



# Blackline Live

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Product Overview

**blackline**safety

## blacklinesafety

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Blackline Safety is a global connected safety technology leader. Providing comprehensive live-monitoring and wireless gas detection, we help teams working in hazardous environments respond to emergencies in real-time and manage efficient evacuations, accounting for everyone's safety along the way. With millions invested in technology research and development, Blackline Safety is recognized for quality and innovation. Our talented team of designers and engineers create and manufacture everything in-house — from wearable technology and personal gas detectors to cloud-hosted infrastructure and web-based interfaces for global industry. We deliver the world's first turn-key, work-anywhere connected safety monitoring solution with gas detection, 3G wireless, two-way speakerphone and live monitoring to meet the demanding safety challenges of organizations in over 100 countries.

Blackline's technology monitors for atmospheric hazards and the wellbeing of personnel working alone in populated areas, indoors within complex facilities and the most remote reaches of our planet.

**Our vision is to become the leading supplier of wirelessly connected gas detection and lone worker monitoring products in the world. We offer the broadest and most complete portfolio available anywhere.**



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# Introduction to Blackline Live

Blackline Live is the engine that drives our connected safety solutions for clients around the world. This robust and redundant system uses industry leading infrastructure providers like Amazon Web Service, Telenor Group, and Iridium’s global satellite network to deliver 99.9% uptime and availability and on-line access 24/7 from anywhere in the world.



With Blackline Live our clients can manage, configure, and deploy our wearable devices, gas sensors and area sensors from anywhere they have internet access.

This document will both demonstrate the power of connected safety and gas detection and how flexible and versatile it is to use when managing your lone worker and gas detection devices.



# 1. Technology

## Wearables

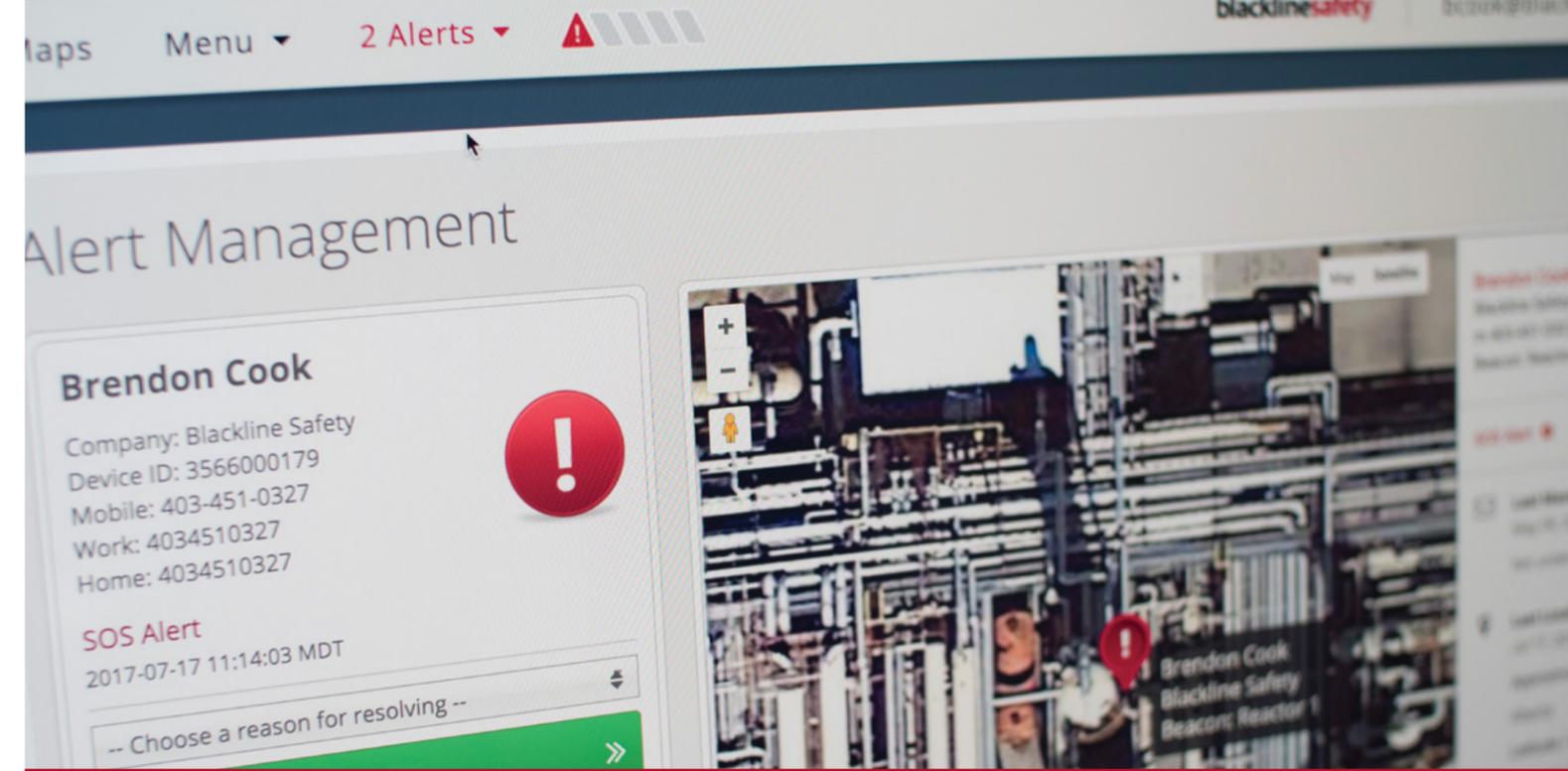
Blackline Safety's award-winning wearable gas detection and safety devices the G7c and G7x connect and protect your workforce with state-of-the-art integrated technologies that include:

- Integrated 2G and 3G cellular radio
- Integrated Iridium Satellite Connectivity
- Long life Li-ion batteries
- GPS 48 channel high sensitivity radios
- Assisted GPS
- Integrated accelerometers
- Gas diffusion sensors
- Optional Gas Pumps



## Area Monitor

Our new EXO area monitor delivers the same technologies in a robust rugged form factor that solve the challenges of continuous toxic and combustible gas monitoring for sites, facilities, and fence lines. Automating long-term area monitoring and connected safety for unmatched efficiency, G7 EXO allows teams to focus on their work at hand. Leveraging integrated cellular and satellite connectivity, G7 EXO can be placed anywhere and automatically communicates environmental data to our Blackline Live safety platform.



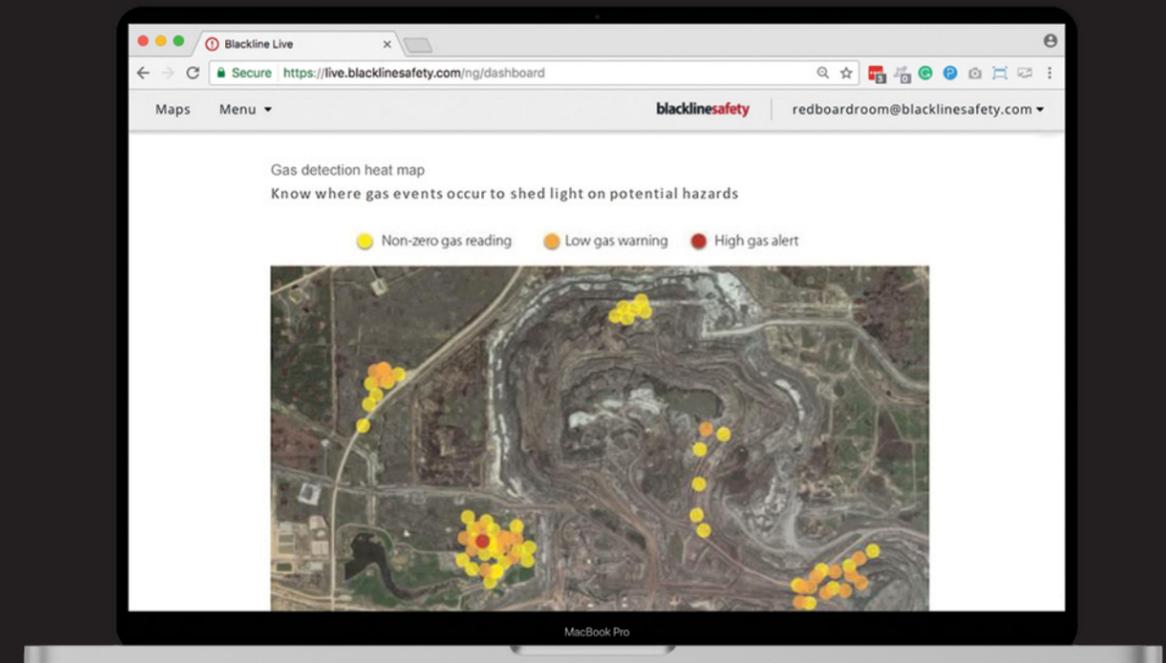
## Blackline Live

The engine that drives this connected safety network is Blackline Live. An advanced cloud-based software service that delivers a powerful and intuitive tool accessible via industry standard browsers anywhere Internet is available.

*Note: Blackline will only support web clients using TLS 1.2 and newer. Support for older TLS versions with known security vulnerabilities will be dropped. Check Blackline Safety's support page for browser version support.*

Blackline Live manages devices, users, gas detection protocols, emergency response protocols, provides live status dashboards and advanced historical reporting using sophisticated analytics.

Blackline Live is also the tool used by safety monitoring agencies around the world — including Blackline Safety's own **Safety Operations Centre** — to monitor for alerts, respond to and resolve incidents and report back on those incidences to our clients.



## 2. Connectivity



Our wearable safety devices and gas detectors connect to our centralized hub where the device's location and status is monitored, and emergency alerts can be responded to. Global cellular connectivity is our primary path to the hub. Through our partner, [Telenor Group](#), and their global network of cellular providers we can reach over 190 countries on the cellular network. Backup channels are used for remote environments where cellular coverage is spotty or unavailable. Here our partner [Iridium](#) and their sophisticated global constellation of 66 cross-linked Low Earth Orbit (LEO) satellites, our coverage becomes truly global including across oceans, airways, and polar regions.

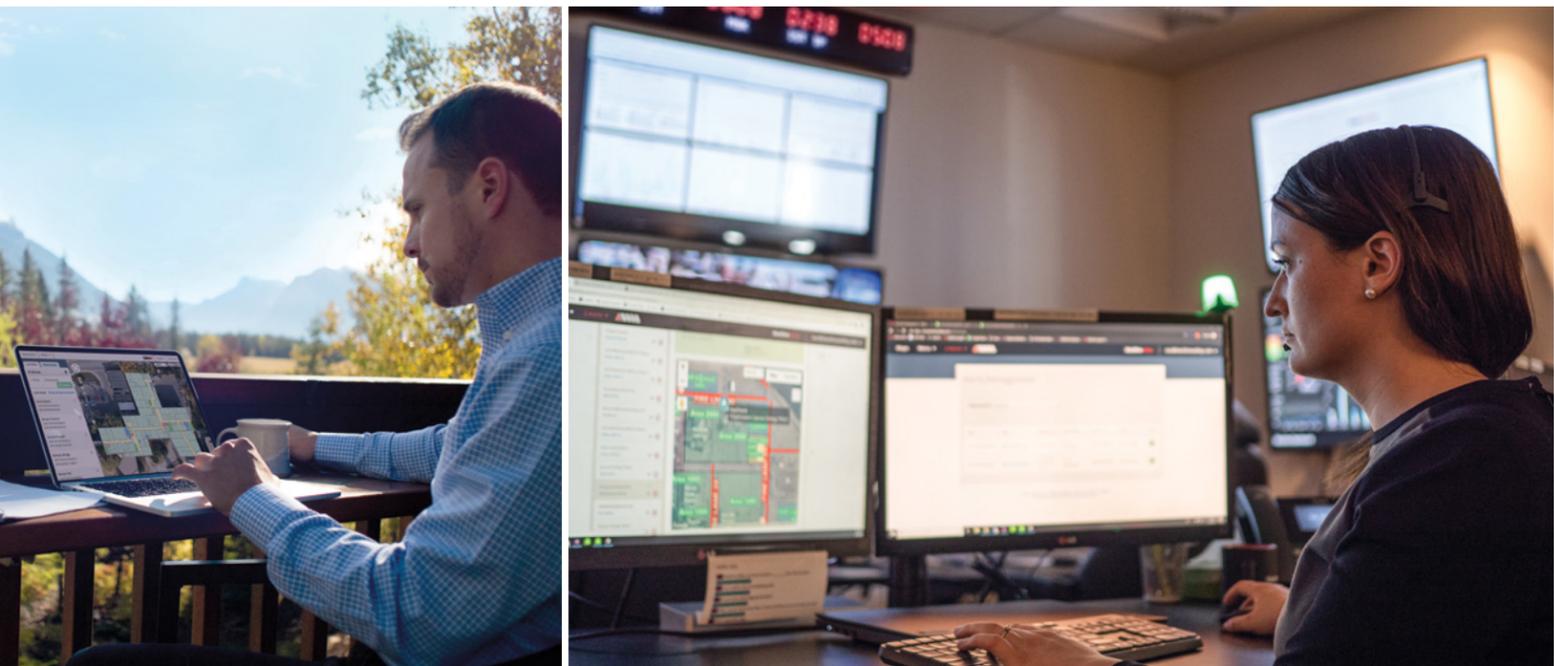
## 3. Security



Blackline Live runs on [Amazon Web Services \(AWS\)](#) highly advanced global network of secure, scalable, and redundant services. AWS data protection services provide encryption and key management and threat detection that continuously monitors and protects our accounts and workloads. AWS identifies threats by continuously monitoring the network activity and account behavior within our cloud environment. AWS gives Blackline Safety a comprehensive view of our compliance status and continuously monitors our environment using automated compliance checks based on the AWS best practices and industry standards we follow.

Blackline Live protects our client's data through a variety of security measures. Starting with data encryption between our field devices and cellular carriers and IPSEC VPN tunnels between carrier facilities and the Blackline Live system.

Robust user configuration and permission options provide clients with confidence that access to and control of their Blackline Live system, devices and users is tightly controlled. Password management mechanisms to force refreshes every 90 days are available and user accounts can be easily removed or refined. Blackline Live also offers powerful grouping functions to further refine user access to these groups.



## Access Control

Blackline Live also uses tiered user roles to allow customers flexible tools to control access and privileges.



### View only

Account users with a view only role can see resources that they have been assigned to but cannot manage them. This role is best for users who might want to check their settings, but do not have the authority to change them.



### Resolve only

These account users cannot edit any resources but can manage and resolve alerts. Resolve only roles are often assigned to monitoring personnel, who are employed to carry out response protocols in the case of an alert.



### Device admins

Device admins have permission to manage within the groups that they are assigned to. This role is best for account users who need to be able to edit devices within a group but should not have influence over devices outside of the group.



### Group admin

Group admins have administrative power over groups they have access to — they can organize and edit these groups as well as the resources within them. They act as support to the organization admin but focus on administration of groups rather than the entire organization.



### Organization admin

These account users have the highest-level role in your organization — they manage the organization and all its resources and relationships and should be the organization's primary point of contact with Blackline.

Role	View	Resolve Alerts	Create and Manage Contacts*	Reassign Devices	Create and Assign Profiles	Create and Manage Groups	Create and Manage Accounts users*	Create Relationships	Edit Organization Details
Organization Admin	View All	Y	Y	Y	Y	Y	Y	Y	Y
Group Admin	View All	Y	Y	Y	Y	Y	Y	N	N
Device Admin	View All	Y	Y	Y	Y	N	N	N	N
Contact Admin	Limited View • Devices • Team Members • Quick Assign	N	Y	Y	N	N	N	N	N
Resolve Only	View All	Y	N	N	N	N	N	N	N
Emergency Responder	Limited View • Maps (live view & History view) • Alerts management • Alert History	Y	N	N	N	N	N	N	N
View Only	View All	N	N	N	N	N	N	N	N
Analytics Only	Unlimited View • Blackline Analytics	N	N	N	N	N	N	N	N

\* In order to create and edit team members, an account user needs to access to the All Devices group.

## 4. Redundancy

Uptime and availability are critical when dealing with safety. Blackline Safety continues to advance our system's robustness and redundancies to reduce or eliminate single points of failure in our connection paths, server pools and databases. AWS provides extensive redundancies in server pools, scalable server-based services, redundant VPN paths and highly secured and robust physical premise disaster mitigation practices to ensure their uptime is world class. Cellular network carriers all run redundant network arrays, Routers and Switching technologies also in robust physically secured facilities. Our partner's infrastructure combined with our own redundancies combine to produce system uptime for Blackline Live of 99.9% availability.

## 5. Availability

Blackline Safety uses a variety of sophisticated monitoring tools to measure and report on the state of our system. These include:

### Safety Components

- North American Network Connectivity (cellular and satellite connectivity)
- Global Network Connectivity ((cellular and satellite connectivity)
- Alert Generation (Ability of alert messages to reach Blackline Live)
- Alert Visibility (Ability of Blackline Live users to view and manage alerts)
- Automatic Alert Notifications (Automatic text and email notifications from alerts)
- Two-Way Voice Calling (Availability of voice calling on supported devices)
- Two-Way Texting (Availability of texting on supported devices)
- Blackline Vision (analytics) uptime
- Third Party Monitoring ("Push" and "Connect" APIs)

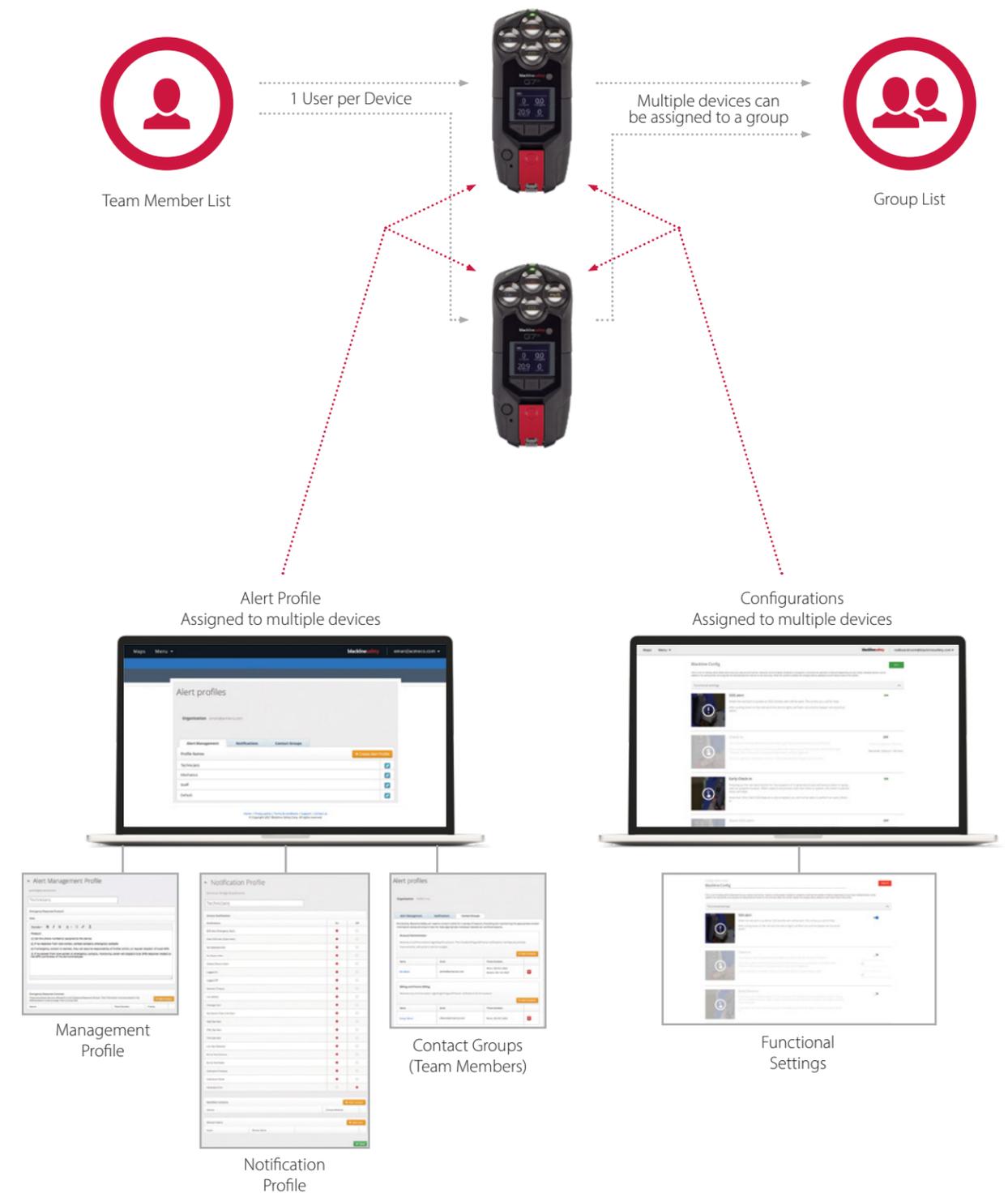
### Non-Safety Components

(feature accessibility and Push to Talk where available)

- Historical views and configurations pages in Blackline Live
- Push to Talk (on supported devices)

## Feature Overview

To understand how to use Blackline Live to manage and configure your devices, it is important to understand the architectural structure and the way users, devices and configurations interact with one-another.



## 5. Availability (cont.)

Blackline Live is “device-centric” by that we mean that configurations, alert protocols, and users are all assigned to a device (G7c, G7x or EXO for example).

Configurations allow you to describe how a device is to behave and how it should respond to safety events. You create a configuration that includes functional settings and Gas sensor settings, then assign that configuration to one or any number of devices. This way you create a configuration once, then easily apply them across your pool of devices. You can create multiple configurations and assign them to different devices throughout your organization.

Alert Profiles define the way alerts to the monitoring agent are treated, here you configure the Alert management protocol (what to do when an alert appears), whom to notify and when and who should be notified of an alert.

Team Members are entered into the system as Contacts or Account users. Contacts do not have access to Blackline Live but can be assigned to a device. To be a valid contact their record must include their Name and should include a valid email address.

Any number of devices can be put into collections or “Groups” as a way of managing large numbers of devices.

## 6. Organization Setup

### Team Members

An organization will have a collection of team members. Team members are split into two categories: contacts and account users

#### Contact

Contacts do not have log-in access to Blackline Live and are simply sets of contact information in the Blackline Live. They can be assigned to devices and alert profiles.

#### Account User

Account users are team members with credentials to log into Blackline Live — they can also be assigned roles that allow them certain permissions in Blackline Live. They can also be assigned to devices and alert profiles.

#### Status

What does ‘status’ mean? A team member’s status indicates the verification state of an email address. Status is shown in three possible states:

- **Pending** - A verification link has been sent to this email, but there has been no response.
- **Active** - The verification link has been opened, and the email has been confirmed to be active. Only account users need to have their emails verified ; all contacts will be shown as active. When assigning account users to alert or notification profiles as emergency contacts, it is important that their email is in active use.
- **Deactivated** - In the case that a team member is no longer part of the business, they should be deactivated in Blackline Live. A team member that is deactivated can no longer be assigned to devices, alert profiles, or notification profiles, and will no longer be in any groups. Any devices that they were assigned to them will be become unassigned. Additionally, deactivated account users will lose log-in access to Blackline Live.

Deactivated team members can still be seen by other users in the portal by clicking the ‘Deactivated’ tab on the team members page. A deactivated team member profile shows all their contact information and group assignments at the time that they were deactivated.

Clicking the activate button will make this team member active in the portal again. The reactivated team member will be brought back, and will be put back into their original groups, provided the groups still exist. They will not be automatically reassigned to their original devices and alert profiles, so they will need to be manually reassigned.

## Quick Assign

Blackline Live has a powerful tool for field users to quickly assign devices to team members. Instead of doing it manually in the software a user can use this power tool in one of two ways.

Using simple data entry, you can type the device ID then the Employee ID # and hit return and the device will be assigned. The employee ID # is the number entered into the team members profile.

Using an off-the-shelf barcode scanner when the cursor is in the Device field you simply scan the back of the device, and the system will enter the device code. Move to the Employee ID field and scan the employees card or badge with a QR code encoded with their employee ID and that ID is entered into the field; hit return and that team member and that device are assigned.

## Groups

Groups are bundles of devices in your organization that are managed by group administrators.

Suppose your organization has 100 devices, and you want to give an employee access to only 10 of them. They may be a work crew, or branch office employees, it does not matter; you choose how to group your devices and users. Account users can be given access to groups by becoming a “group manager.” This allows them to see the group and devices within it. You can make as many groups as your organization needs and the search, sort and pagination tools will help you manage large amounts of groups.

### Mass Notifications

Beyond being able to manage many devices by grouping; Blackline Live also has a powerful mass notification tool that uses groups. Here you can compose a single text message and quickly deliver it to every device in any group. This can be helpful when dealing with an emerging situation where you want to communicate with an entire group quickly. It is important that you attach users to devices, so you know who is wearing the device and who you are communicating with.

### All devices group

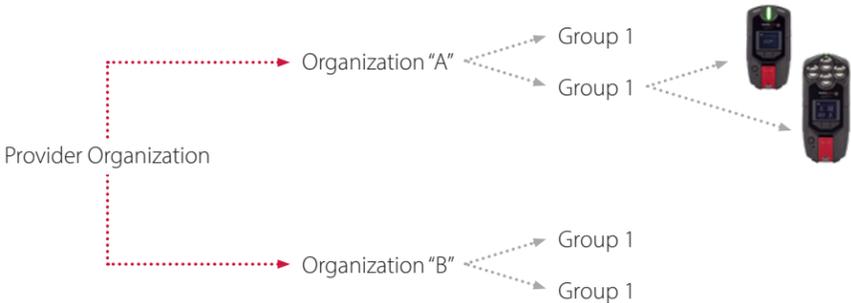
This is the default group in every organization that automatically contains all devices. It collects all devices as they are activated or moved into the organization. It cannot be deleted, and devices cannot be removed from it unless they are moved to a different organization altogether.

An account user’s role in the All devices group acts as their most basic role throughout the entire organization. For example, if an account user has a resolve only role in the All devices group, this means they can see all the organization’s devices and resolve alerts on every device. However, they can also be given “higher access” roles in other groups, so that they might be able to manage or edit specific devices.

The All devices group plays a large part in relationships and sharing it with another organization allows them to see all the resources in your organization.

# Relationships

A relationship agreement is a one-way link between two businesses, where one business can manage or monitor the other's resources. Relationships are based on the idea of sharing groups, and always involve two parties: the client and the provider. For example: monitoring service providers under a relationship can observe the safety statuses of your devices and resolve alerts as they occur. Resellers can use relationships to help set up accounts and walk customers through the onboarding process.



## Client

The client is the business that is receiving services. Client organizations invite a provider to a relationship agreement and get to choose which roles the provider will have over their groups.

## Provider

The business in a relationship agreement that is providing services.

- If you would like to give another organization access to your resources, you can **invite** them to be your provider through Blackline Live. Click the **add provider** button on the Relationships page and fill out the form. You will need to provide a unique relationship name and the email of the organization admin that will be managing your shared resources.
- Select one of the three relationship types (Non contractual, Contractual – Resolve only or Contractual – Group Admin) and click send when you are done. If they accept the invitation to become your provider, they will gain access to the groups you have decided to share with them

## Non-contractual Relationship

A non-binding agreement between a client and a provider that can be modified by the client at any time. For example, the client could change which groups the provider has access to, or (for the All devices group) what role they play (group admin vs. resolve only).

*Note: Typically, the client will grant access to the All devices group for their provider, and then define their privileges as group admin, device, admin, resolve only or view only. Further group specific access and roles can be defined by granting specified access to groups.*

Without access to the All devices group your provider can only resolve issues, they will be able to move add or change devices, team members or configurations on your behalf.

## Contractual relationship

An agreement that is locked once setup. A contractual relationship gives the provider either **resolve only** or **group admin** access to all your organization's groups. And therefore, all your devices.

Changes and termination of a relationship are carried out by Blackline's Account Management and Customer Care teams to ensure that safety protocols are maintained, and no one is left unprotected unintentionally.

# 7. Devices

Our G7 product line incorporates leading incident detection and advanced location technology with 3G and satellite communications to ensure seamless monitoring. From gas detection to lone worker monitoring, gas detection compliance, data analytics and evacuation management, G7 has your teams covered.

G7 is expandable — customizable cartridges tailor monitoring capabilities for every employee role and job. Each device is wirelessly configurable from Blackline Live user accounts, removing the guesswork from managing a world-class safety program. From portable gas detection to lone worker monitoring, G7 keeps you and your teams connected.



# G7c

Always connected 3G wireless, location technology, automatic incident detection and a built-in speakerphone empowers the fastest possible response. G7 Cartridges tailor G7c functionality. Intrinsically safe.



# G7x

True last-mile safety monitoring with satellite communications, location technology and automatic incident detection helps you keep your remote teams safe. G7 Cartridges tailor G7c functionality. Intrinsically safe.



# G7 EXO

G7 EXO is the world's first cloud-connected area monitor with integrated 2G/3G/4G communications. When G7 EXO is turned on, it automatically connects directly to the Blackline Safety Cloud, streaming critical insights of your site or facility.

## Devices in Blackline Live

It starts with your Devices page, this is an immediate overview of all the devices in your organization showing to whom they are assigned and what configuration they are using and the last time that device was in contact with Blackline Live. Specifically, it details:

- **Status** — whether the device is online or offline, and whether it has unresolved alerts.
- **Check-in reminder** — the time left until the device requests a check-in.
- **Assigned team member** — the team member currently assigned to this device. Clicking on it allows you to assign a different team member.
- **Organization** — the organization the device belongs to.
- **Device ID** — the type of device and its ID number. Clicking on it links to the device's details page.
- **Device name** — the device's custom name. Clicking on it links to the device's details page.
- **Configuration profile** — the configuration profile that the device is currently assigned to.
- **Alert profile** — the alert profile that the device is currently assigned to.
- **Last communication** — the last time that the device was online. Clicking on it redirects you to the history view map, showing where the device was last seen.

## 8. Configuration Profiles

Blackline Lives configuration screens are a power tool to configure the way your device behaves, including what alerts to send to Blackline Live, and at what gas levels you want alarms and alerts triggered and more. You can configure your device for any of six different operation modes:

- **Normal Operation**
- **Pre-Entry**
- **Leak Check**
- **SCBA**
- **High Risk**
- **Pump Run**

## Normal Operation

The Normal operating mode defines how the device will operate during regular work activities. This configuration is divided into two major sections

**Functional Settings** for personal safety incidents, like Check in, SOS alerts, fall detection, no motion detection, lost network connectivity and battery alarms.

**Gas Sensor Settings** for devices equipped with onboard gas sensors; here is where you set bump test and calibration frequency, and various gas thresholds for a variety of gas sensors

## Normal Operation / Functional Settings

### About Alarms vs Alerts

An alarm is "low level" warning sound and yellow flashing light display occurring on a device. The incident is logged by the system, but no monitoring attendant is contacted, and no notifications are sent.

An Alert is an incident that sends a notification to a monitoring agent or an automatic notification of the Alert is sent out to the designated emergency response contact. Alerts can be identified by red flashing lights and siren on the device.

### SOS Alerts

SOS alerts allow lone workers to reach out for help, should they feel at risk or threatened in any way. When a lone worker feels their safety threatened by another individual; often an audible alarm and "light show" (G7) is enough to dissuade potential offenders from continuing or escalating.

### SOS alert setup

Call for help by pulling the red latch on any G7 device or swiping the slider in the Loner Mobile app. This will send an SOS red alert to your monitoring agent. After activating the alert, the device's lights (G7) will flash red and it will sound an alarm. Your monitoring agent will acknowledge the alert and execute the alert management protocol defined in the Alert Profile.

*Configuration options consist of a simple ON/OFF option to enable the SOS feature.*



### Silent SOS alert

In some cases, however the wearer may feel that a silent alarm is better so as not to agitate an offender. If you need to call for help discreetly, the silent SOS feature will generate an alert for monitoring personnel without triggering any lights or sound on the device.

You can choose to trigger a silent SOS by pulling down on the red latch, or by pressing and holding the red latch for 3 vibrations on a G7 device. Loner Mobile users can trigger a silent SOS alarm by pressing the "!" button and holding for 3 seconds.

*Configuration options include: ON/OFF and Latch pull or hold (3 seconds) to trigger the alarm and vibrate ON/OFF on silent alarm. The software has the intelligence to guide the user through conflicting options on use of the latch.*

### Check-in

An automated check-in is a powerful way to make sure your team members remain safe. This mechanism is particularly useful for lone workers; ensuring that they continue to be safe and accounted for throughout their workday.

These check-in's also log the devices current status and location which is transmitted to the monitoring software the next time the device executes its regular system update with the server. Information included from the check-in includes:

- **Time of check-in**
- **Location at the time of the check-in – Street address / legal land description / latitude and longitude**
- **Gas readings (if equipped with gas sensors)**
- **# of satellites used to generate location (indicates location accuracy)**
- **Speed of travel**
- **Battery life**
- **Cellular signal strength**

*NOTE: For more on device reporting refer to the Monitoring and Response section*

The device will prompt the wearer to “check-in.” After the user acknowledges the request the device will reset the timer and ask the wearer to check in again later. Should the wearer miss a check-in; the device will sound an alarm reminding the user to check-in, after a pre-defined time “Pending Alarm” the device will escalate to an alert sending notice to the monitoring agent prompting them to investigate and determine the status of the wearer.

The check-in reminder configuration determines how often your device will ask your team members to check-in. If you are unable to check-in, the yellow pending alarm will sound for the duration of the pending period. After this point, a missed check-in alert will be triggered.

- Configuration options include: An ON/OFF switch to enable or disable this feature. Check-in reminder time (between 15 and 180 minutes), Pending Period setting (between 5 and 180 minutes). The Pending period is the time the device will wait after the user has missed a check-in before it notifies the monitoring agent of the missed check-in.
- Check-in reminder + pending period = total time before missed check-in is identified by a monitoring agent.

## Early Check-in

Early Check-In offers the user the ability to check-in prior to the pre-defined schedule. This is useful if the user knows that he or she will be unable to respond to a check-in request, and check-in early resetting the timer to give them the full time-window before the next check-in request.

Provided Silent SOS is not enabled; Pressing the red latch button for the duration of 3 vibrations will send a check-in with updated location information to the Blackline servers. The check-in timer will reset. If the silent SOS feature is enabled on latch press, you will not be able to perform an early check-in.

- Configuration Options: A simple ON/OFF switch to enable the feature. The software has the intelligence to guide selection options between Silent alert and Early check-in.

## Fall detection

Should a member of your team trip and fall, or fall off a platform or ladder, our G7 devices use their built-in accelerometers and the configurations in Blackline Live to determine if an alarm should be raised for a detected event.

If the device detects a fall, it will trigger a yellow alarm on the device. Pressing the red latch button to check in will cancel the alarm. If you are unable to check in before the pending period expires, a red alert will be sent to monitoring personnel.

A lower fall impact indicates that the device will react to light falls, while a higher fall impact indicates the device will only detect heavier falls.

- Configuration Options: A simple ON/OFF switch to enable the feature, and a sliding scale to fix the sensitivity of your device in accordance with the nature of your team members work. Desk workers would have a lower sensitivity as you would not expect dramatic bumps or drops (25%). A construction worker on the other may require a higher setting to reflect the physicality of the job (65%).

## No-motion detection

If a team member become immobilized for any reason, trapped, pinned or have suffered a medical emergency; our G7 wearable devices using their accelerometers and the settings in Blackline Live can alert monitoring agents that your team member is not moving and may be in jeopardy.

If the device does not detect movement during the configured movement period, it will go into a yellow alarm. Pressing the latch button to check in will cancel the alarm. If you are unable to check in before the pending period expires, a red alert will be sent to monitoring personnel.

A lower movement setting indicates that the device will be able to detect small movements, while a higher movement setting will only detect larger movements. This setting is important based on the nature and physicality of the work your particular team member is doing.

- Configuration Options: No motion period is the amount of time the device will wait after detection no motion before it triggers a yellow alarm. Movement % is a sliding scale to establish how sensitive the device will be to movement (or lack of moment) there are no guidelines for percentages, the user must test and calibrate to their own situation.

## Pending Alarm

This is the length of time that the yellow pending alarm will continue after a fall or no-motion event is detected. If the team member presses the latch button to acknowledge the alarm it will not escalate. If they are unable to acknowledge before the pending period expires, a red alert will be activated, and an alert sent to monitoring personnel.

*NOTE: When using Pre entry, SCBA (Self Contained Breathing Apparatus) or Leak check mode, the pending alarm is the amount of time you can add to the regular timeout period to extend the mode before being timed out.*

- Configuration Options: Pending alarm time can be set from 30 seconds to 180 seconds. You determine how much time to give your team member to acknowledge an alarm before it gets escalated to the monitoring agent.

## Drive safe check-in & operational while charging

In certain circumstances it may not be safe to ask a team member to check-in or acknowledge an alarm. For instance, should they be driving or operating a vehicle, a check-in request or alarm could be distracting and unsafe.

This configuration tool allows you to have the device automatically acknowledge check-in requests, fall detections, no-motion alarms and will mute bump and calibration reminders as well as low battery warnings.

The device will automatically check in for you while driving. G7 can detect when you are driving at speeds of 20-35 km/h, depending on the quality of the GPS information it is receiving. Loner Mobile equipped cellphones can similarly use GPS satellite information to make speed estimations.

When toggled on, these features will automatically acknowledge check-in reminders, fall detection and no-motion, as well as mute bump and calibration reminders and low battery warnings. Additionally, you can choose to mute incoming messages and low gas alarms while using these settings.

- Configuration Options: ON/OFF switch to enable the Drive-safe check-in (automatically acknowledging check-in's and alarms while driving).
- Two check boxes instructing the device to mute gas alarms or incoming messages while driving.

In many cases when a G7c or G7x wearable device is charging, it is not in use. There are occasions however where it may be advantageous to have the device remain on while charging. For example, you have a team member charging their device at his or her workstation, and you want them to continue to check-in.

This configuration option gives you the power to choose whether the device remains operational while being charged. Operational while charging allows you to instruct your G7 to remain on while charging.

- Configuration Options: ON/OFF switch for Operational while charging (otherwise the device will automatically shut down while charging)



## Connection lost alarm

Connectivity to Blackline Live and to a monitoring agent is critical to the safety of your team. G7 devices show a blinking green light when NOT connected and a solid green light when connected. Should the disconnected state become extended, you want your user to know they are not able to reach out to their monitoring agent for help.

This option instructs the devices to warn you when it has lost connection longer than the configured time period

- Configuration Options: Enter a value of minutes between 1 and 30. This is the amount of time your device can be disconnected from our servers before an alarm warns the user the connection status.

## Low battery alarm

Our G7 wearable devices have powerful on-board 1100mAh Lithium Ion batteries with 18 hours uptime on a 4-hour recharge. Our powerful area monitoring device G7 EXO is powered by an industry leading 144Ah Lithium Iron Phosphate battery that delivers an industry leading 100 days of operation (in normal mode). Yet your team members may find themselves near the end of a battery life and in jeopardy of missing vital alarms and losing connectivity to our servers and monitoring agents.

This configuration allows you to choose how low the battery can get before it issues a warning to the wearer (or team member responsible for the EXO area monitor). Choose a % remaining battery life such that the remaining battery life is enough to safely to a charging device attached.

- Configuration Options: Choose a % of remaining battery life, at which point the user will be notified by an alarm that the battery is low, and they should make plans to recharge soon.

## Available (text) messages

While some of our cellular connected devices (G7c and G7 EXO) allow your team members to communicate verbally through voice communications, all our G7 devices are capable of texting. This can be powerful, as the team member may be unable to speak, or in a threatening situation where it may be unsafe to speak.

To streamline texting from our devices, so the user is not "pecking out" a message in an emergency; you can configure 10 unique text messages of your choosing that your team member can select from an on-screen menu right on the device. From typical "Yes," "No" responses to your own messages like "Call John," "Dispatch ERT" etc.

- Configuration Options: Choose 10 unique messages each from 1 to 16 characters.



## Normal Operation / Gas Sensor Settings

For more information about gas detection refer to **Blackline Safety's Combustible Gas and Its Detection** ebook

Any of our G7 devices can be equipped with up to 4 gas sensors from a selection of 20 different sensor types giving you powerful customized gas detection capabilities. Blackline Live brings your gas detection and response capabilities to an entirely new level with unparalleled control and configurability for gas level thresholds, alarm and alert rules and compliance for bump testing and calibration.

Here is where you can apply your own gas detection protocols to your wearable and area gas detectors in the field.

### Bump test Interval

First, what is a bump test? A safe practice where G7's alarm indicators and gas sensors are tested by applying a known concentration and amount of gas to confirm the sensors will trigger an alarm in the event of gas exposure. Blackline recommends you do not exceed 30 days without a bump test.

### Calibration interval

First, what is a calibration? A periodic calibration where a known concentration of gas is applied for a set amount of time. This procedure ensures the gas sensor can accurately detect gas levels through its operating life. Calibration schedules depend on your company's safety policy; however, Blackline recommends not exceeding 180 days without a calibration.

### Bump test and calibration reminder alarm

If bump test or calibration intervals are enabled, G7 will inform the user of an overdue bump test or calibration with a yellow warning alarm. This alarm can be muted, but the overdue message will still be displayed on the device interface.

- Configuration Options: This is a simple toggle to mute the alarm bump and calibration reminders will continue to be displayed on the device.



## Bump test and calibration reminder window

This setting will prompt the device to display a bump test or calibration reminder alarm upon startup if one of these tests is due within the configured window of time. Enabling this feature will help ensure G7 goes into alarm upon startup instead of while it is in use in the field.

For example: if you have a daily bump interval, your bump test will be due in 24 hours. If your configured bump test window is two or more hours away, rather than having an alarm triggered while you're at the work site, G7 will go into yellow warning alarm on startup, and the device would prompt you to test it before going into the field.

- Configuration Options: Here you toggle this warning feature ON/OFF and how far ahead to warn you of a pending bump test requirement, this can be between 1 and 15 hours in advance of the scheduled bump test.

## Zero sensors

Occasionally gas sensor readings can drift away from a zero reading even when zero gasses are present. As long as the wearer is in an environment known to be void of any gas, they can zero the sensors to ensure that the presence of any gas is then accurately registered on the device.

- Configuration Options: This toggle of ON/OFF allows the user (through the on-device menu) to zero the sensors manually. There are options to automatically zero sensors in the gas sensor profiles.

*Note that when performing a calibration G7 will zero sensors.*

## TWA calculation method

Time Weighted Average is way of measuring sustained exposure to toxic gases. This calculation establishes a threshold limit value (TLV) which establishes a reasonable level to which a worker may be repeatedly exposed, day to day, over a working lifetime without adverse health effects. of a chemical substance. While this term is specifically referenced by ACGIH, it is often used and referred to by OH&S and OSHA.

A Time Weighted Average (TWA) is a TLV(R) based on an 8-hour workday and a 40-hour workweek. For example, if the TWA for carbon monoxide is 25 ppm. This means that an average of 25 ppm is the safe TLV(R) for an 8-hour workday.

There are two generally accepted methodologies for calculating TWA, OSHA's standard uses a moving average calculated over the past 8-hour period. ACGIH (American Conference of Governmental Industrial Hygienists) on the other hand can use a time interval of between 4 and 16 hours for its exposure calculations.

- Configuration Options: The option selection of OSHA (Occupational Safety and Health Administration) or ACGIH/EH40 changes the period of time the TWA calculation method uses. If you select ACGIH/EH40 then you can change the time interval for TWA calculations to between 4 and 16 hours in 1-hour increments.

## Gas settings for toxic gas sensors

Gas sensors can be configured and controlled using the same configuration criteria for any of these toxic gas sensors.

- Hydrogen sulfide
- High range hydrogen sulfide
- Carbon monoxide
- High range carbon monoxide
- Carbon Dioxide
- Ammonia
- High range ammonia
- Chlorine
- Sulfur dioxide
- PID Sensor



## Calibration Gas concentration

This is the concentration level of this gas type in the gas cylinder used for manual (non-dock) calibrating of the sensor. These concentrations can be found on the cylinder label.

## Display units

This is a unit of measurement display choice depending on the unit of measurement used in a client's specific region or purpose. PPM or Parts Per Million or milligrams per cubic meter denoted as mg/M3. Note: 1 g/ M3 = 1 mg/L = 1 ppm.

## High threshold

This is the level of gas concentration that will trigger an immediate alert that includes red lights, sirens, and notification to your monitoring agent (if you have one). Whether or not an alert is transmitted to your monitoring agent is also configured in the Alert management profile – device alerts section on a sensor by sensor basis.

This is configured typically to a concentration of gas that is not yet dangerous but that immediate action should be taken to extract one's self from the area where the exposure is taking place.

## Low threshold

Low threshold is the gas concentration level sufficient to trigger a local (yellow light) alarm on the device. This is typically a level of gas that should be cause for attention by the user, so that their awareness is heightened, and they can monitor themselves more closely. These alarms are logged by Blackline Live but unless the measured gas concentration exceeds the high threshold, the device will remain in (local) alarm state until the gas concentration subsides, should the user mute the alarm the device will sound again in 2 minutes if the gas concentration remains above the low threshold.

## STEL interval

Short Term Exposure Limits is a method to monitor and cumulative exposure to low level gas. Occupational Safety and Industrial Hygienists establish guidelines for safe exposure limits for a variety of gases.

The STEL interval is the period that the calculation algorithm will use to establish the exposure level. The calculation is a moving average in 1-minute increments over the interval period.

- Configuration Option: The STEL (Short Term Exposure Limit) interval can be as low as 5 minutes and as long as 15 minutes with an increment of 1 minute.

## STEL threshold

This is a gas concentration level used by the STEL calculation model to trigger a STEL alert and notification to a monitoring agent of a sustained exposure.

## TWA period

The Time Weighted Average period is a fixed 8 hour period if the user is using OSHA standards for TWA. Calculations if the user is using ACGIH/EH40 standards, the TWA period can be adjusted to suit the users specific environments or requirements.

- Configuration Options: TWA period is either 8 hours (OSHA standard) or between 4 and 16 hours (ACGIH/EH40 Standards) in increments of 1 hour.

## TWA threshold

The TWA threshold is the calculated exposure limit that will trigger an Alert and notification to a monitoring agent of a sustained exposure.

## Auto-zero on startup

This toggle will instruct the G7 device to automatically zero the gas sensors to ensure accurate gas readings. The device must therefore be in a "normal" environment absent of gases other than nitrogen, argon, carbon dioxide and water vapor at the time of startup.

- Configuration Options: This is a simple ON/OFF toggle to enable this feature on a sensor by sensor basis.

## Unique Calibration and Threshold settings

- Configuration Options: Each gas sensor has unique calibration gas ranges and unique threshold ranges for high threshold, low threshold, STEL, and TWA.

Gas	Calibration Gas	Gas Thresholds (High/Low/STEL/TWA)
Hydrogen sulfide	.5 - 50ppm in .1 ppm increments	.5 - 50ppm in .1 ppm increments
High range hydrogen sulfide	.5 - 50ppm in .1 ppm increments	".1 - 199.9ppm in .1ppm increments or 200 - 500ppm in .5ppm increments"
Carbon monoxide	5 - 500 ppm	5 - 500ppm
High range carbon monoxide	2 - 2000 ppm	2 - 2000ppm in 5ppm increments
Carbon Dioxide	5 - 50000 ppm in 50 ppm increments	5 - 50000ppm in 50ppm increments
Ammonia	.5 - 100 ppm in .1ppm increments	.5 - 100ppm in .1ppm increments
High range ammonia	1 - 500 ppm in 1ppm increments	1 - 500 ppm in 1ppm increments
Chlorine	.2 - 20 ppm in .1ppm increments	.2 - 20ppm in 1ppm increments
Sulfur dioxide	.5 - 100 ppm in .1ppm increments	.5 - 100ppm in .1ppm increments
Hydrogen cyanide	.2 - 30ppm in .1 increments	.2ppm to 30ppm in .1ppm increments
Chlorine dioxide	.05 to 2ppm in .01ppm increments	.05ppm to 2ppm in .01ppm increments
Ozone	.03 - 1ppm in .01ppm increments	.03ppm to 1 ppm in .01ppm increments
Nitrogen dioxide	.2 to 30ppm in .1ppm increments	.2 ppm to 30ppm in .1ppm increments
PID Sensor	".25 - 99.9ppm in .1ppm increments or 100 - 600ppm in 2ppm increments"	".25 - 99.9ppm in .1ppm increments or 100 - 600ppm in 2ppm increments"

## Photoionization (PID) detector

Background on VOC's, Volatile Organic Compounds

These are organic chemicals containing carbon, excluding carbon dioxide and carbon monoxide, among others, that vaporize at room temperature. In high concentrations, VOCs can be dangerous to human health when they enter the lung or touch the skin.

Excess VOCs in the home can be very harmful to the health of any residents. Overexposure to VOC emissions can lead to respiratory problems and cause lung damage, but other issues that can result from exposure to excessive chemical emissions include :

- Eyes, nose, and throat irritation
- Headaches, loss of coordination and nausea
- Liver, kidney, lung, and central nervous system damage
- Fatigue
- Dizziness

Furthermore, VOCs have been found to cause cancer in animals, particularly in the lungs. And it is suspected they may have the same effects in humans, although clinical studies have yet to clearly define the link.

## Target Gas

The detectability of VOC gases using PID (Photoionization detectors) can vary; for example, a concentration of 10ppm Isobutylene may register 10ppm on the sensor, while 10ppm Toluene may register 20 ppm on the sensor. Isobutylene is assigned a response factor of 1, then other gases are assigned relative response ratings. Gases with a response level less than one are more detectable so can therefore produce a higher reading, and those with response ratings higher than 1 produce a lower reading. There are some VOC's that are not detectable at all.

By selecting a VOC gas type other than the calibration gas (isobutylene), a correction factor is used to produce a more accurate reading. For example, Toluene has a response factor of .56 so a 10ppm presence of Toluene would produce a reading of (approx.) 20ppm. If you select Toluene as the target gas, the reading will be corrected back to 10ppm.

- Configuration Options: With Blackline Safety's newest ION Science 10.0eV PID detector, you can choose from over 700 target gases.

## Gas settings for LEL, lower explosive limit gases:

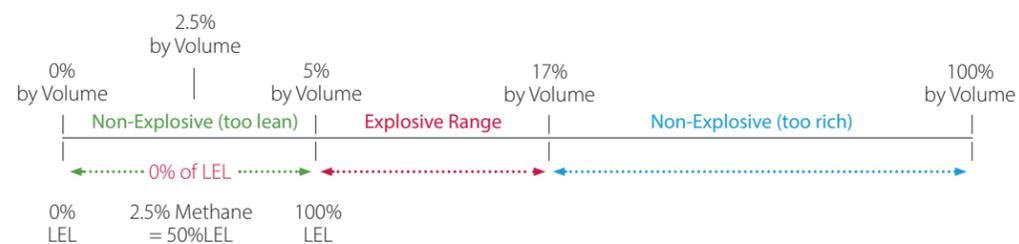
First some background on LEL. Combustible gas and solvents that create explosive vapor in air when spilled, or leak into an area, have a Lower Flammable Limit which can be found on a specific Material Safety Data Sheet materials (MSDS). **LFL is the same as LEL.** Combustible Gases and Solvents also have an Upper Flammable Limit (UFL), which is the same as with UEL, or Upper Explosive Limit. An LEL Detector simply detects, indicates, and alarms for levels between 0-100% LEL of materials it is calibrated to monitor and detect.

Using methane in air as an example, the LEL of methane is 5% by volume. So, an LEL detector or sensor, that is calibrated to detect methane in air in a range of 0-100% LEL Methane will detect the presence of methane in air between 0-5% by volume. When reading 50% LEL methane the sensor will read the equivalent of 2.5% Methane by volume in air.

More information available in Blackline Safety's Combustible Gas ebook.

## Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air

Visual example to show where on the scale % of LEL is measured



These LEL IR/P (infrared detector or pellistor detector), and LEL MPS (Molecular Property Spectrometer) sensors can identify the presence of flammable gas levels. In the case of the MPS detector, it can detect the presence of any of these specific flammable gases.

- butane
- ethane
- ethylene
- hexane
- hydrogen
- isopropanol
- methane
- pentane
- propane
- propylene
- toluene and xylene

## Calibration gas concentration (methane)

This is the concentration level of methane gas in the gas cylinder used for calibrating these sensors. The %LEL used in this setting sets the calibration point and therefore maximizes accuracy for that %LEL.

**For example:** if you set this to 50% LEL or (2.5% by volume) the sensor will be most accurate at 2.5% by volume. If you set it to 100% LEL the sensor will be most accurate at 5% by volume (methane)

## Display units

This is a way to display the level of gas either as a % of the lower explosive limit or as an absolute value (% by volume). For example, Methane with an LEL of 5% by volume could have its LEL presented as 50%LEL or 2.5% by volume.

Note: If a Hydrogen sensor is installed and used as part of the LEL readings (LEL sensors do not recognize hydrocarbons like hydrogen) display units must be set to %LEL. Devices with H2 sensors will not accept new configurations where LEL is set to %vol and will default to %LEL units if the cartridge is switched to include an H2 sensor.

## High threshold

The high threshold for LEL is a level at which you want a red light, siren alert with alert notification made to a monitoring agent triggered. This is a level approaching the LEL at which you would want to instruct the wearer to remove themselves from that area immediately.

Gases at this level are still not combustible, but one would want to take precautionary measures anyway.

- Configuration Options: Enter a value between 4 and 60 % LEL with an increment of 0.01.

## Low Threshold

The low threshold setting is used to identify even very low levels of combustible gases, this threshold (when exceeded) will trigger a local yellow lights and siren alarm without notification to a monitoring agent.

- Configuration Options: Enter a value between 4 and 60 % LEL with an increment of 0.01.

## LEL-MPS specifics

This sensor auto calibrates, and therefore does not require traditional calibration like infra-red or pellistor sensors. Nevertheless, some organizations mandate manual calibration, so the option is available to include the LEL MPS sensor as part of the manual calibration process.

- Configuration Options: Same as LEL IR/P but also includes a toggle ON/OFF to include this sensor in manual calibrations.

## Hydrogen

Hydrogen sensors are often used in conjunction with LEL- IR detectors to detect the presence of hydrogen which LEL- IR detectors cannot. As Hydrogen is considered a flammable gas rather than a toxic one, there are only low and high threshold triggers and not triggers for sustained exposure (STEL/TWA)

- Configuration Options: Calibration gas can be from 400ppm to 40,000 ppm in 400ppm increments. High and Low threshold settings use the same range and increments.

## Oxygen

Because humans and animals are adapted to breathing 21% oxygen in air, anything much different from 21% would be hazardous to our health. Therefore, many safety standards associations and safety hygienists consider any oxygen level below 19.5% as oxygen deficient or anything above 23.5% as oxygen enriched air.

### Calibration gas

This is the gas concentration used during a manual (non-dock) calibration. This number can be obtained from the cylinder label.

### Baseline reading

This is the reading that the device will produce for any oxygen reading between 20.6 and 21.1 (normal oxygen range). This reduces "noise" from multiple normal oxygen readings.

### Threshold settings

These settings determine when alarms and alerts are triggered by the device. Low thresholds represent oxygen levels of concern and therefore local yellow lights and sirens alarms. High thresholds are more dangerous and therefore trigger red lights, sirens, and alert notifications when a monitoring agent is used.

Configuration Settings:

- Sensor ON/OFF toggle
- Calibration gas between 0.1 and 19%,
- Baseline reading of either 20.8 or 20.9,
- Enrichment high (Alert) and Low (Alarm) thresholds between 0.1 and 25%
- Depletion High (Alert) and Low (Alarm) threshold between 0.1 and 19%,
- Note: Enrichment and depletion thresholds exclude normal levels between 20.6% and 21.1%
- Automatic Zeroing of gas on startup (simplified calibration)



## Pre-Entry Mode

Pre-entry mode is a way of using your gas detector to measure the gas levels in a confined space prior to entering that space. This can be accomplished by using an optional pump attachment on either a G7c or G7x wearable, or on a G7 EXO area monitor equipped with a pump and hose. Some users attach their wearable gas detector to a string or rope and lower the whole device into a chamber before entering.

In the Pre-Entry configuration you indicate how long your device will stay in pump mode. After the timeout period, your device will go back into normal operating mode.

Pre-Entry mode includes the ability to change the way your gas alarms behave during this mode. Since you are measuring for the presence of gas, you may not need or want an alarm triggered, because then you have to go through the process of clearing an alarm, or respond to an alert response from your monitoring agent.

Configuration options consist of:

- **Pre-Entry, Leak Check** and **SCBA** all suspend the measurement of sustained exposure to low level gasses
- **Normal alarm functionality**, where your device will go into alarms or alerts according to your settings in normal operating mode.
- **Display red alerts as yellow alarms**; here the presence of a gas above low-threshold levels triggers a local yellow alarm on your device. No alerts are transmitted to your monitoring agent.
- **Mute all alarms and alerts**, this choice disables all lights and sirens even when gas is detected, and no alerts are transmitted to the monitoring agent.
- **Pump Required** this is an ON/OFF toggle to indicate whether your device will be gathering gas through a pump/hose combination or through the on-board diffuser sensors.
- **Timeout period** This is the period you want your device to operate in this special mode.

## Pump Run

This mode functions in essentially the same way as Pre-Entry, with the exception that there is no timeout. This mode is for use when a pump and hose are attached to a G7 device and samples drawn for analysis. Because the presence of gas is anticipated, red alerts and yellow alarms can be muted, or high levels of gas that would normally trigger a Red alert only trigger yellow (local) alarms.

It is vitally important that the device return to normal operating mode so that unexpected detections of gas will again trigger alarms and alerts.

Configuration options consist of:

- **Normal alarm functionality**, where your device will go into alarms or alerts according to your settings in normal operating mode.
- **Display red alerts as yellow alarms**; here the presence of a gas above low-threshold levels triggers a local yellow alarm on your device. No alerts are transmitted to your monitoring agent.
- **Mute all alarms and alerts**, this choice disables all lights and sirens even when gas is detected, and no alerts are transmitted to the monitoring agent.

## SCBA

SCBA is a special mode specifically designed for when the device wearer is also wearing self-contained breathing apparatus (SCBA). Because the wearer is expecting toxic gases or low oxygen levels, and therefore be at greater risk, you may want to ensure that some settings are forced on during that time, including:

- **Fall detection**, as this equipment is heavy and could cause more harm should the wearer fall
- **No motion detection**, because the wearer is in an environment expected to be dangerous, and should they stop moving, someone must be alerted right away.
- **Pending alarm time** is set to determine how long the user has before the local alarm is escalated to an alert to the monitoring agent.

The pending alarm will also be the length of time you have after your mode-timeout period has expired, and the device returns to normal operating mode.

- **Connect lost alarm** you will want your team members to know if they have lost connection to Blackline Live, as this could present a serious safety issue should they fall, stop moving or need an alert of any kind sent to their monitoring agent.

This mode includes an additional gas setting to continue to monitor and trigger alarms for LEL (Lower explosive limit). This is critical as the wearer may have gas alarms turned off because their expecting exposure to toxic gas but will want to know if explosive gases are present and be notified with alarms.

Configuration options consist of:

- **Fall detection** – ON/OFF either enabled or not
- **No-Motion detection** – ON/OFF and the No-motion period; the time the wearer must remain motionless before the device goes into alarm.
- **Pending Alarm** – The period the device will stay in yellow alarm mode before escalating to red alert and notifying the monitoring agent.
- **Connection lost alarm** – ON/OFF and lost connection period; the amount of time the device can be out of reach of Blackline Live before an alarm is triggered.

## Leak Check

This mode is functionally the same as Pre-entry mode. Instead, here the device is using a pump and hose, by hand or by an attached handle to place near where suspected leaks are to detect the presence of gas.

- Configuration options are the same as Pre-Entry mode

## High Risk

High Risk mode is for any situation that you think your functional settings (Check-in, Fall, No Motion) should be elevated or turned on (if they are off under normal operation configuration).

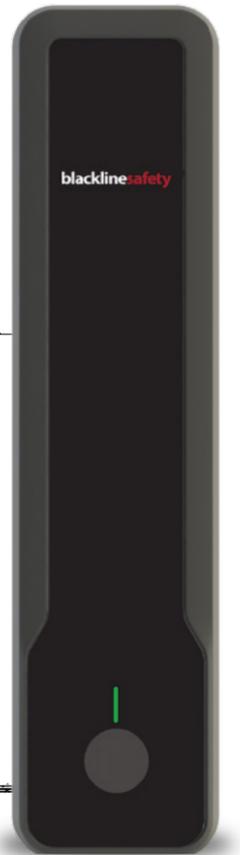
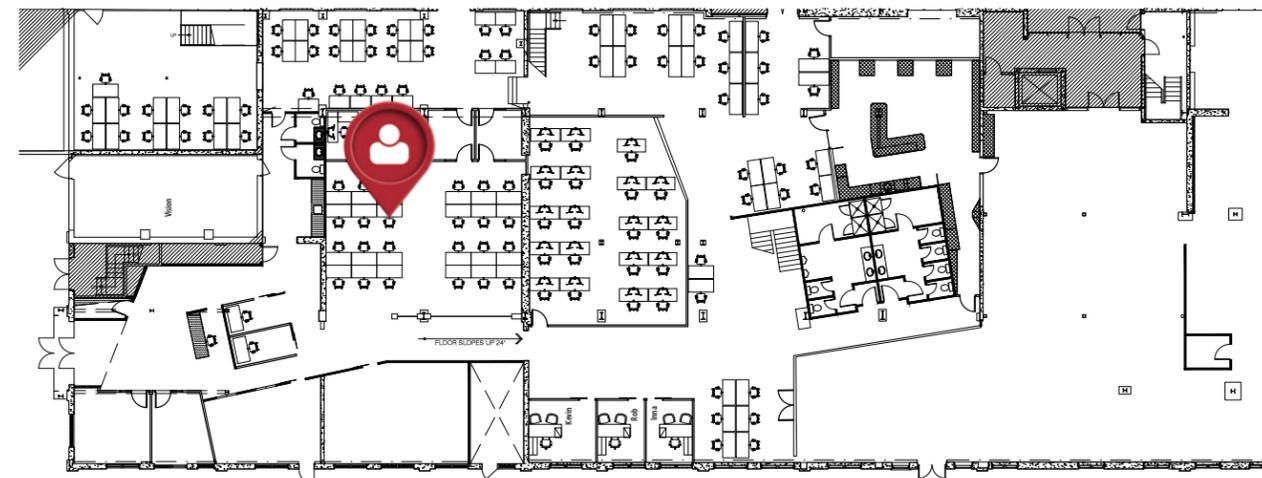
## 9. Beacons

Location Beacon augments location transmissions where GPS alone may not be sufficient. Installed inside and around facilities, beacons transmit location signals for proximity detection with a Blackline Safety monitoring device.

Beacons work together with optional *floor* and *site plans* that are uploaded into *Blackline Live* by mapping an employee's location in context of their surroundings and delivering comprehensive situational awareness in and around complex facilities. In addition, Location Beacons provide a configurable power level that accommodate different positioning needs.

The beacon management page in Blackline Live displays all the beacons in an organization. When you select one the window to the right displays the beacon information, the layer where it resides and a graphical representation of its position on a floorplan.

You can reposition the beacon to different layer and to a different location on that layer simply by selecting the layer you want and dragging the blue pin to your desired location.



## 10. Floorplans

Floorplans are simply building layout maps used to provide greater detail and resolution than is available from a map. Blackline Safety UX team can place your floorplan directly over the building and include layers when multiple floors or levels are needed to replicate your layout.

The floorplan page simply provides a list of all your floorplans and an information screen detailing their location and placing them on an interactive map.

## 11. Docks

The Blackline Safety G7 Dock is the simple solution to calibrating, bump testing and charging G7 devices. Docks arrive ready to perform, requiring no initial setup, and can manage up to four single- or multi-gas cylinders. Docks can be used with both G7c and G7x devices, and support G7 Single-gas or Multi-gas cartridges. Managing calibrations and bump tests is easy using G7's LCD screen and navigation system — no complicated menus, ports, or setup. G7 Dock uses Blackline Live portal for device management and to store data for reporting and compliance tracking. Gas inlets can also be configured through Blackline Live in the Dock management page.

Selecting Docks from the main menu produces a list of all the docks in your organization. This is a quick view to show the device name, activation code, Dock ID, Organization, and status. The device name is a hyperlink that allows the user to drill down to the dock configuration page.

The G7 Dock has 4 configurable inlets and one gas-out port. Each inlet can be configured to select the cylinder attached to the port.

In the dock inlet configuration, you enter the lot number and data from cylinder, and the gas concentrations from the cylinder label. These concentrations will be used by the G7 for calibration and bump testing.

There is also a field where you can increase the pump speed from our default setting of 48% to a higher draw to accommodate gases with higher viscosity.



## Alert Profiles

Alert profiles are a power set of tools where you establish your directives for Blackline Live, your monitoring agents or external contracted monitoring agents. Here you can indicate what events you want to trigger alerts, and how to respond to those alerts, and whom to notify. This is also where you tell Blackline Safety whom to contact in your company for administrative communications.

Once an alert profile has been created then, you can then assign devices to it. Now the system and your monitoring agent knows how to handle alerts from those devices.

Alert profiles have three components to them:

### Alert Management Profiles

**Alert Management** is where you define a specific set of rules or protocols for responding to alerts. You can create any number of unique Alert Management profiles each to suit a specific purpose or a collection of devices.

#### Emergency Response Protocol

An Alert management profile includes the Emergency Response Protocol - a freeform space where you provide instructions to a responding agent on how to respond and whom to contact for any given alert event. If you are monitored by Blackline Safety's SOC you will not be able to create/edit/delete these profiles, as they need to be created together, to ensure the instructions are clear and straight forward for our agents to use when responding to an alert.

- Configuration Options: There are some useful formatting tools available in this free-form window, the typical Bold, Underline, Italics and you can create your document in word and paste into this area for additional formatting options.
- Configuration Options: Additional navigational tools are available to create links to external page, or links to anchors within the profile itself. These can be useful in creating a step by step response procedure for an agent to follow.

#### Emergency Response Contacts

The second section in the Alert Management window is the Emergency Response Contacts. Here is where you identify which team members are your emergency response contacts. These contacts are used in the instructions in the Emergency Response Protocol.

#### Notified Contacts

Section #3 is your list of Notified Contacts. These are contacts used primarily by self-monitored organizations. These contacts will automatically receive notification of an alert via email or SMS. They must already be a team member.

- Configuration Options: You can choose to have the notification sent by email or by SMS although it is important to know that SMS messages are provided on a best effort basis and delivery cannot be guaranteed. whom to notify of an alerts and what incidences you want to have trigger an alert. You can also pick a delay for notifications.

## Device Alerts

The next section on this page is the Device Alerts. Here is where you indicate what kind of events will trigger an Alert and therefor contact with a monitoring agent. These options include on/off toggles for all the lone-work safety events such as fall detection, no motion, missed check-in, as well as log on/off, connectivity issues and battery life.

Gas alerts by type is a set of toggles where you can have your device(s) generate alerts for Over-Limit, High Gas, STEL, or TWA on an individual gas by gas basis.

- Each of these alert types has a drop-down selection available where you turn on or off alerts for specific gas types.

This is common (for example) for customers to choose to not generate an alert for CO, as many environments have wearers come in close proximity to running vehicle exhaust, which would generate an alert unnecessarily, as the wearer knows of the exposure and does not consider it to be a risk.

## Device Users

Lastly in the Alert Management Profile is the **Device Users** list. Here is where you identify which devices in your fleet are to use this profile. If a team member has been attached to a device already, then both the team member name and the device name will appear so you can include them in the list of devices using this profile.

## Notifications

As part of your Alert profile structure, you can use the Notification profile to create a second tier of alert notifications. This could be that you want a basic set of response rules and notifications in your Alert Management Profile, then a different set of notifications for a subset of events. For example; you could have your standard alert protocol set to send notifications of any gas event to team member "A," and an additional notification protocol to send notifications to a different team member (team member "B") any time a specific gas event (for example H2S) occurs.

## Contact Groups

Periodically, Blackline Safety will need to contact clients for a variety of reasons. Providing and maintaining the appropriate contact information below will ensure that the most appropriate individual receives our communications from us.

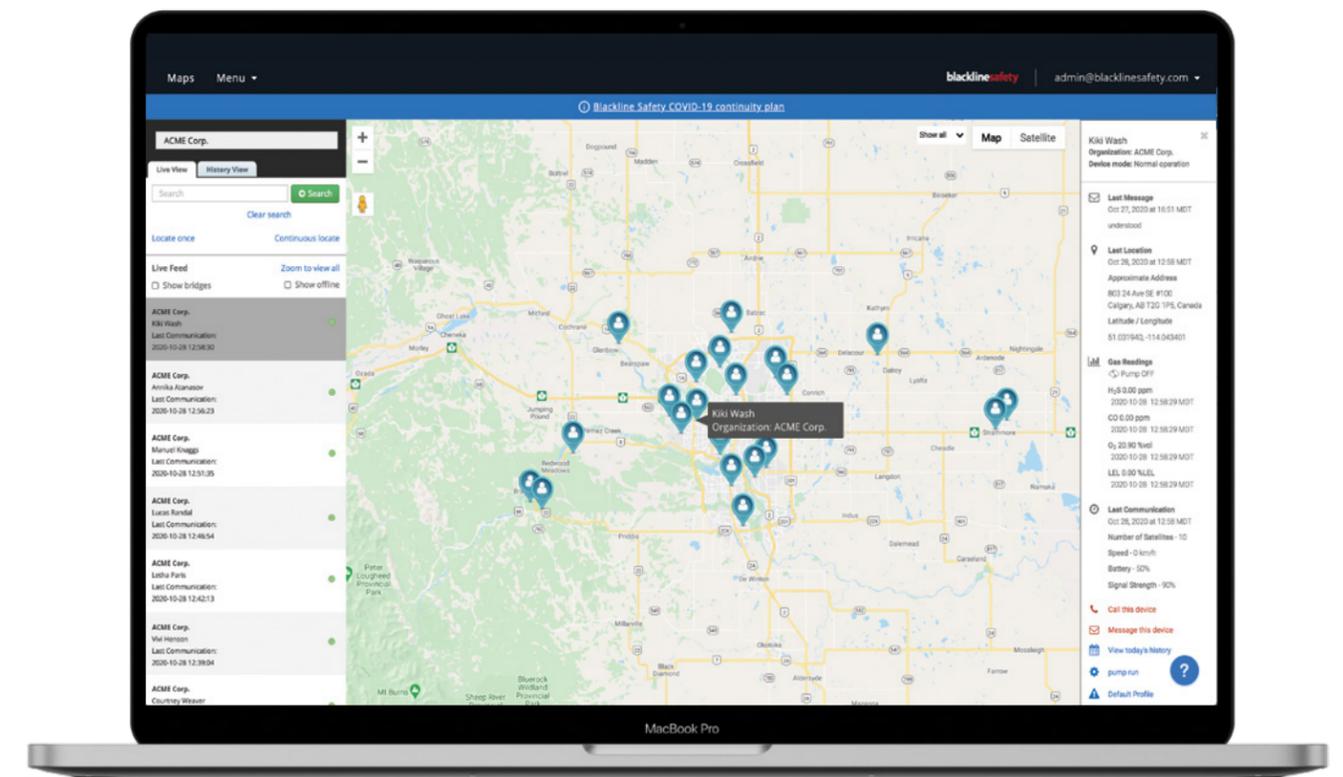
- Account Administrator** receives all communications regarding this account.
- Billing and Finance** receive only communication regarding billing and finance
- Website updates and new features** receive bulletins regarding new features and changes to the functionality in Blackline Live.
- Service outages** contacts receive information regarding any incident or event that may result in an interruption of service.

## Monitoring and Emergency Response

Blackline Live can be used as an active monitoring tool. Monitoring agents, whether in-house, external service providers or Blackline Safety's own Safety Operations Centre (SOC), can continuously monitors your gas detectors and Loner Mobile devices. Device locations are continuously updated, so you know exactly where all your device wearers are at any time. Alerts generated by these devices are typically received by Blackline Live within 2 seconds, allowing the monitoring agent to quickly acknowledge the alert and begin the process of resolving the issue. The system also maintains a complete history of these events for auditing and reporting purposes.

Blackline Live can be configured to automatically create notifications to specified team members in the event of an alert message. This is accomplished in the Alert Management Profile and Notification Profile pages.

Blackline Live's intuitive map-based tools show all of an organization's devices at a quick glance, including the device type, status and if any are in a state of alert.

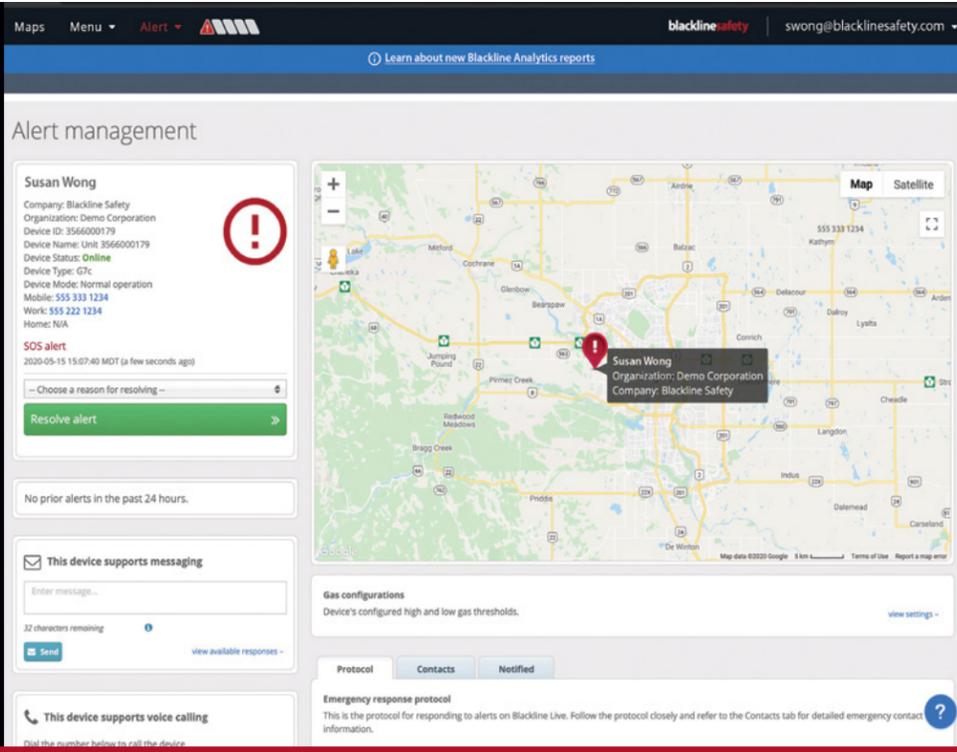




## 12. Alert Monitoring

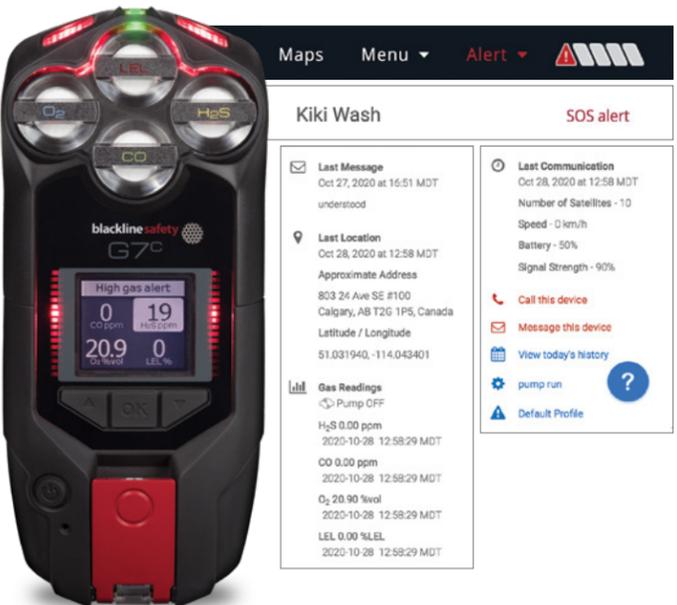
The device being monitored has an exclamation mark and red pin indicating that this device is in an alert state. In the black bar at the top you can see that an alert indicator has appear accompanied by the flashing bar symbol and an audible alert indicating an alert is active. In the information window to the left you can see a list of the devices being monitored and their current status.

When a device goes into an alarm or alert state, that information is communicated with Blackline Live immediately. In the case of alarms they are logged into the system for future investigation and reporting. For an alert, a red flashing indicator and audible sound plays to indicate to the monitoring agent that an alert event is under way or in the case of a notification only model, notifications are transmitted.



## 13. Alarm Sequence Example

A G7c detects a deficiency of oxygen such that it puts the device into Alarm. This sets off the yellow lights and siren for the user to mute and acknowledge and take appropriate action. This incident is transmitted to Blackline Live and logged into the device history.



# 14. Alert Sequence Example

The G7c has measured the oxygen levels below the safe threshold triggering and Alert. This sets off Red flashing lights and Siren then notifies a monitoring agent that the device in a Low Oxygen Alert Status. The user can mute the siren and turn off the flashing lights, but the issue is now being handled by the monitoring agent.



Maps Menu Alert SOS alert

Susan Wong SOS alert

**1** Acknowledge alert

Would you like to acknowledge this alert?

Close Yes

Their first step is to acknowledge the alert, which is indicated on the device as flashing blue lights. Then assuming the device has been configured with voice enabled; the agent initiates a call to the device where a handsfree call can be made to communicate with the user to determine their condition and respond accordingly.

**2** Susan Wong

Company: Blackline Safety  
 Organization: Demo Corporation  
 Device ID: 3566000179  
 Device Name: Unit 3566000179  
 Device Status: Online  
 Device Type: G7c  
 Device Mode: Normal operation  
 Mobile: 555 333 1234  
 Work: 555 222 1234  
 Home: N/A

SOS alert  
 2020-05-15 15:07:40 MDT (a few seconds ago)

— Choose a reason for resolving —

Resolve alert

The Emergency Response Protocol in Blackline Live directs the process of responding to (and resolution of) an incident. After the incident is resolved by the agent the alert is logged into the system.

**3**

Last Message  
 Oct 27, 2020 at 16:51 MDT  
 understood

Last Location  
 Oct 28, 2020 at 12:58 MDT  
 Approximate Address  
 803 24 Ave SE #100  
 Calgary, AB T2G 1P5, Canada  
 Latitude / Longitude  
 51.031940, -114.043401

Gas Readings  
 Pump OFF  
 H<sub>2</sub>S 0.00 ppm  
 2020-10-28 12:58:29 MDT  
 CO 0.00 ppm  
 2020-10-28 12:58:29 MDT  
 O<sub>2</sub> 20.90 %vol  
 2020-10-28 12:58:29 MDT  
 LEL 0.00 %LEL  
 2020-10-28 12:58:29 MDT

Last Communication  
 Oct 28, 2020 at 12:58 MDT  
 Number of Satellites - 10  
 Speed - 0 km/h  
 Battery - 50%  
 Signal Strength - 90%

Notifications are sent according to the alert profile and details of the event are then made available through Blackline Safety's Analytics Reports.

The kinds of events that trigger an Alert and immediate notification to a monitoring agent are defined in the Alert Management Profile



# 15. Incident Response

The screenshot displays the 'Alert management' interface with several key components:

- Alert Details (1):** Shows information for Pierrick Perrault, including organization (ACME Corp), device ID, name, status (Online), type (G7c), mode (Normal operation), and mobile number. A 'High gas alert (H<sub>2</sub>S)' is noted with a timestamp. An 'Acknowledge alert' button is present.
- Alert History (2):** A summary box stating 'No prior alerts in the past 24 hours.'
- Messaging (3):** A section indicating 'This device supports messaging' with a text input field and a 'Send' button.
- Voice Calling (4):** A section indicating 'This device supports voice calling' with contact information for ACME Corp.
- Notes (5):** A text area for adding notes, with a 'Post Note' button.
- Alert List (6):** A list of recent alerts, showing details for ACME Corp alerts received by server and triggered by device.
- Map (6):** A map of the United States showing the location of the alerting device with a red pin.
- Gas Configurations (7):** A section for 'Gas configurations' with a 'View' button.
- Emergency Response Protocol (8):** A detailed protocol for responding to alerts on Blackline Live, including steps for evaluation, SOS alerts, and emergency contact procedures.

# Alert Management Screen Anatomy

- Device information window** - This window displays all the profile information associated with a device in an alert state. Employee information, Configuration, Mode phone numbers and the nature of the alert.
- Resolve Alert** - This is the tool the agent uses to explain the reason for the resolution of an alert, a reason must be provided to resolve an open alert. These reasons available include:
  - System Test** - This is used to flag the event as an internal test, not an actual safety event.
  - False alert without dispatch** - User was called and indicated they were "okay"
  - False alert with dispatch** - could not reach user, then dispatched according to protocol, later found out that the user was okay.
  - Incident without dispatch** - This is used when a legitimate incident has occurred, but the user indicated that they did not require emergency response, so none were dispatched.
  - Incident with dispatch** - For when an incident has occurred, and emergency responders were dispatched. Our SOC agents will follow up with emergency responders to ensure they reached the user and close the ticket with notes that responders reached the user.
  - Pre-Alert** - This option is used by monitoring agents to clear unacknowledged or unresolved alerts in an organization that has been enabled for monitoring and has open alerts in their system. The resolves any ambiguity around test alerts and alerts after an organization has gone "live" with a monitoring agent.
  - Demo / Training** - Used when resolve alerts initiated for sales or training demonstrations
  - System Maintenance** - Used during service interruptions to identify (in particular) missed check-in alerts that occurred because of an outage, rather than the user missing the check-in request.
- Text Messaging window** - if the device supports text messaging (G7 family not loner mobile devices) this is where the agent can type in a message to be transmitted and displayed on the target device.
  - Messaging Limitations include: 2 lines of text, 16 characters per line. Currently English characters except \ and ~ which cannot be used.
  - A dropdown is available by clicking on the "view available responses" link. The standard set of text messages available on the target device is shown. These messages can be modified in the Configuration Screen / Available messages section
- Logging window** - This is a free-form window where the monitoring agent can enter the specifics associated with the response and resolution to an alert. This is useful information when reviewing alerts and alert management after the fact.
- Alert Management Map** - Displays the location of the device in alert, as well as other devices from the same organization that are nearby.
  - Right-click the map to bring up a useful measuring tool that allows the monitoring agent to establish how far away another user is from the device in alert state.
- Gas Configurations window** - Shows if the device has gas sensors on board. By clicking on the view settings link to the right, this section expands to show the actual gas settings on the devices.
- Emergency Response Protocol** - Displays the customer's specific instructions for how to respond to specific alerts. This is used as a step-by-step guide for the responding agent to use when responding to alerts.

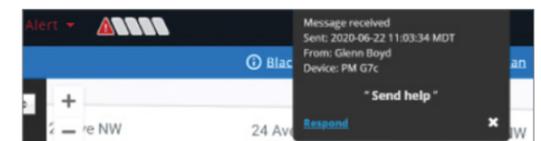
Gas configurations  
Device's configured high and low gas thresholds.

Device's configuration: Solo Rides  
Configuration version: 2

H <sub>2</sub> S	CO	O <sub>2</sub>	LEL
Low threshold: 5.00 ppm	Low threshold: 35.00 ppm	Drift/leak Low threshold: 23.50 %vol	Low threshold: 10.00 %LEL
High threshold: 10.00 ppm	High threshold: 200.00 ppm	Drift/leak High threshold: 23.50 %vol	High threshold: 20.00 %LEL
		Depression High threshold: 18.00 %vol	
		Depression Low threshold: 19.50 %vol	

*NOTE: Blackline Live is configured to automatically resolve alerts left unresolved after 14 days.*

- Alerts in the last 24 hours** - This window lists all the alerts from this device in the past 24 hours, useful for an agent to identify patterns.



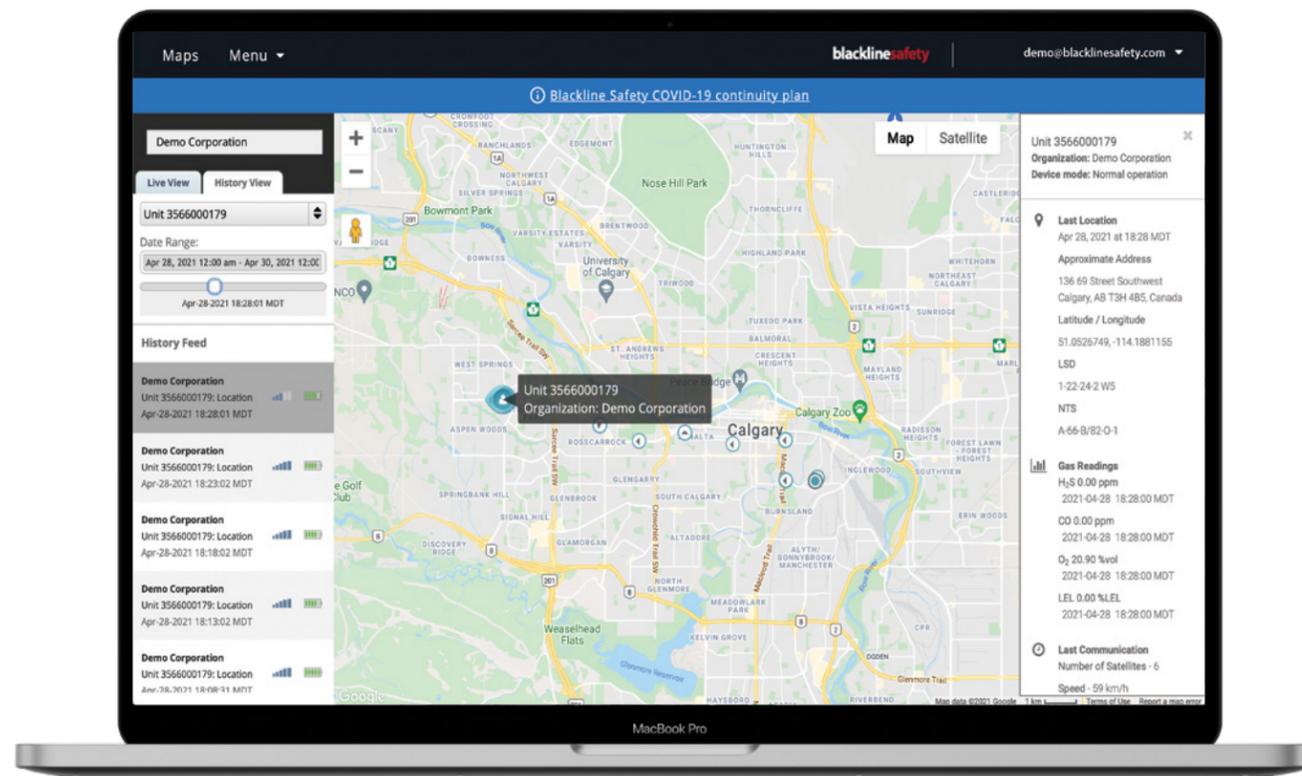
## 16. History View

The Map page can be viewed in the Live view (shown prior) or in a history view. The history view gives the Blackline Live user the opportunity to drill down to see the devices history of events over a specified period. You can choose a time window within which to view your device history, blackline live creates a list of all events including scheduled communications, logging on / off, alarms and alerts. Clicking on any of these events reveals a second information window to the right of the map with the details associated with that event.

The history view also shows the geo-location reported by that device over that same period. This is displayed in a "breadcrumb" format.

This map view (just as with the Live View, can be viewed in traditional map format or in satellite imagery to provide better geographic definition.

Further floorplans can be incorporated to provide even finer resolutions when tracking device locations.



## 17. Dashboard

Blackline Live's dashboard page provides an intuitive at-a-glance view of your entire fleet of devices and their compliance with bump tests and calibration. This is what we refer to as "Fleet Health." Two pie charts display as simple red/green representation of devices that are currently compliant and those where action is required. The two charts represent the current devices on-line and the other shows the entire fleet regardless of whether the devices are currently on-line or not.

Below is a line by line table of your organization's devices and their individual status. Here you can see if a device is online, any of nearly 40 possible errors and messages from each device which could include: Calibration due, Bump test due, Cartridge missing, etc.

This display can be modified using the "Display" pulldown to select the columns to show or hide.

## Reporting

Blackline Live includes a suite of powerful analytics-based reports that provide an enhanced view of your device and user pool. These reports take advantage of the incredible amount of information available when using connected devices to provide useful insights on:

- Alerts
- Bump and Calibrations
- Devices and Cartridges
- Docks
- Event Maps and Reports
- Gas sensor readings
- Location beacons
- Usage/Compliance
- Close Contact Tracing

**Blackline Safety's Vision division** offers a wide variety of custom analytics and data science products for customized reporting and analysis.

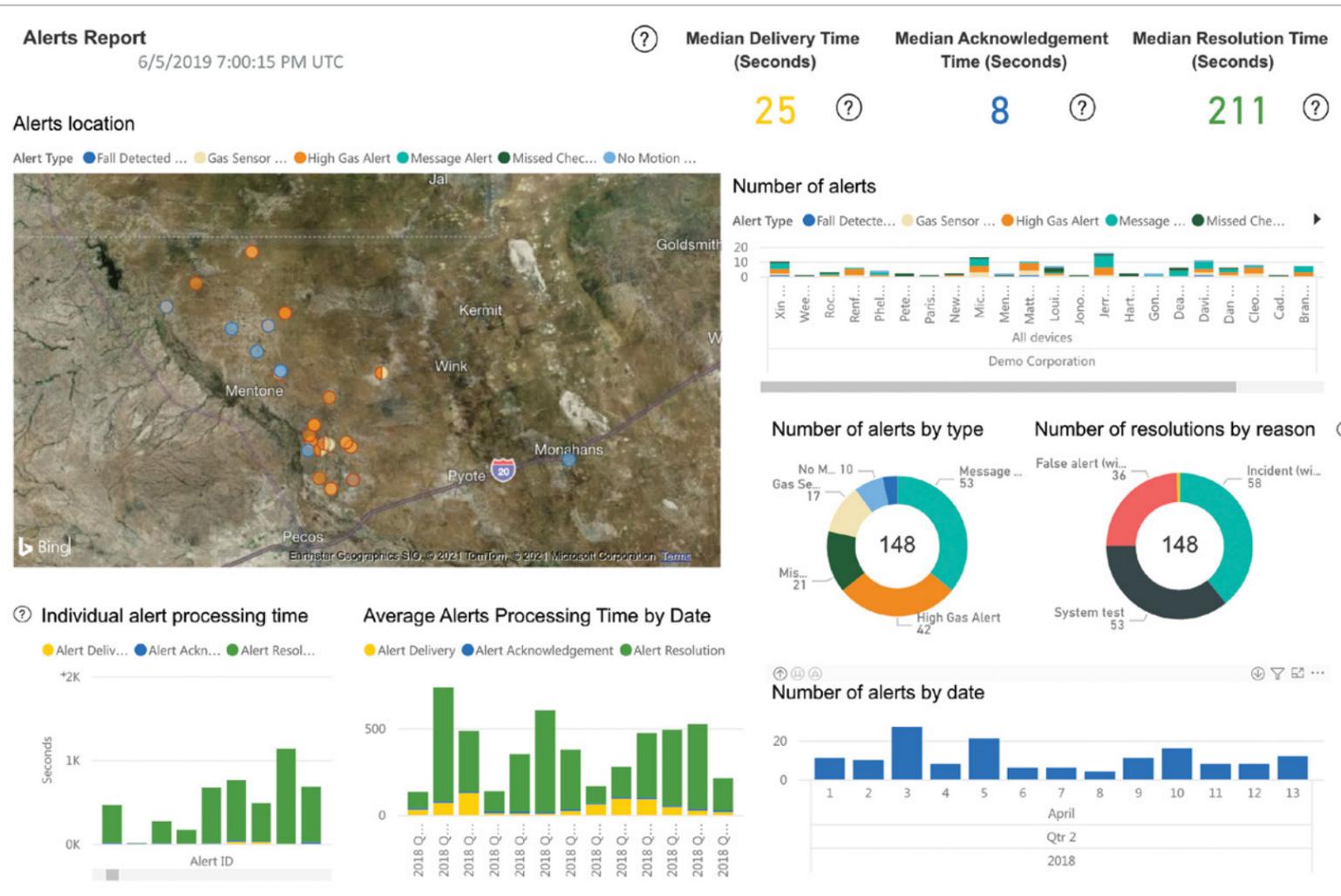
# 18. Alerts

The Alerts report can instantly provide insight into what hazards your workers are exposed to in the workplace, and how often they are occurring. If your devices are monitored, you can also use this report to review the efficiency of your monitoring team.

You can cross reference with other visuals in the report to help form improvement strategies:

- You can monitor the number of alerts over time to see whether any new training procedures, processes or policies have had an impact on the number of alerts being experienced.
- If you are curious about the performance and efficiency of your monitoring team, you can review how long it takes alerts to be acknowledged and resolved.

Depending on whether you want to see high-level trends or perform granular troubleshooting, you can see alert processing times as an average, or individually.



## Insights:

- Certain areas on-site might be more susceptible to alerts, indicating that the area may need to be avoided, or that workers may need special equipment to work there. Clusters of similar alerts are a sign that an area might be a danger to workers. By looking at the alert locations map, you can see where alerts are taking place and identify potential problem areas.

The alerts report can help evaluate whether a group of workers might require more training, or whether they are being disproportionately exposed to hazards.

Check the alerts chart to determine which groups or individuals are experiencing the most alerts.

# 19. Bump and Calibration Compliance

For work that may be done in areas with hazardous gases, gas compliance tests are essential for ensuring gas detection equipment is functioning properly.

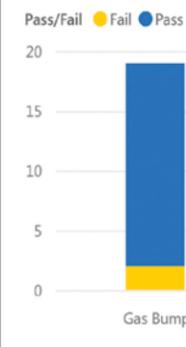
Companies that work in these conditions strive for 100% compliance to ensure the safety of their workers.

## Bump and Calibration Report

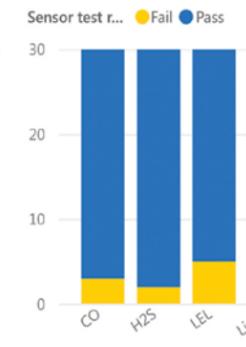
Last Updated: 6/5/2019 7:00:15 PM CDT

Number of tests: **30**  
Number of devices: **17**  
Number of docks: **2**  
Fail %: **23.33%**

### Number of tests



### Tests per sensor type



### Tests



## Insights:

This report gives an overview of how many successful and failed tests have occurred and provides valuable information for troubleshooting failure cases.

- Here you can see if some users are getting more test failures than others and may reveal a gap in training.
- Devices can be tested manually, or with G7 dock. Both methods can result in different kinds of test failures. This report is incredibly valuable in troubleshooting; see how many tests are performed, the number of devices tested, how many docks are being used and the overall success rate. Use this report in combination with the usage and compliance report to determine whether compliance trends coincide with bump test and calibration frequency and success.

## 20. Devices and Cartridges

The Devices and Cartridges report delivers a general overview of your device and cartridge fleet. This report shows what kind of devices and cartridges are in the organization, as well as the firmware status and gas compliance status of the devices.

## 21. Docks

Use the docks report to see an overview of where your docks are being used and the test results of gas compliance tests.

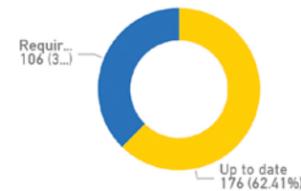
### Asset Utilization Report - Devices and Cartridges

Last Updated: June 05, 2019 19:00:15 UTC

Total Devices

282

Firmware status



Total Cartridges

115

#### Total Fleet

Device type	Number of devices
G7 Bridge	142
G7x	140

#### Cartridges

Sensors	Number of cartridges
CO H2S O2 LEL	6

#### Latest firmware

Device type	Latest firmware version
G7x	3.411R1
G7 Bridge	3.411R2

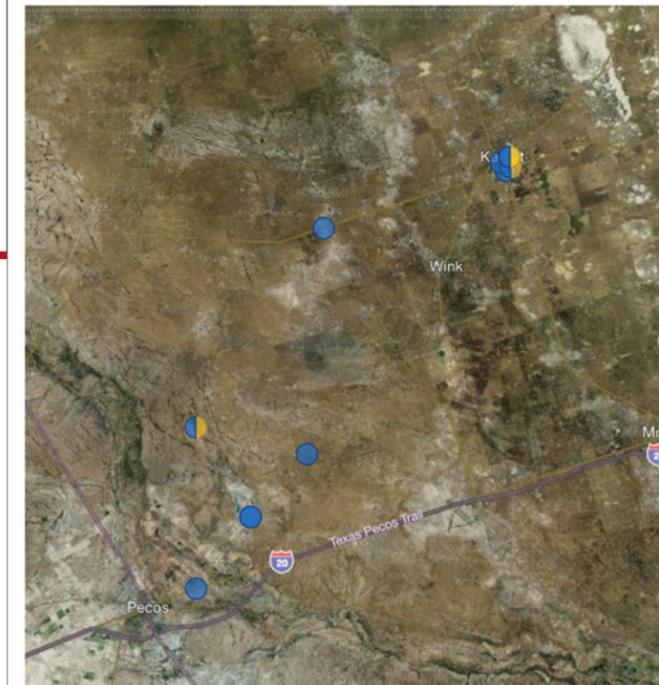
### Insights:

- This report gives an overview of your device fleet at a specified point in time. This overview includes what kind of devices you have and how many of each kind, as well as how many cartridges and gas sensor combinations you are using.
- A device's firmware version can determine whether the device has certain information or features available. This report can indicate how many devices have outdated firmware and which firmware each device is running.
- You can use this report to check the gas compliance of your device fleet and get an idea of which devices need to be tested soon. The device logs table includes the date and time the devices were last bump tested or calibrated, the date and time the next tests are due, as well as the current compliance status of each device.

### Asset Utilization - Docks

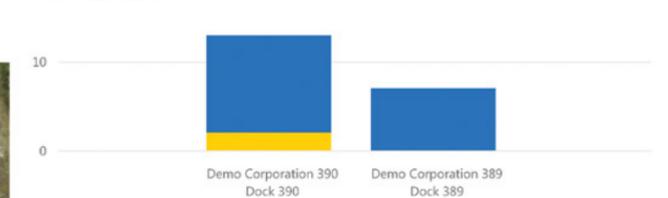
Last Updated: 6/5/2019 7:00:15 PM CDT

Pass/Fail ● Fail ● Pass



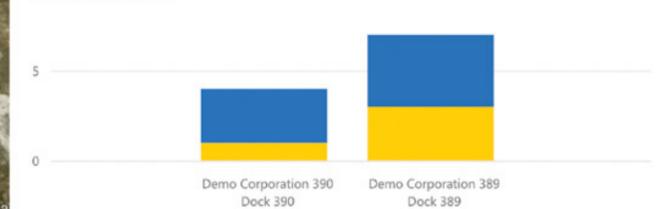
#### Bump Tests per Dock

Pass, Fail ● Fail ● Pass



#### Calibration Tests per Dock

Pass, Fail ● Fail ● Pass



#### Dock Logs

Dock ID	Dock Name	Last bump test	Last bump test result	Last calibration	Last calibration result	Total number of bump tests and calibrations
389	Dock 389	4/9/2018 3:18:35 PM	Pass	4/12/2018 7:09:27 PM	Pass	14
390	Dock 390	4/14/2018 1:19:27 PM	Pass	4/11/2018 1:47:05 PM	Fail	17

### Insights:

- To see how many tests were performed on each dock, refer to the bar chart visuals on the right side of the report. These charts, split into bump tests and calibrations, indicate how many tests passed or failed.
- The map visual indicates where bump tests and calibrations are taking place and give you an idea of where docks are set up or if they are being moved around. The colour of a point will indicate whether the tests performed in that location passed or failed and hovering over the point will give an exact amount of how many tests passed or failed.
- The dock logs list the date and time that a bump test or calibration was performed on each dock, as well as the results of each test. The columns of this table can be sorted to quickly see which docks are failing tests, or which docks are not being used.



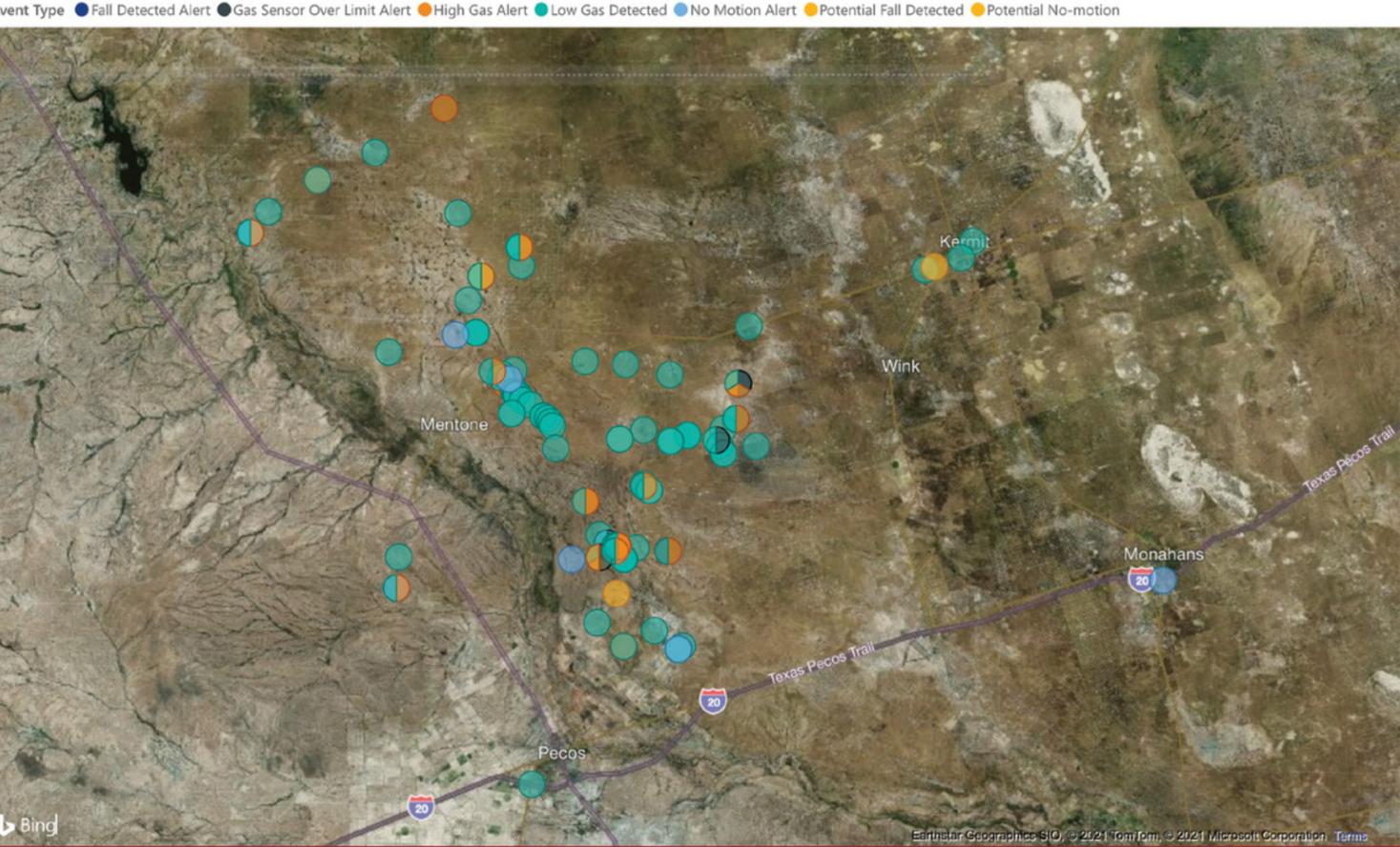
# 22. Events Map

Knowing where a worker was located when they received an alert can be incredibly valuable when identifying or monitoring potentially hazardous areas.

## Event Heat Map Report

Last Updated: 6/5/2019 7:00:15 PM CDT

Reset page



### Insights:

- By default, you will see a distribution of all events that occurred on a map. Use the filters to filter out any events types you do not want to see. Clusters of events are an indicator of a hazardous area. You can zoom in to see the area in more detail. To troubleshoot events from a group or individual has experienced, you can select them from the filters in the sidebar.
- The Events Map provides a crucial piece of information in concert with the Events Report by showing you exactly where alerts take place. Being able to prepare for work in a potentially hazardous areas can help workers avoid emergency incidents.

# 23. Events Report

There are several non-alert events that your Blackline device fleet can be exposed to that can deliver valuable information about the environment they are being used in. Monitoring non-alert events can help you identify and address potential hazards before they result in an actual alert scenario.

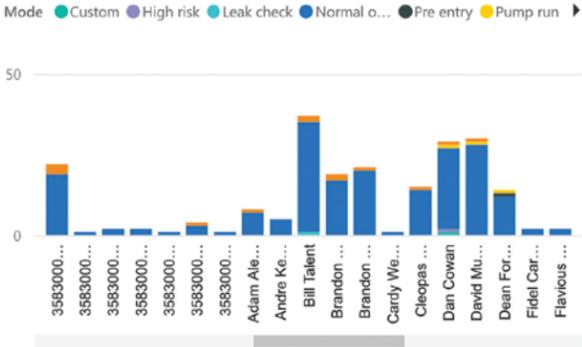
## Event Report

Last Updated: 6/5/2019 7:00:15 PM CDT

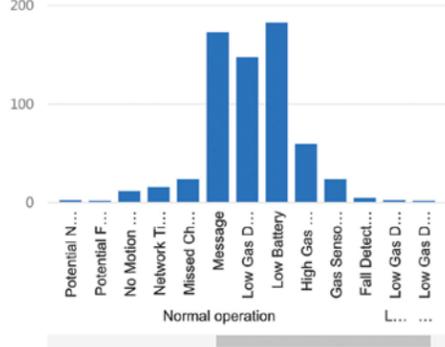
Reset page

Total events: 710  
Devices related to events: 68

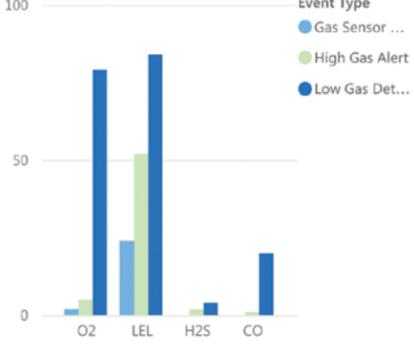
### Events per user



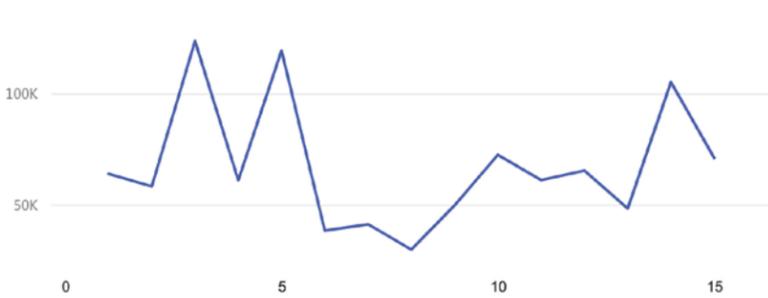
### Events per type



### Gas events per sensor



### Total events over time



### Events details

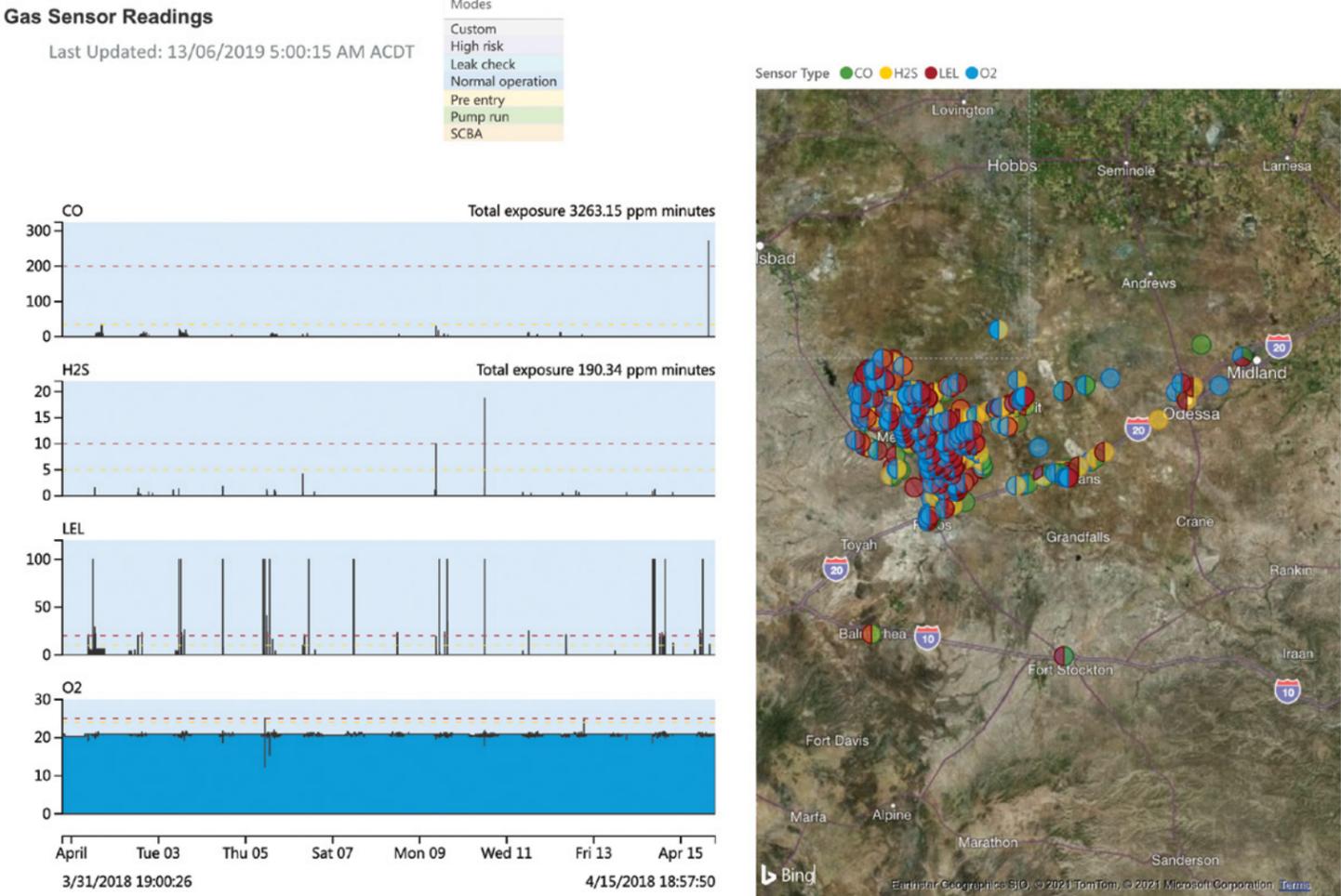
Organization	Group Name	Assigned Device User	Mode	Event Type
Demo Corporation	All devices	3583000513	Normal operation	Low Battery
		3583000515	Normal operation	Low Battery Network Timeou
		3583000521	Normal operation	Low Battery

### Insights:

- Events can be compared between groups of users to evaluate whether a group of workers might require more training, or whether they are being disproportionately exposed to hazards. High frequency of warning alarms like low gas alarms and fall detection alarms can be an indicator that an area is hazardous and should be addressed to avoid an alert scenario in the future.
- The number of events can be tracked over time to determine whether new policies, procedures or training are helping to reduce the number of hazards workers are exposed to.

# 24. Gas Sensor Readings

The Gas Sensor report allows you to understand where workers are being exposed to gas no matter how small the amount. This will help reveal areas that have hazardous gases, and combinations of hazardous gases.

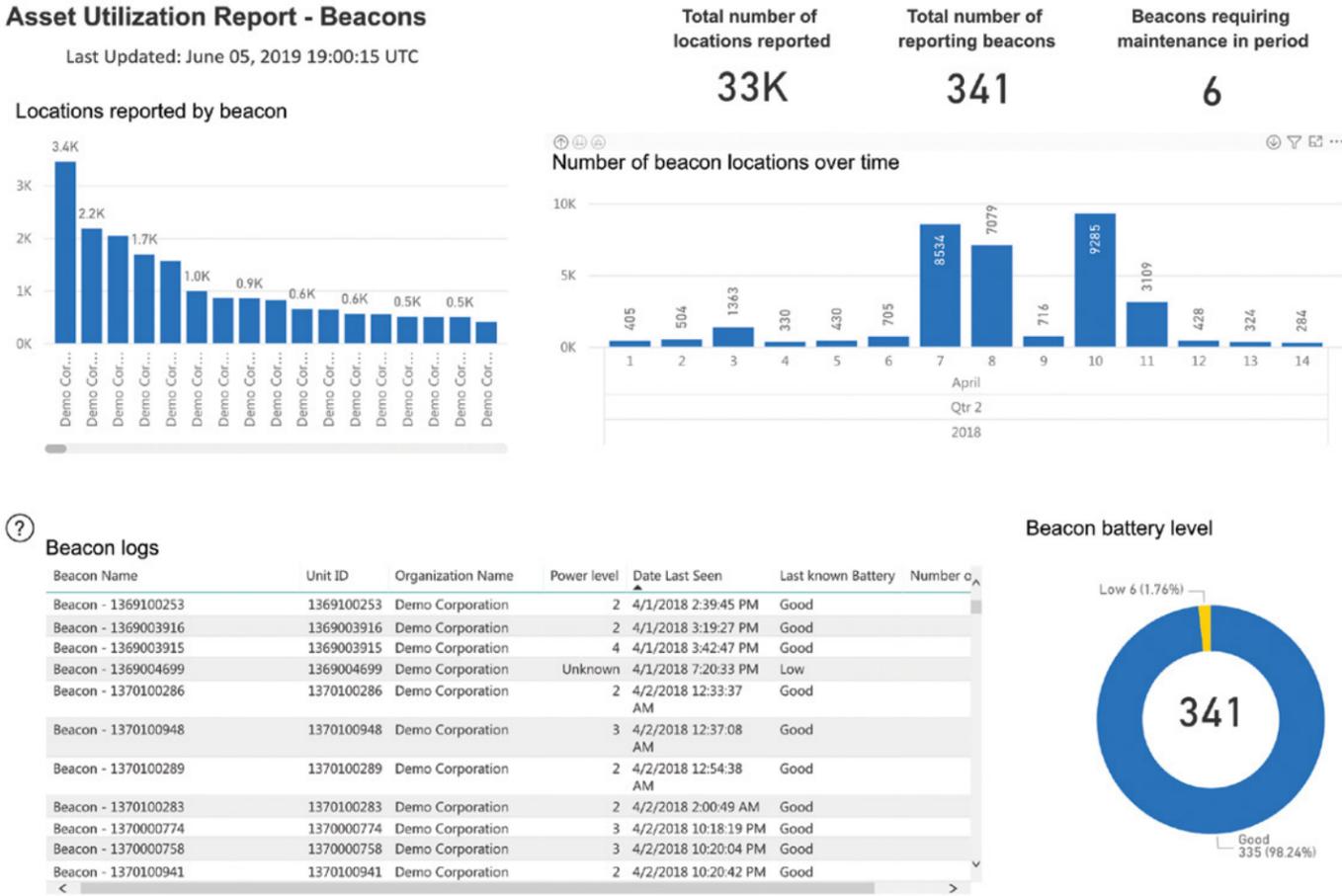


**Insights:**

- The gas readings report lists out gas readings for each gas sensor over the same span of time. This allows you to compare readings over time and reveals if there are multiple exposures happening at one time. Areas of exposures are shown on a map, so you can see concentrated areas of frequent exposures that may need to be avoided or may require workers to wear specialized equipment to enter.
- Hovering over a point will reveal when the reading was collected and what it was at the time. This report is valuable for troubleshooting events, as well as seeing a trend of gas exposure information over time.

# 25. Location Beacons

This report provides an overview of your Blackline Location Beacon fleet. This report can provide you with insights regarding the efficiency of your beacon placement, and which beacons need maintenance.



**Insights:**

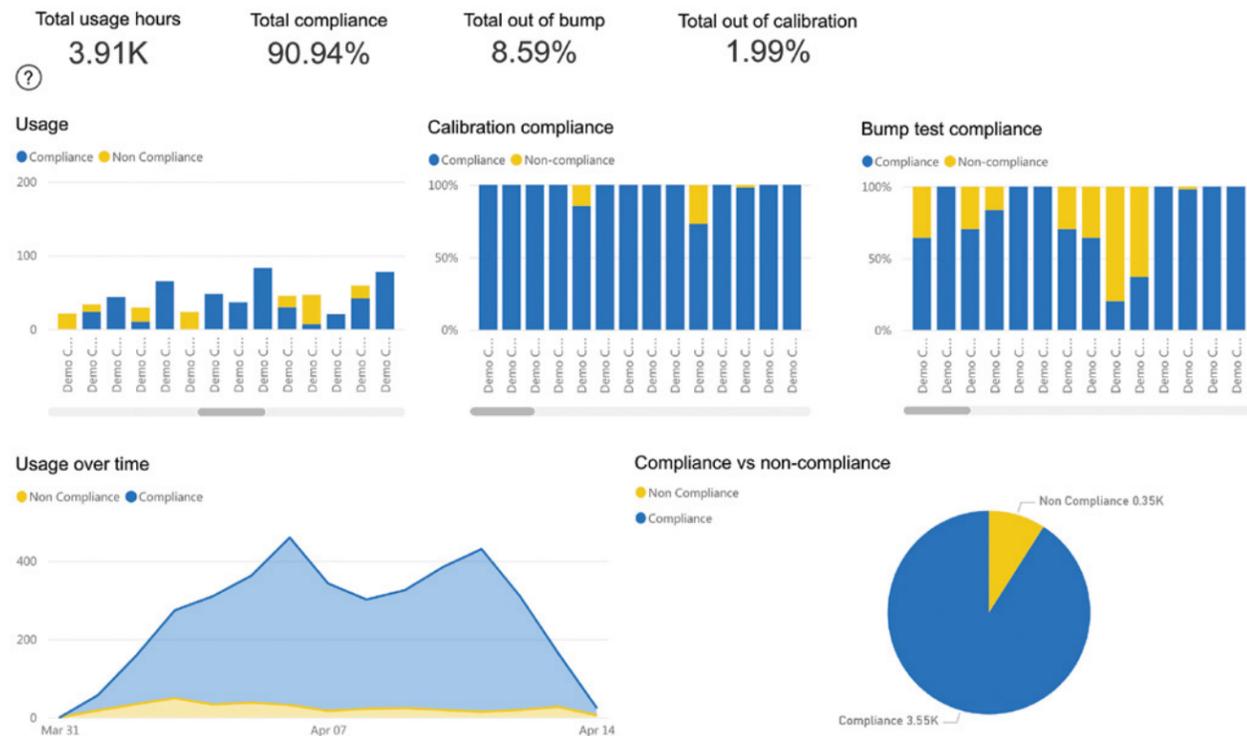
- To determine if your beacons are set up in good locations, monitor the amount of locations being collected over time, and check to see if any beacons have significantly fewer locations than the others. Fewer locations indicate that beacons are set up in areas that are not frequently travelled and are not serving their function to provide accurate locations.
- Since beacons require little maintenance and typically only need to have their batteries replaced every five years, it can be easy to forget to check their battery levels. A beacon cannot communicate when it has run out of battery, but if you notice a beacon has not communicated recently and its last known battery level was "low," there is a chance that the battery may have died and needs to be replaced.
- The "beacon locations" tab shows the placement of your beacons on a map. The colour of the dot indicates the last known battery level — watch for yellow and grey dots, which indicate low and unknown battery levels.

## 26. Usage and Compliance

Usage and gas compliance are both metrics used to ensure workers are doing their jobs safely. This report tracks the percentage of compliance in your organization for high-level visibility and may highlight opportunities for policy and process improvement.

### Usage and compliance

Last Updated: January 15, 2020 19:50:01 U...



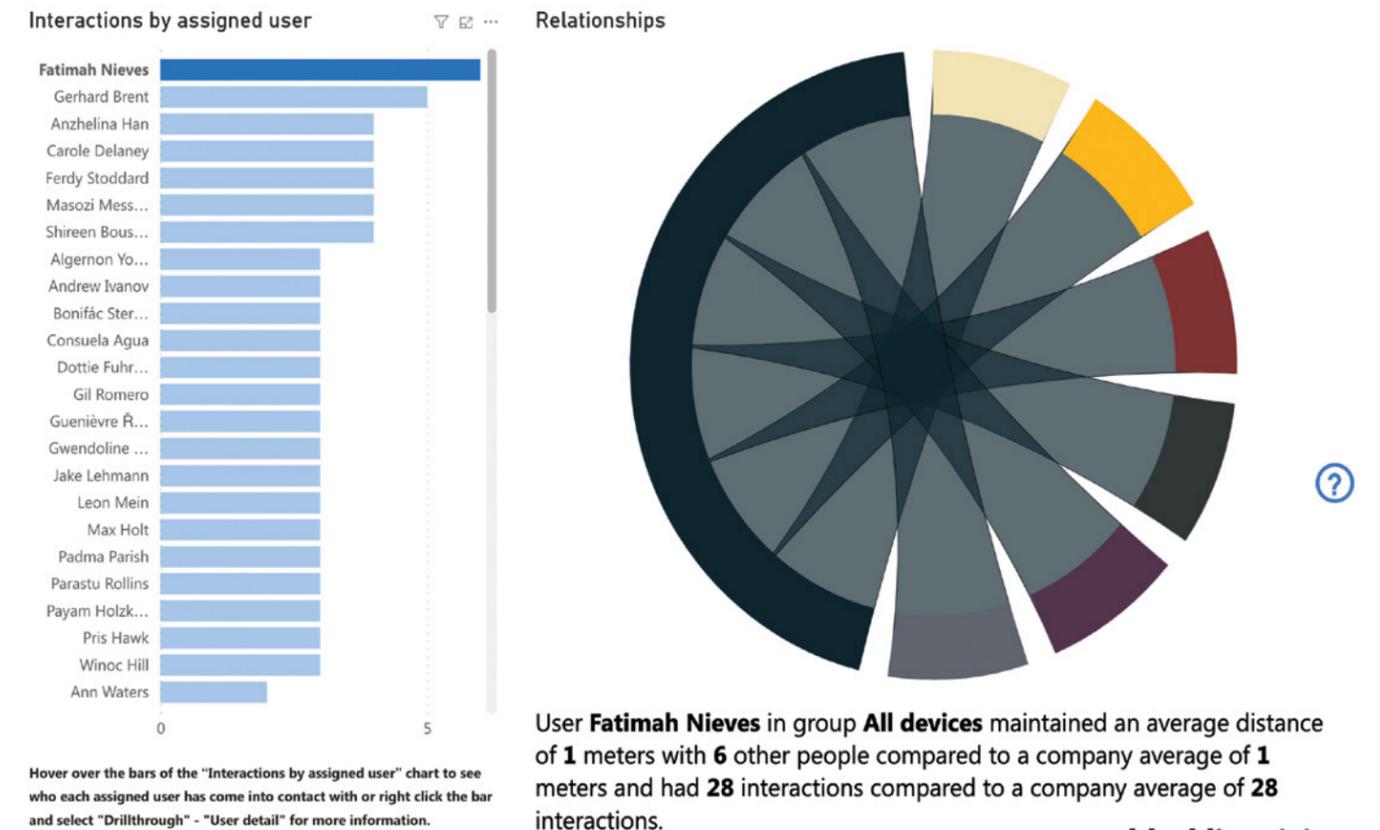
#### Insights:

- While device usage can be used as an analog for productivity measure, it primarily indicates that the device was powered on and monitoring a worker's safety for their shift.
- Most companies have a given number of usage hours they expect to hit. For example, they might expect a worker to have device usage for their entire shift. By sorting the usage visual, you can quickly see which group or individual has the most and least usage.
- Bump tests and calibrations are a requirement for working in areas that could contain hazardous gas. These gas compliance tests ensure equipment is functioning properly so that workers will be informed in the case of an exposure.
  - The goal for any company tracking gas compliance is to be 100% compliant by regularly testing gas detection equipment.
- This report reveals the percentage of compliance across the org or within a group to find gaps in training
- The information from this report can also be used in combination with the bump test and calibration report to troubleshoot the cause of test failures and non-compliance.

## 27. Contract Tracing

This report aids in monitoring social encounters between workers by generating a list of who was working near each other during a specified period. The report delivers information about which users were near one another and when, the smallest distance between them, and where instances of close encounters occurred on a map.

### Close Contact Report



#### Insights:

- This report will display the number of close contacts (2 meters) between employees wearing G7c devices. Use this report to assess how your organization is doing in managing your physical distancing guidelines.
- With this report, organizations can look for individuals who have an unusually high level of close contact interactions with other device wearers. This opens the opportunity for coaching on the importance and impact of physical distancing measures.
- A network map shows if processes or policies aimed at isolating groups into cohorts is working.

## Glossary

### Area monitoring

In areas where fixed gas detection is not practical, or during temporary procedures or emergencies, area monitors are used to provide the benefits of a fixed gas detection system that is independent of the established site infrastructure.

### Balance gas

The gas used to fill the remainder of the calibration gas cylinder after the correct concentrations of the calibration gases have been included. This is typically either air or nitrogen.

### Bump testing

Checks functionality of a gas detector by applying gas to the sensors to confirm that it continues to detect the presence of gas.

### Calibration

Applies a known quantity of gas to a sensor and adjusts the resulting measurements to match the gas applied.

### Calibration gas

Used to calibrate gas sensors. Contains known quantities of all gases required to perform the calibration procedure.

### Catalytic bead (pellistor) sensor

A combustible gas sensor design consisting of a catalyst bead and a reference bead. The catalytic bead burns the target gas and the reference bead does not.

### Combustible gas

A gas which will burn when mixed with oxygen at sufficient concentrations.

### Compliance

Legislated requirements of businesses to report on proper use and maintenance of gas detection equipment.

### Fire triangle

The fire triangle represents the three conditions necessary for a fire to occur: heat, oxygen, and fuel.

### Fixed detection

Permanent sensors are placed at appropriate locations to provide early warning of a gas exposure.

### Flammable range

The range concentrations of a combustible gas mixed with air which when heated to sufficient temperature will cause a fire.

### Flash point

The lowest temperature at which a liquid's surface gives off enough vapor to be ignited by a spark or small flame.

### Hydrocarbon compound

An organic chemical compound made up of only carbon and hydrogen elements.

### Hydrocarbon combustion

Occurs when a hydrocarbon compound mixes with oxygen and is heated to sufficient temperature to cause a combustion reaction.

### Hydrogen combustion

Occurs when hydrogen gas mixes with oxygen and is heated to sufficient temperature to cause a combustion reaction.

### Ignition temperature

The lowest temperature at which a heat source can cause a combustible gas to ignite.

### Lower explosive limit (LEL)

The lowest concentration at which a combustible gas and air mix can ignite.

### Micro Electromechanical Systems (MEMS) sensor

Combines mechanical and electrical components onto a single chip.

### Molecular Property Spectrometer (MPS)

A combustible gas sensor which analyses the properties of the target gas and automatically classifies the gas and adjusts reading for greater accuracy.

### Nondispersive infrared (NDIR) sensors

A combustible gas sensor that utilizes a compound's absorption of infrared radiation to detect the presence of gas.

### Percent lower explosive limit

The percentage of a gas' concentration relative to its lower explosive limit.

### Personal monitoring

The last line of defense against gas exposure events. Workers on a site with gas risks wear a personal gas monitor in their breathing zone to monitor the air they are being directly exposed to.

### Poisoning

Occurs on a pellistor sensor when contaminants decompose on the surface of the catalyst bead, decreasing the sensitivity of the sensor or in some cases causing a full failure. This condition is permanent.

### Sensor overload

A shift in baseline readings of a pellistor sensor caused by exposure to high concentrations of combustible gas. This shift can take several days to revert to normal.

### Upper explosive limit (UEL)

The upper limit of the flammable range of a combustible gas.

### Volume per volume (%v/v)

The percentage mixture of a gas in the air.



## Additional Resources

- **Blackline Safety website:**  
[blacklinesafety.com](https://blacklinesafety.com)
- **Blackline Safety support website:**  
[support.blacklinesafety.com](https://support.blacklinesafety.com)
- **LEL-MPS Combustible Gas Sensor Info Sheet:**  
[blacklinesafety.com/lel-mps-one-sheeter-download-0](https://blacklinesafety.com/lel-mps-one-sheeter-download-0)
- **G7c Personal Safety Wearable information with cellular connectivity:**  
[blacklinesafety.com/g7c-wireless-gas-detector](https://blacklinesafety.com/g7c-wireless-gas-detector)
- **G7x Personal Safety Wearable information with satellite connectivity:**  
[blacklinesafety.com/g7x-wireless-gas-monitor](https://blacklinesafety.com/g7x-wireless-gas-monitor)
- **G7 EXO Area Gas Monitor information:**  
[blacklinesafety.com/g7-exo](https://blacklinesafety.com/g7-exo)
- **Blackline's cloud connected sensor information:**  
[blacklinesafety.com/cloud-connected-sensors](https://blacklinesafety.com/cloud-connected-sensors)
- **Blackline Safety video:**  
[youtube.com/watch?v=JyH7FkKapNc](https://youtube.com/watch?v=JyH7FkKapNc)

**blacklinesafety**

Wherever there's a need for safety, we're there.

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**blacklinesafety**





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