
# *Wireless Site Surveys*

## A Consolus White Paper

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Ready to jump on the wireless band wagon? Want to enjoy a successful WLAN experience? Start with a wireless site survey. Careful planning and design, which includes a comprehensive site survey, will ensure a successful deployment plan, taking into consideration user requirements, budgets, future growth, security, and performance.

## The Wireless Site Survey

So what is a wireless site survey? Simply put, a site survey establishes the foundation for building your wireless network. The survey becomes your network baseline document and, as such, is the fundamental tool that guarantees the success and viability of your implementation. And, because it is a snapshot of your network, it will become invaluable as you grow and fine-tune your network.

A well-executed site survey addresses such areas as system, user, and aesthetic requirements. It also addresses network applications, growth, performance, and security and takes into consideration the placement challenges of the radio frequency (RF) spectrum.

***An effective site survey is the foundation to a successful deployment plan.***

The objective of a site survey is to determine adequate coverage areas by verifying the number of wireless access points required, as well as their most effective placement and configuration.

The site survey process starts with reviewing the existing environment and ends with delivering a comprehensive site survey report.

The site survey process is comprised of three major phases:

1. ***Preparing for the Site Survey.*** The wireless specialist reviews the existing environment, prepares the site by gathering the required equipment and determining the optimal route, and does a preliminary site walk-through.

2. ***Conducting the Site Survey.*** The wireless specialist holds a kick-off meeting to start the project and does a formal site walk-through.

3. ***Developing the Site Survey Report.*** During this phase, the wireless specialist prepares the site survey report, reviews it with the project stakeholders, and works with your organization to plan the next steps in the implementation process.

After the initial site survey, it is recommended that you conduct periodic reviews of your environment and make adjustments to your network accordingly.

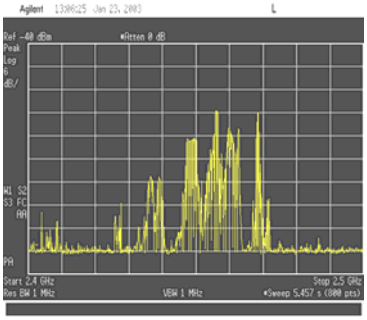
## Wireless Environment Types

The first step in the site survey process is determining what type of environment you have. This will dictate the format and complexity of the survey. There are four different types of environments. A wireless specialist can help determine what type of environment you currently have.

The four types of environments are:

1. No existing RF in the facility or in the area. This is considered a new deployment.
2. No existing RF in the facility, but RF in the area. The RF that is in the area must be identified and taken into account when conducting the survey.
3. Existing RF in the facility that the new network must work in conjunction with.
4. Existing RF that is unidentified (e.g., old equipment that may conflict with the new network). In this case, a spectrum analysis is recommended.

## The Spectrum Analysis



***Spectrum analysis graph***

A spectrum analysis is often done in conjunction with a site survey, particularly for large or complex facilities and/or challenging RF environments. The goal of a spectrum analysis is to determine what portion of the radio frequency (RF) spectrum is currently in use by other systems and to discover potential interference.

In addition to discovering what parts of the spectrum are in use, a spectrum analysis is used to detect if any 'out of band' RF energy exists and to determine its affect and potential conflicts with the frequency ranges of your proposed network. For example, if your proposed network is 802.11b (2.4GHz) a spectrum analysis will discover if there are any neighboring sources or sources from other technologies outside of the 2.4 GHz range. These 'out of band' energy sources can have strong power signatures that will produce harmonics that conflict with the proposed network (or 'in band' source). A walkie-talkie at one watt can cause a spike in the RF spectrum. A spectrum analysis done by a qualified vendor will identify all potential sources of conflicts.

Sources of RF interference can range from seemingly minor appliances such as microwaves to equipment essential to your operations. If the RF spectrum is in use by other systems, then steps are taken to determine if the multiple systems can co-exist with minimal interference and without affecting performance.

Based on the findings of the spectrum analysis, a channel plan is created. A channel plan documents what channels are available, if one is already in use, or if a different type of antennae is needed based on the findings.

Spectrum analysis data can also be used to determine signal strength, as well as size and shape of coverage areas.

### Who Should Conduct The Survey

A professional site survey should be performed by a qualified wireless integration vendor who possesses a solid knowledge of wireless environments and technologies. A certain level of experience is necessary to ensure that a high quality survey is performed. This will mitigate any risks to the overall implementation.

It is also important to take into consideration the types of facilities and RF environments the vendor has worked with and how similar those environments are to your environment.

A qualified vendor thinks in three dimensions, not just two. Because a wireless network goes beyond physical walls, it is important to test coverage areas and potential interference areas beyond just the immediate surroundings. For example, in a multi-floor structure, both the floors above and below the access point must be tested.

A wireless specialist has the knowledge and time required to focus on conducting a well-diagrammed and documented survey, so that your internal staff can focus on running your business.

## The Benefits of a Site Survey

Why perform a site survey? Without it, you risk incurring performance degradation, cost overruns, security breaches, and potential gaps in coverage areas, ultimately affecting user experience and administrative costs.

In large deployments, a site survey can result in a reduced number of access points required to cover an area, improved user experience, and a better designed network. This is because the network is designed specifically for the customer applications and the usage requirements for which it was intended.

The benefits of a wireless site survey are many. Most importantly, outsourcing the wireless site survey ensures that you have a solid baseline that accurately and explicitly depicts your network.

***O.J. Wolanyk, CIO of Memorial Health Systems in Springfield, Il, originally thought he would need 300 access points. A site survey, conducted by Consolus, helped him cut that number in half, resulting in a significant cost savings.***

| The Benefit | The Reason |
|---|---|
| Optimized number of access points | Based on user requirements and network applications, a site survey accurately diagrams the network and defines the appropriate network topology to optimize the number of required access points. |
| QoS evaluation | A site survey identifies areas that require higher concentrations of access points to increase aggregated throughput in geographical areas. |
| Minimized network interferences | A site survey includes a channel plan that allocates areas for RF noise and other existing wireless systems. |
| Blueprint for growth | The output of a site survey, the Site Survey Report, establishes a baseline for troubleshooting, ongoing reviews, addition of technologies, and future growth. |
| Increased ROI | A site survey is the foundation for a deployment plan that will save networking dollars, |

| | |
|---|---|
| | reduce operational management and troubleshooting issues, and also increase user acceptance and productivity. |
| Shortened implementation cycle | A site survey provides the starting point and takes the guesswork out of the implementation process, reducing the overall implementation timeframe and the time spent on troubleshooting. |
| Knowledge transfer mechanism | The Site Survey Report provides a single point of reference for all areas within your organization. As employees change, this document will provide the turnover vehicle to ensure your network runs smoothly and correctly. |

**Pre-Site Survey Checklist**

Before beginning a site survey, you should have the following:

- Building floor plan
- Wireless equipment for testing access points
- Antenna specifications and examples
- Number of users, including remote users
- Mobility needs
- Coverage area requirements
- List of applications that use wireless
- Example of proposed client devices

A comprehensive Pre-Site Survey Questionnaire helps facilitate the Existing Environment Review.

## Preparing for the Site Survey

Because a site survey affects so many areas of your organization, advanced preparation is critical in order to facilitate the process.

### Existing Environment Review

***Review the current environment.*** This includes the existing network, security policies and procedures, current systems, applications, and processes. The review includes identifying any existing access points and channel settings and current network usage problems, if any.

***Gather information.*** The following information should be available: floor plans, blueprints, square footage, network/phone closet locations, and number of users in each area.

***Understand the network requirements.*** Become familiar with the applications and types of clients that will use the network, the proposed topology design (e.g., will there be multiple VLANs vs. one VLAN), performance and security requirements and security protocols. Note future growth plans, if known.

### Site Preparation

***Gather the required equipment.*** Have the following equipment available before starting the walk-through: access points, antennas, battery chargers, camera, and the wireless equipment for testing access points. The wireless access point and client devices should match the proposed equipment to be installed as closely as possible. If possible, have examples of other wireless equipment for testing with the proposed solution.

***Determine the optimal route.*** Study the floor plans and evaluate the environmental and user requirements, existing RF, and potential noise sources to determine the best start point and route through the facility. Create a channel plan.

***Conduct a preliminary walk-through.*** Walk through the facility with a wireless sniffer to determine what channels and parts of the spectrum are in use and could be potential noise sources.

## Conducting the Site Survey

A site survey should always be conducted; however a scaled-down version may be applicable in some circumstances. A scaled-down version will still cover the elements of a full survey. A full survey will not necessarily be required in environments with less than three access points (e.g., a SOHO environment) and where issues of security and performance are not of issue.

Most importantly, a survey should be conducted at the start of a new wireless network implementation. In addition, a site survey should be conducted before extending an existing network or before undergoing new construction or building changes.

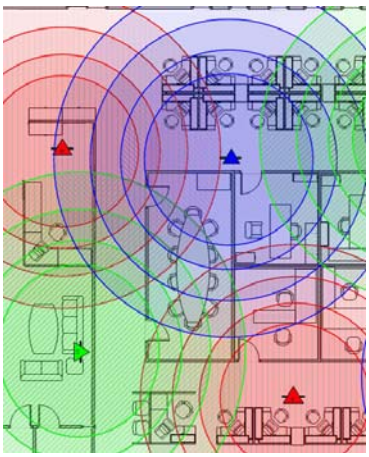
### Kick-Off Meeting

A kick-off meeting is the opportune time to discuss the logistics of the site survey project, including:

- creating a communication plan
- verifying the deliverables
- establishing the timeframe for the project
- reviewing the project plan and schedule
- identifying key contacts
- coordinating the site roll-out
- identifying and documenting any risks
- reviewing change management procedures

In addition, it is important to review the findings from the Existing Environment Review, resolve any open questions, and review the objectives of the site walk-through.

## The Site Survey



*Access point transmission radius*

A survey walk-through is the most important component of a site survey. Nothing can substitute for actually being there and testing access point coverage.

During a walk-through, the goals are to test for access point coverage and to determine the best placement based on the coverage requirements, fault tolerance needs and aesthetic requirements. In addition, the wireless specialist looks for RF interference and determines and documents signal strength.

The walk-through includes plotting access points, taking measurements, ascertaining signal to noise ratio, and identifying user areas – both fixed and mobile (roaming).

To do this, the wireless specialist will set the access point, walk the perimeter of the signal strength and verify the location by reading the coverage at varying distances away from the access point. This is where the three-dimensional thinking comes in. It is important to take readings not only on the same floor, but also on floors above and below and mark the basic service areas on the floor plan and note any RF interferences.

During a walk-through, it is essential to operate the typical applications and potential RF noise sources (e.g., microwaves) in the areas where users most often use them and test coverage and signal strength. The walk-through should also allow for other RF installations – those in other buildings or in organizations within your building.

## The Site Survey Report

The Site Survey Report is your baseline document from which you will implement your network. Additionally, it will be your baseline for troubleshooting and for future growth of your network. This document gives you detailed information about what your RF environment will look like.

Having a comprehensive Site Survey Report will reduce your risks and save you time and money in the long run. If your RF network is poorly designed and problems occur, you can spend a substantial amount of time troubleshooting to find out where and what the issues are. If your resources are limited or stretched, you may not be able to spend the time required to troubleshoot and correct. Ultimately, your network costs increase.

The Site Survey Report contains specific recommendations related to your site and includes:

- a detailed access point coverage map*
- interference problem areas
- pictures of access point locations

- graphs of cell coverage
- firmware and hardware
- the equipment used in the survey
- bill of materials required for the specified network installation

*The access point coverage map includes a detailed network diagram, noting access point placement and configuration (including information about external access points), antenna type, orientation, and special mounting, cabling, and power options.

### Close-Out Meeting

The final step in the site survey process is to hold a close-out meeting to deliver the final Site Survey Report, review the details of the site survey, discuss any changes, concerns, and lessons learned that were uncovered during the survey, address key milestones moving forward and to plan the next steps in the implementation process.

NOP World identified the following advantages of going wireless:

1. Users were 22% more productive due to increased connectivity.
2. ROI savings averaged over $550 per user, exceeding initial estimates.
3. Accuracy improvements were reported by 63% of users.
4. Quality of life improvements were noted by 87% of respondents.

*Source: NOP World – Technology, "Wireless LAN Benefits Study," Fall 2001)*

## Ongoing Reviews

Because a site survey is a snapshot in time of your environment, ongoing reviews and fine tuning are a must. As your environment changes, your network must be able to adapt and reflect those changes. It is critical to update your network diagram to keep it accurate and timely.

The easiest way to conduct an ongoing review is to walk around your facility. Find out if any of your neighbors have added a wireless network. Have you recently reorganized? Check to see if there are any new design plans or office configuration changes being contemplated. Discover if coverage areas have been affected by any furniture or equipment moves. Has new equipment been added? Check to ensure that coverage is still in effect and that there isn't any RF interference.

Most importantly, as you walk around your facility, note the changes, and update your documentation to reflect the latest configuration.

As with any project, success is determined by the effort put into the planning and design stage. For WLAN implementations, the site survey is a critical component of the planning and design stage. It is your roadmap to a successful implementation, ensuring that it will meet your users' expectations, increase productivity, and enhance performance expectations – ultimately improving your users' overall quality of life.

## *About Consolus, Inc.*

*Consolus, Inc. is a solutions delivery company focused on emerging technologies for voice and data communications and key business applications.*

***Consolus is endorsed by industry leaders Cisco, Panasonic, AirMagnet, and Bluesocket.***

*Consolus possesses a solid understanding of wireless technology, wireless security, and VoIP. As a wireless systems integrator, Consolus will assist you in the planning, design, implementation, and ongoing support of your network. Consolus has successfully implemented WLANs in the healthcare, hospitality, financial, and education arenas.*

*The skilled team at Consolus began conducting site surveys before 802.11 standards were fully ratified. At that time, wireless site surveys were highly recommended as a requirement for the licensed and unlicensed spectrums. Surveys were used to identify optimal coverage per access point and to guarantee the appropriate coverage. These determinations were extremely critical ten years ago, when the cost of access points were in the thousands of dollars.*

*Consolus' experience and knowledge has grown from that point to include the latest wireless technologies – 802.11b, 802.11a, and the newest entrant in the field, 802.11g. Over the years, Consolus has performed a significant number of site surveys under very demanding conditions, ranging from compressed timeframes and constrained budgets, to technology and environmental challenges*.

*Consolus has been in business since 1999, initially focused on technology application studies and consulting services. In early 2001 the company added hardware and services delivery for voice and data infrastructure applications.*

*Contact Consolus at 303.777.2254 or visit our web site at www.consolus.com.*