

## Honeywell Process Solutions



# The Truth About Wireless Site Assessments

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## Introduction

When considering the implementation of an industrial wireless network, manufacturers and other end users must have a clear understanding of their wireless solution requirements, understand issues impacting the success of their installation and the return on technology investments. Important factors in the selection of a wireless solution include network performance, data security, reliability and cost.

Prior to moving forward with a wireless solution, end users should consider the potential value of conducting a complete onsite survey to determine the project scope, challenges and how their specific requirements can be met. Wireless site surveys typically address the coverage area desired at the plant, existing power and network infrastructure, and the goals or customer network requirements for the implementation (both immediate and long-term). The survey may also include a thorough assessment of interfering and operating frequencies currently in use or ambient in the environment, as well as any potential security exposures.

## Background

Newcomers to industrial wireless frequently have questions pertaining to the selection, installation and operation of this advanced technology. Their questions may include: What is a wireless site assessment? Why do the majority of reputable wireless equipment manufacturers recommend it while some companies say this service is not required? What is the truth about wireless site survey and design?

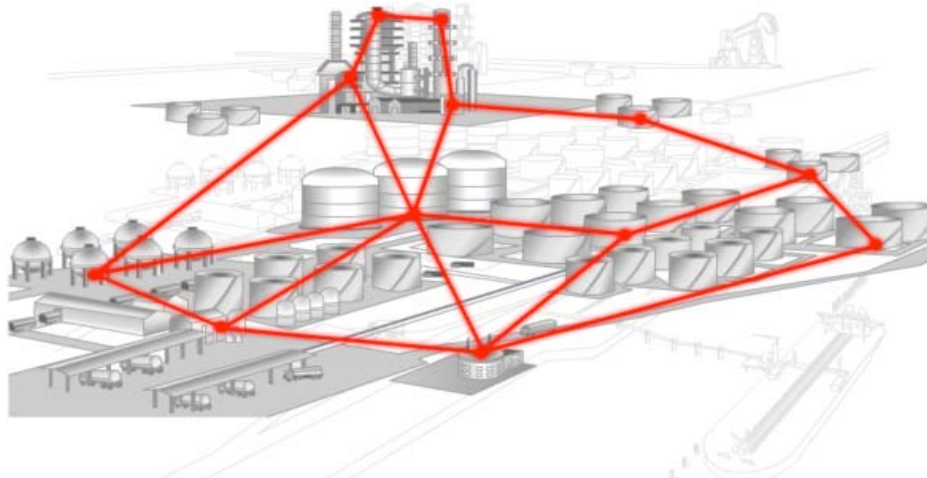
A wireless site survey, or RF site survey, is the process of planning and designing a wireless network for a specific installation site that will deliver a predetermined performance level, area coverage, capacity and quality of service meeting customer requirements. Dependent upon the customer's requirements, this process can range from a simple test to a full wireless site assessment that includes:

- Spectrum analysis of the site
- Physical verification of all planned equipment locations
- A review of currently deployed wireless networks
- Evaluation of various antenna choices to optimize performance
- Customer's expected applications
- How much area the client wants covered by the wireless system
- Any wireless systems already in place
- Planned wireless device locations to determine mounting and power requirements
- Equipment selection to meet the customer's requirements
- Correct antenna choices and mounting to optimize performance
- Physically testing and verifying all equipment locations

An assessment is typically performed on-site by qualified engineers with specialized equipment. The result is a documented design that has been field tested and will perform to designed parameters.

Independent studies have shown that most wireless networks installed today are not optimally designed and many do not provide the service levels they were intended to support. Because of this, stringent wireless site assessments, along with their resulting designs, are becoming essential, especially to support the new breed of wireless services such as video (process or security), real-time location services and wireless gas detectors. All three of these applications will be highly dependent on quality of service or who gets the bandwidth at the right time.

A robust, tested design will ensure the right application functions correctly when the situation is critical (See Fig. 1).



**Figure 1. A wireless site survey addresses implementation issues such as existing power and network infrastructure, and interfering and operating frequencies currently in use or ambient in the environment.**

So the answer to the question “Do I need a site survey?” is: it depends on the customer’s expectations for network performance, reliability and future capability.

## Questions to Consider

Is a wireless site assessment always necessary for the successful deployment of a wireless network? The short answer is no. The more correct answer is “it depends.” In truth, the need for a site assessment hinges on many factors, such as:

- What is the intended application and performance required?
- What frequency is the wireless system using to communicate?
- What is the intended area of coverage and how dense is it?
- How large is the facility?
- Will the new system be required to coexist with other existing wireless systems?
- How complex is the interface between the wireless and the wired network?

### **What is the intended application and what performance does it require; bandwidth/speed?**

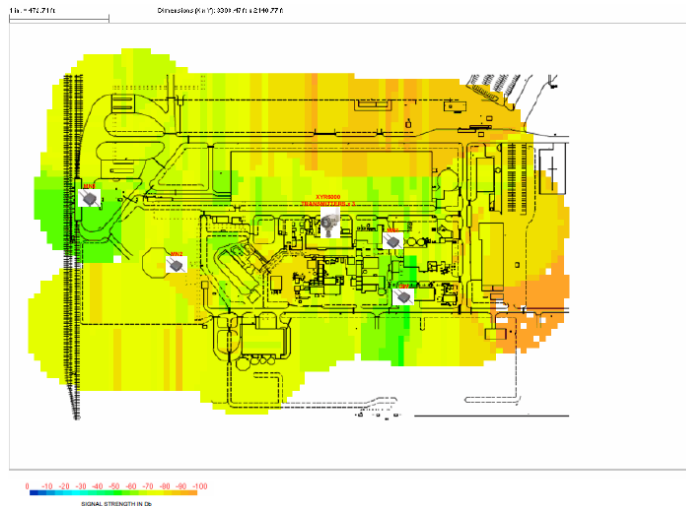
A pure field instrument application has very different requirements than a wireless video application. Understanding key requirements is critical to deciding whether or not to undertake a site assessment. For example, video is a very high bandwidth application whereas wireless field instruments typically do not require as much bandwidth but may have other critical criteria such as quality of service, latency or reliability maximization.

### **What frequency is the wireless system using to communicate?**

A meshing network will typically use either the 2.4 or 5 GHz range to mesh. 2.4 GHz is also used for IEEE 802.11 b/g, IEEE 802.15.4, and ISA100a communications. Other forms of wireless communications use the 700 to 900 MHz range. Knowing what you’re planning to do and what frequencies you will be using can affect your decision on whether or not to undertake a site assessment, since all frequencies have very different propagation characteristics. Typically, the higher the frequency, the less effectively it propagates and is attenuated by obstructions which could result in a higher density, more costly or lower performing system.

## What is the intended area of coverage?

Obviously, a smaller area of coverage should make for a simpler wireless design, unless the area of coverage is a very dense maze of structure and piping barely allowing daylight in. Although RF can have some success in cluttered industrial environments due to reflections or creating multiple communication paths by bouncing off objects, if you can't physically see through an area, chances are wireless equipment will not perform optimally either (See Fig. 2). Therefore one may need to implement various antenna choices and/or locations to make the system meet the customer requirements.



**Figure 2.** One of the deliverables from a wireless assessment is a WiFi coverage thermal map. A wireless site assessment involves planning and designing a wireless network for a specific installation that will deliver a predetermined performance level, area coverage, capacity and quality of service.

## How large is the facility?

The takeaway here is the size of the facility in relation to the requested area of coverage. If today's goal is the crude unit only, the entire team should still keep in mind the big picture and take into consideration possible future requirements for the rest of the plant. This provides assurance that investments made today are not wasted as the network expands.

## Will the new system be required to coexist with other existing wireless systems?

If no wireless currently installed in the facility and future planned RF density will be minimal, it will simplify deploying a new wireless network. Conversely, high RF density onsite or planned for the future will complicate deployment and may have an impact on the customers key system requirements.

## How complex is the interface between the wireless and the wired network?

This point is very much joined at the hip with what applications the customer is expecting to run. A pure field instrument application has a relatively simple connection to the DCS. A mobile worker application is somewhat more complex, especially if network security best practices are implemented. An equipment health monitoring application has different requirements than a field instrument application. Wireless video has completely different requirements from all of the above.

## “I've deployed wireless equipment before and been successful, what if I don't do a site assessment?”

As previously mentioned, a deployment not preceded by a site assessment may still function. However, even a wireless system involves a fair amount of engineering and installation work to install. Depending on the device, there may still be a requirement for power cable. The equipment needs to be mounted on some sort of bracket. If the wireless device is in the wrong location, all of this work is for nothing. Additional, but unnecessary equipment may be ordered and deployed in an

attempt to overcome the shortcomings of poor equipment placement. Without a site assessment, trying out and ordering antenna options in an attempt to increase performance may be a waste of additional time.

**“My planning software claims to place my wireless equipment without having to actually go out into the field. Won’t that work?”**

There are major wireless survey software manufacturers with similar products. In some cases, they are very good. However, the software is only as good as the data entered into it. These packages typically require an image be loaded into the software and then defining the obstructions in the image. Currently, none of these packages are designed for the industrial environment. They have no options for pipe rack, cable tray, tanks and other obstructions routinely encountered in our industry. Even if there was such a package, no software can completely compensate for all the obstructions or interferences encountered in the real world. There is no substitute for actual field testing in order to maximize the performance of your wireless investment.

**“Can I successfully deploy a wireless network without a site assessment?”**

Wireless equipment can be deployed with success without a detailed site assessment. How successful the implementation is can only be determined by answering the questions we’ve discussed. Chances are that if you can physically see where you want to deploy wireless equipment from where you are, you can expect a functional wireless link between the two locations. The actual performance of the link can only be verified through testing.

Some factors can affect the link performance, such as interference in the area and antenna choices. If you compare the engineering and installation requirements of a wired field device to a wireless field device, you’ll see many parallels. They both need a physical location. They both need to connect to the process in some way, depending on their function. Where they differ is how they communicate with each other.

Although an electrician could engineer a wired field instrument installation by visually laying out the conduit and cabling, there’s usually an engineering package guiding the electrician as to what type of wire to use, what type of conduit and how it should be routed, and how the instrument should be mounted. This engineering package was developed with input from a physical inspection of the area, or a site survey. In the case of a wired field instrument, the specifications are very detailed about how long a certain type of cable can be and other mounting characteristics. This is because, in general, external environmental factors don’t affect a wired field instrument. Wireless field instruments, on the other hand, can be susceptible to environmental factors around them.

Also, without test equipment, it is difficult to visualize how RF communications could be affected by unseen interference. A seasoned engineer can visualize how different antennas may react to a given physical environment, but this comes with the experience of many installations in different environments.

In Cisco’s Mesh Access Points, Design and Deployment Guide Release 7.0, the following statements are made regarding site surveys:

- “We recommend that you perform a radio site survey before installing the equipment. A site survey reveals problems such as interference, Fresnel zone or logistics problems. A proper site survey involves temporarily setting up mesh links and taking measurements to determine whether your antenna calculations are accurate. Determine the correct location and antenna before drilling holes, routing cables and mounting equipment.”
- “Cisco always recommends a site survey before taking any real estimations for the area and creating a bill of materials.”

## Conclusion

In conclusion, can a small wireless network be implemented without a site assessment? The short answer is yes. Will the network perform to its full potential or to the customers' requirements? It may or it may not. There are many factors to consider when deploying a wireless network; whether to perform a site assessment or network design depends on the importance the customer places on how the system should perform to meet their requirements.

### More Information

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