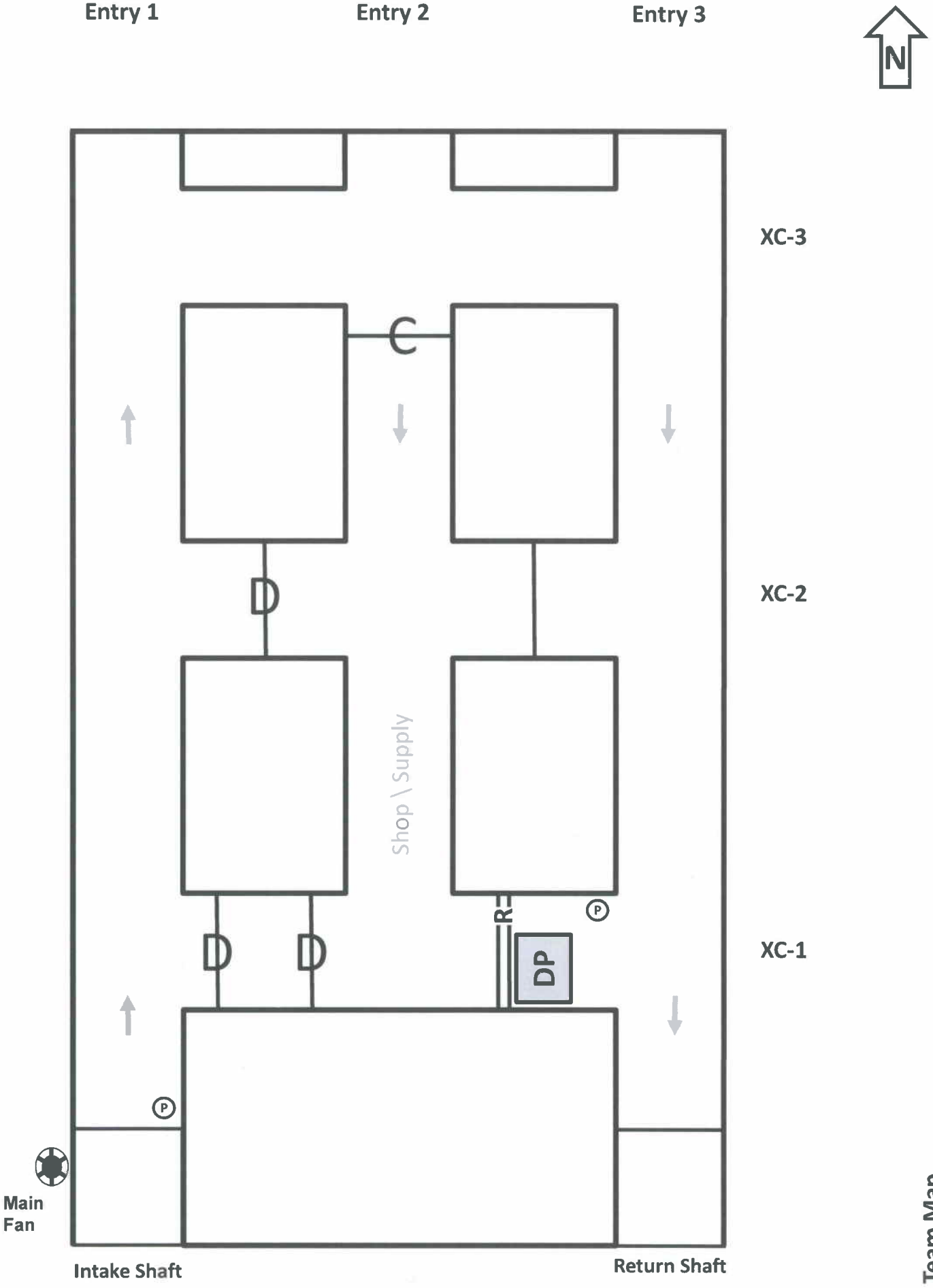
Regulator

Check Curtain

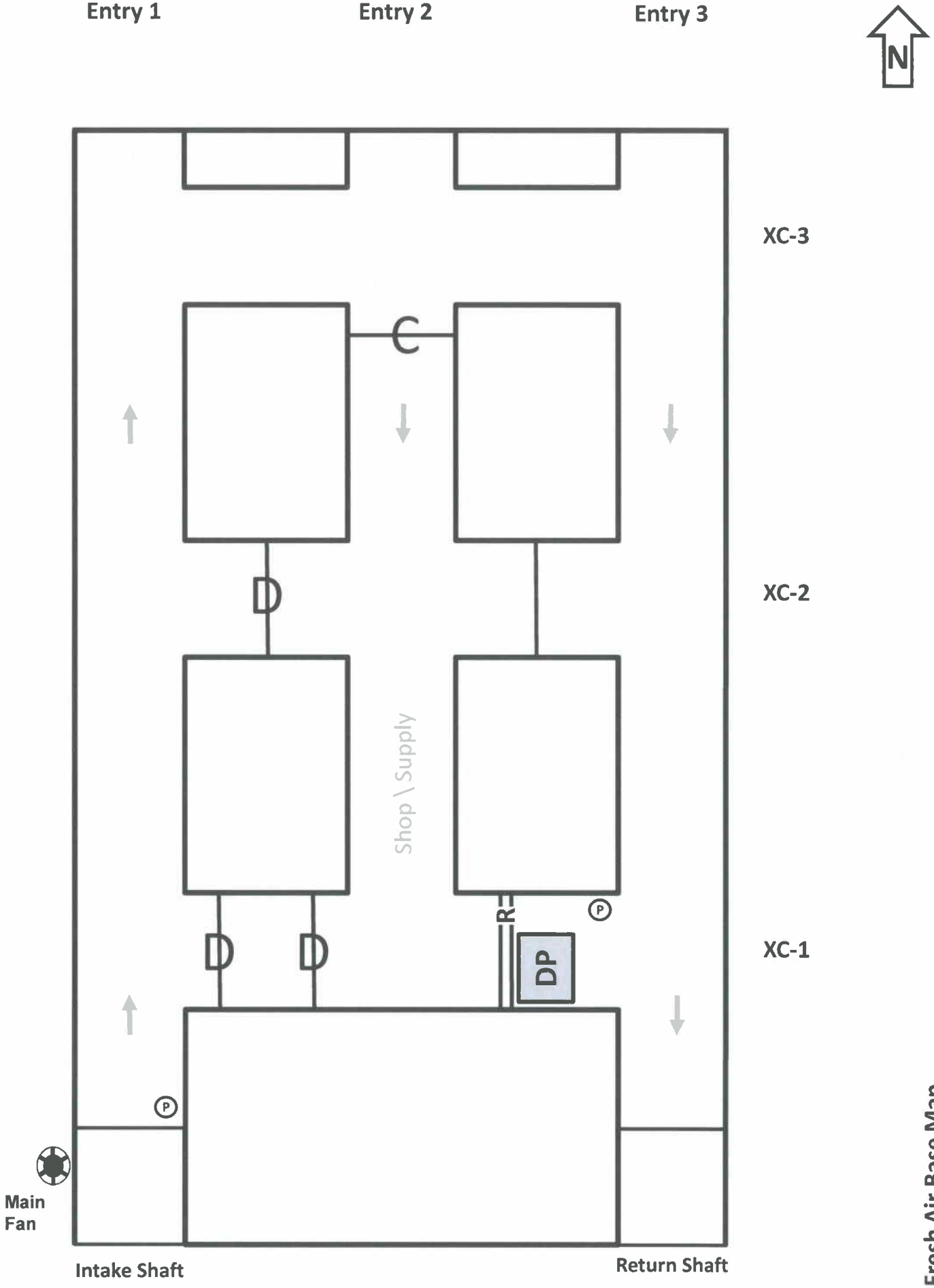

Airflow & Direction


Conveyor Belt

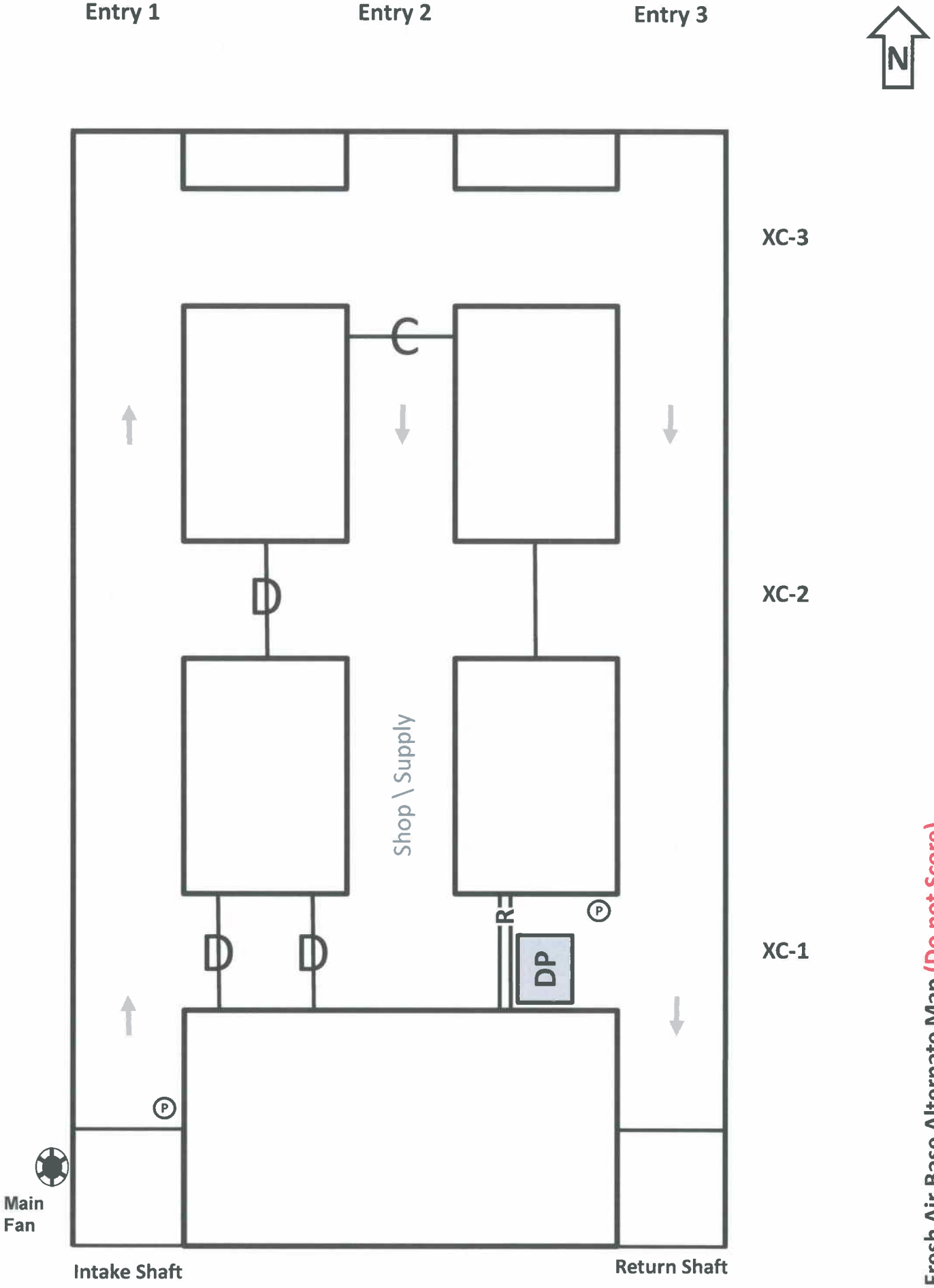

Ventilation Fan


Entry 1
Entry 2
Entry 3
N
XC-3
XC-2
XC-1
Shop \ Supply
R
P
DP
P
Main
Fan
Intake Shaft
Return Shaft

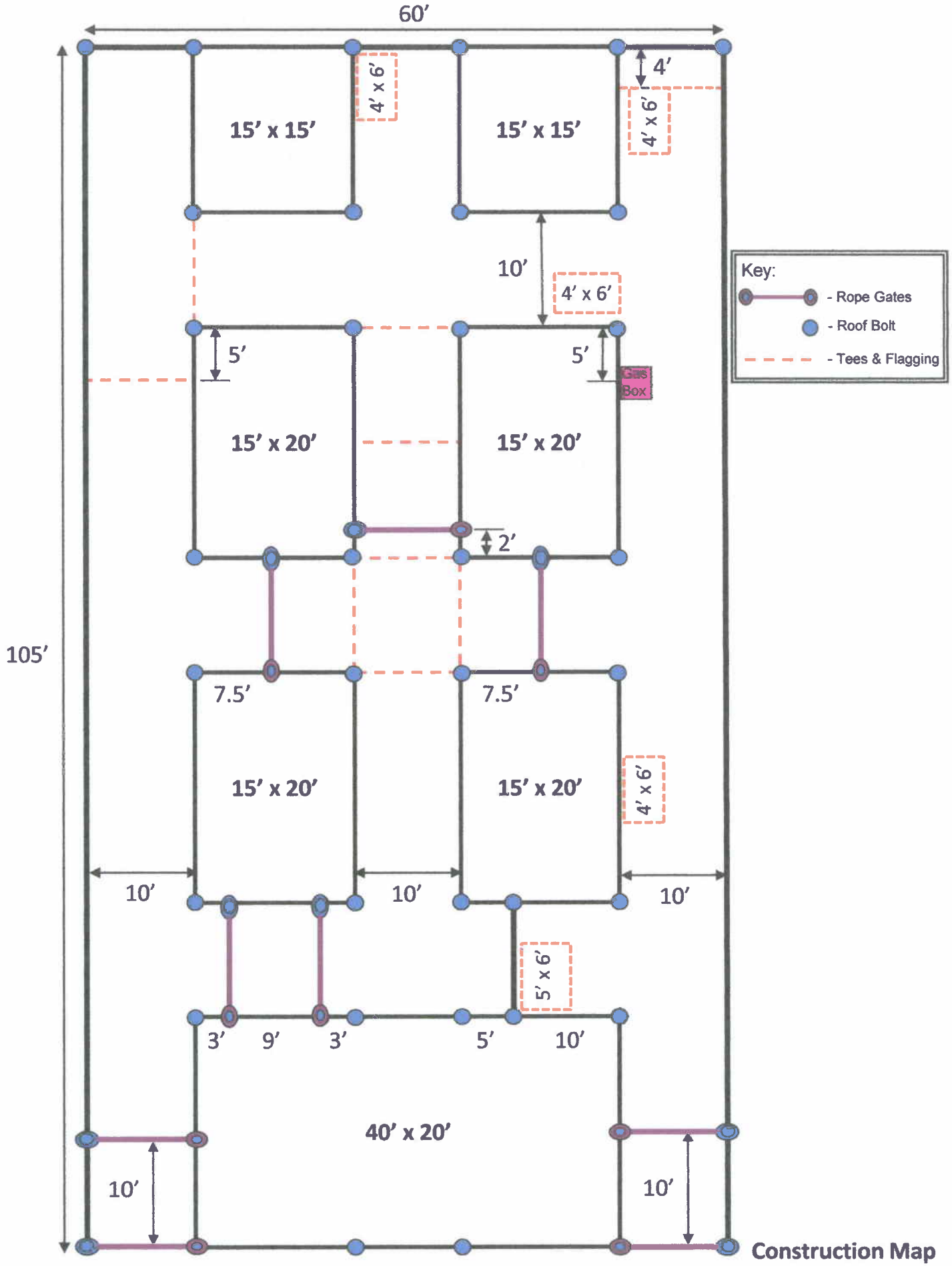
Team Map



Fresh Air Base Map



Fresh Air Base Alternate Map (Do not Score)



Construction Map