TELXON

Prepared by:
Telxon Corporation
911 Western Avenue, Suite 401
Seattle, WA 98104-1031

Site Survey Report

Contact names and customer references have been replaced for this sample document

Northwest Mill

A Division of Major Mills
123 Main Street
Mayberry, WA 98765

Table of Contents

1. Contacts

Telxon Corporation 911 Western Avenue # 401; Seattle, WA 98104	
James, VP, NW Sales	123-456-7890
Al, Director of Technical Services	123-456-7890
Tony Cataldo, Systems Engineer	123-456-7890

Northwest Mills	
Contact1, *Name remove from sample*	*Address Removed from sample document*
Contact2, *Name remove from sample*	*Address Removed from sample document*
Contact3, *Name remove from sample*	*Address Removed from sample document*

2. Site Survey Summary

Telxon performed a site survey for Northwest Mills. This report includes the site survey results for the mill. The mill was surveyed for a 900 MHz wireless data collection network. This mill will use a combination of vehicle mounted terminals on forklifts, fixed terminals, and possible handheld RF devices in the future.

Site Description

The mill consists of several buildings of varied construction. Most buildings use corrugated metal walls and roof over a wood or steel frame. Ceiling heights vary between buildings. The mill also has tall wood handling equipment, boilers, smoke stacks, towers, and silos that make RF coverage more challenging. The saw area (across the street from the main office) will be enclosed by a new structure. When completed most of the internal walls will be removed. The Hardwood mill may require a site tune after the new structure is completed. New Access Points (APs) may be required to cover the new buildings.

Coverage Requirements

This mill requires coverage in the following areas: Shipping, Storage (finished and green), Palletizing, outside the kilns, and most places where a forklift can move lumber. The RF system must provide redundant coverage in the Planar area, in the areas around the Kilns, and on the rail Loading Dock. The mill also requires a swap-out strategy in case an AP fails.

System Redundancy and Fallback

This mill will use five wired Access Points (AP) and two repeaters. The mill has lots of overlapping coverage areas and one of the APs can be temporarily used as a “hot spare” if required (AP#7). The mill will have a “hot spare” available locally (at the Centralia mill) in case of an emergency. If the network cable fails then most of the APs can act as repeaters until the network cable is repaired.

Survey Procedure

The 900 MHz surveyed used a PTC 860 with SRFPlus survey software, Arlan 630 Access Point (AP), and a 2dB omni-directional antenna. The final 900 MHz installation will use 3 dB omni-directional antennas instead of the 2 dB antenna. The results obtained using the 2 dB antenna ensure a very comfortable coverage safety margin when using the 3 dB antenna on the final system. The survey tests consisted of echoing data packets between a PTC-860 terminal and an Arlan 630 Access Point. These data packets ranged from 750 to 1,500 bytes in length. The CIM Vision software uses an intelligent terminal application with minimal sized data packets. These smaller data packets will also increase the effective RF coverage area (the smaller the data packet the greater the RF coverage).

3. System Component/Configuration Summary

Arlan 630 Ethernet Access Point

The Arlan 630 Access Point (AP) provides a wireless link between RF terminals and the wired network. Each AP provides a specific area of coverage called a “microcell.”

2 dB Omni-Directional Antenna

The 2dB omni-directional antenna connects directly to the 630 AP. This 10” antenna provides good coverage for most areas. The 2dB omni was used for the site survey.

3 dB Omni-Directional Antenna

The 3dB omni-directional antenna connects to the 630 AP and provides optimum coverage in dense stock areas. This rugged antenna hangs downward when installed. The 3dB antenna provides about 25% - 30% more coverage than the 2dB antenna used in the site survey.

Survey Parameters

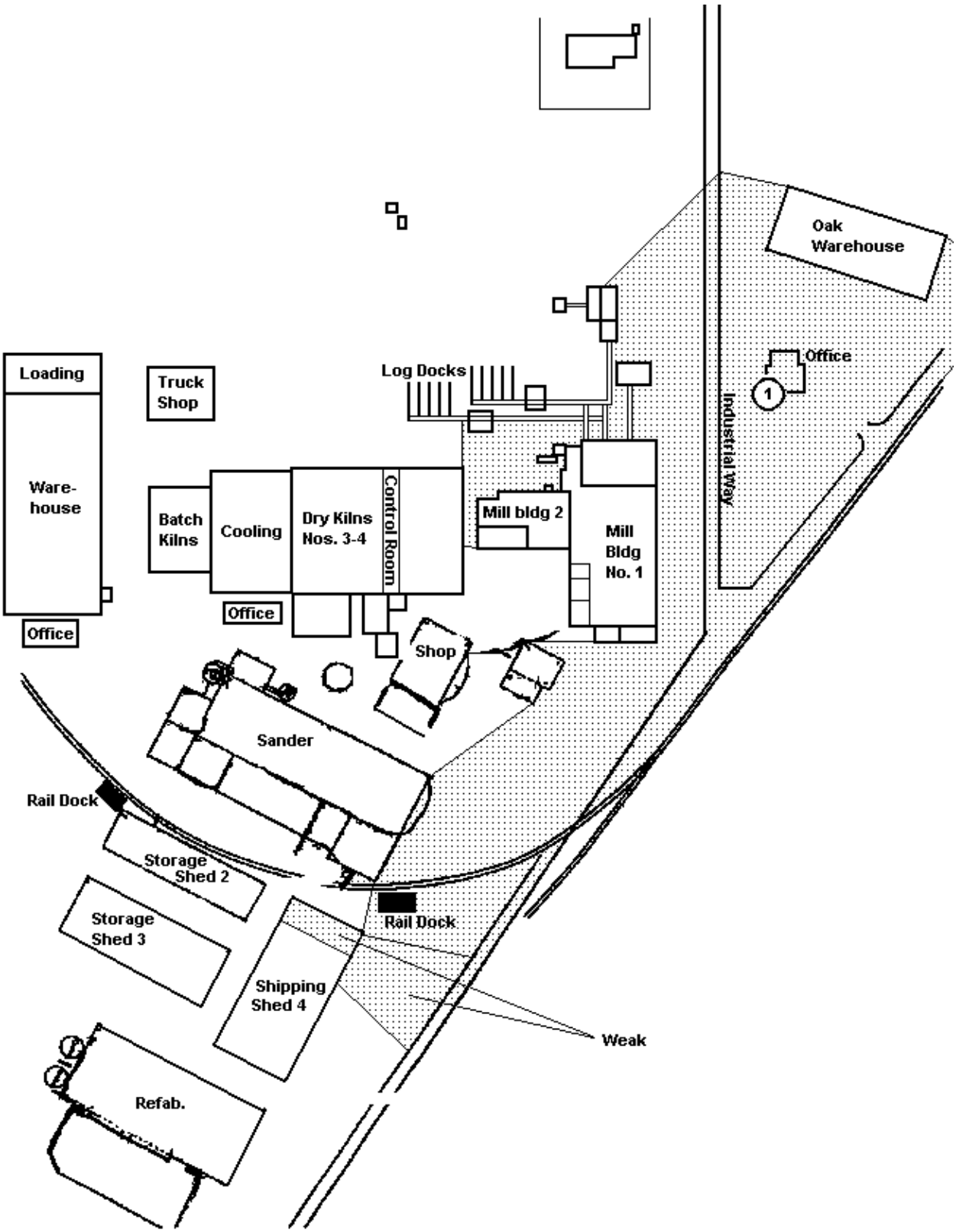
Access Point	900 MHz	Arlan 630 Access Point (AP)
Antenna	900 MHz	2 dB omni-directional antenna
Terminal	900 MHz	PTC-860 with SRFPlus diagnostic survey software
Frequency	900 MHz	PTC-860 channel 4 (917.83 MHz)
System ID	900 MHz	SYS_ID = 2
Packet Size	900 MHz	750 bytes (back Warehouse)
		1,000 bytes (Shops and Store Rooms)
		1,500 bytes (all other APs)

4. Equipment Placement: Hardwood Mill

This section contains placement details and maps for each AP. This survey covers the mill as it exists on the day of the survey. A site tune may be required after the Kiln is completed (foundation was being laid on the day of the survey). This equipment placement tried to take into account these new buildings but Telxon can make no guarantees or claims about coverage in the new buildings until they are constructed.

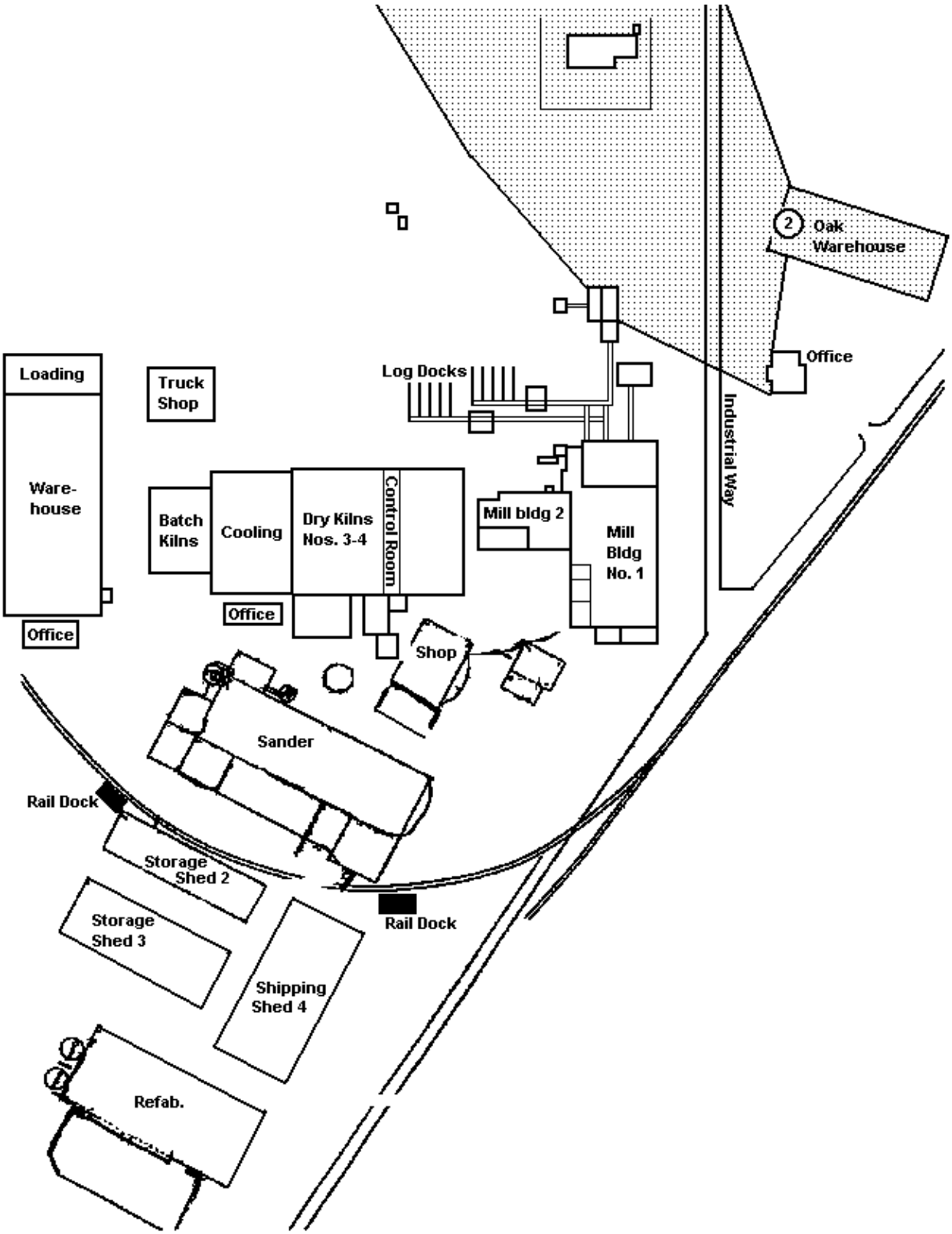
5.1 Equipment Placement: Main Office (AP#1)

Access Point #1	
Equipment	900 MHz Arlan 630 Access Point, 3dB MaxRad omni-directional antenna, 20' coax extension cable, and lightning arrestor.
Location	Mount the antenna on a short mast on the front corner of the building above the roof line. Mount the antenna on the side of the Office closest to Industrial Way and on the side farthest away from the Oak Warehouse. Mount AP#1 on the inside wall of the office and use a 20' coax cable to connect the AP to the antenna. Run the cable through a hole in the front wall to avoid putting any holds in the roof itself. Mount the AP so that the status lights are easily visible.
Coverage	This antenna covers roughly one-third of the mill. AP#1 provides coverage for the areas around the Industrial Way, the lumber storage areas near the road, and the rail loading dock. It also provides a wireless link to AP#2 in the Oak Warehouse.
Cabling	Connect AP#1 to the existing Ethernet network in the office. Power the AP using the existing AC power.
Note	When installing this antenna make sure that it provides a strong signal to the antenna in the Oak Warehouse. The antenna must be installed such that the front of the office building does not block the signal going to the Oak Warehouse.


Oak
Warehouse
Office
1
Industrial Way
Loading
Truck
Shop
Log Docks
Ware-
house
Batch
Kilns
Cooling
Dry Kilns
Nos. 3-4
Control Room
Mill bldg 2
Mill
Bldg
No. 1
Office
Office
Shop
Sander
Rail Dock
Storage
Shed 2
Storage
Shed 3
Rail Dock
Shipping
Shed 4
Weak
Refab.

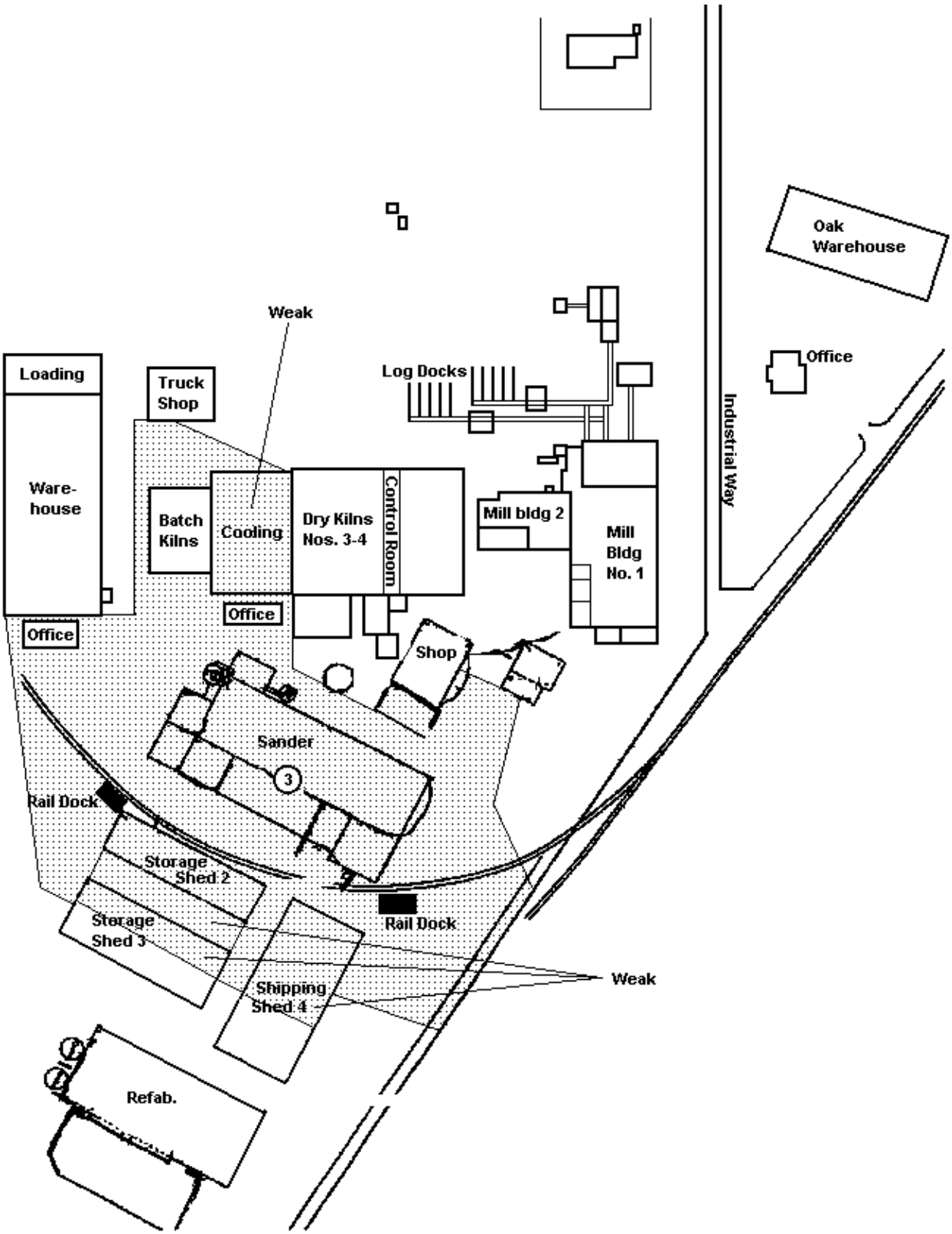
4.2 Equipment Placement: Oak Warehouse (AP#2)

Access Point #2	
Equipment	900 MHz Arlan 630 Access Point, 3dB MaxRad omni-directional antenna, 20' coax extension cable, lightning arrestor, and NEMA enclosure.
Location	Mount the antenna above the main doorway (front door) on the inside of the Oak Warehouse. The bottom of the antenna must extend about 6" below the top of the doorway. The bottom half of the antenna should be visible from the road in front of the building. Placing the bottom of the antenna below the top of the doorway allows the signal to cover the loading area in front of the warehouse. This antenna also allows the signal to connect with AP#1 at the Main Office.
Coverage	This antenna provides coverage for the Oak Warehouse, the loading area in front of the warehouse, and in the log yard area across the street.
Cabling	AP#2 acts as a wireless repeater to AP#1 in the Main Office. Mount the AP in a NEMA enclosure and connect it to the antenna using a 20' coax extension cable. Power the AP using the existing AC power and filter the AC using a small UPS.
Note	It is critical that this AP have a good wireless connection to AP#1 in the Office. Also, the antenna must be mounted as described above with the bottom of the antenna extending below the top of the doorway.


2
Oak
Warehouse
Office
Industrial Way
Log Docks
Loading
Truck
Shop
Ware-
house
Batch
Kilns
Cooling
Dry Kilns
Nos. 3-4
Control Room
Mill bldg 2
Mill
Bldg
No. 1
Office
Office
Shop
Sander
Rail Dock
Storage
Shed 2
Rail Dock
Storage
Shed 3
Shipping
Shed 4
Refab.

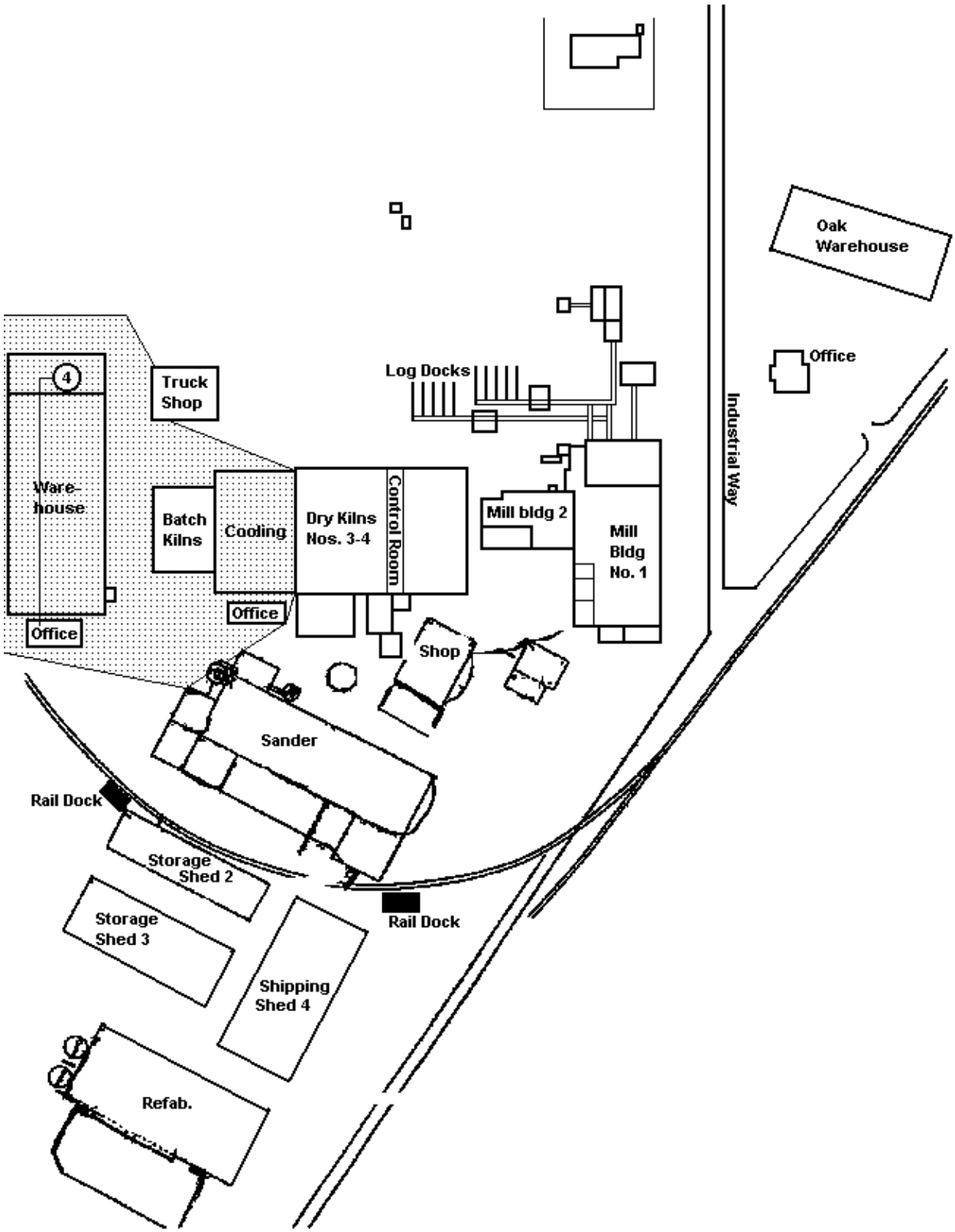
4.3 Equipment Placement: Sander Shed #1 (AP#3)

Access Point #3	
Equipment	900 MHz Arlan 630 Access Point, 3dB MaxRad omni-directional antenna, and 20’ coax extension cable.
Location	Mount the antenna the roof of the office in the middle of the Sander Building. Place the antenna on the side of the office closest to the center beams of the building. Be sure that the antenna is as far from the metal supports as possible (mounting too close will create RF shadows). Mount AP#3 on the inside wall of the office and use a 20’ coax cable to connect the AP to the antenna. Mount the AP so that the status lights are easily visible.
Coverage	This antenna provides coverage for the interior of the Sander Building, the areas around the building, backup coverage in the dry kiln output area, and the storage area near Industrial Way.
Cabling	Connect AP#3 to the Ethernet cable that runs through the center of the building. This office does not appear to have an Ethernet drop. Add a drop and a hub for the office and run a 30’ CAT-5 cable to the AP from the hub. Power the AP using the existing AC power. Telxon recommends adding a small UPS to power the AP and any computers in the office due to the heavy equipment used in this building.
Note	This building could not be covered from the outside. When surveying the building there were numerous dead spots in the center of the building in the lumber storage area. There was no obvious reason for these dead spots. Therefore, the only way to get reliable coverage in this building was to install an AP inside the building. Normally the number of APs installed around a building such as this would cover the interior. In this case antennas external to the building could simply not provide coverage.


Oak
Warehouse
Office
Industrial Way
Weak
Log Docks
Loading
Truck
Shop
Ware-
house
Batch
Kilns
Cooling
Dry Kilns
Nos. 3-4
Control Room
Mill bldg 2
Mill
Bldg
No. 1
Office
Office
Shop
Sander
3
Rail Dock
Storage
Shed 2
Storage
Shed 3
Rail Dock
Weak
Shipping
Shed 4
Refab.

4.4 Equipment Placement: Warehouse (AP#4)

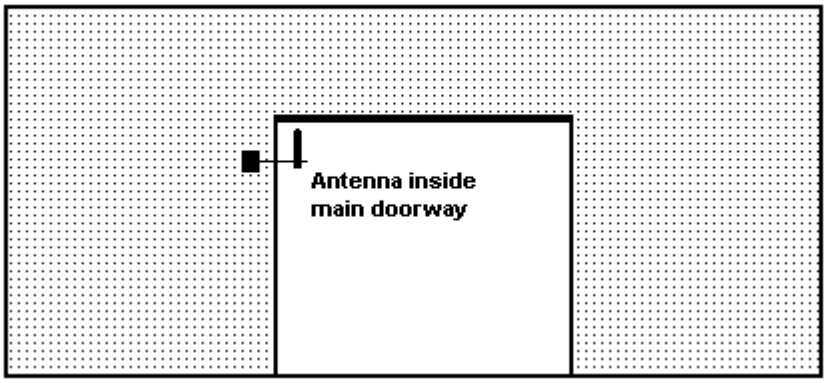
Access Point #4	
Equipment	900 MHz Arlan 630 Access Point, 3dB MaxRad omni-directional antenna, and 20' coax extension cable.
Location	Suspend the antenna from the ceiling of the truck loading area. Hang the antenna from the 2nd steel rafter on the side of the ceiling closest to the Dry Kiln. Do not bolt this antenna to the ceiling. Allow the antenna to hang from the ceiling by the coax extension cable (should hang perpendicular to the ceiling). This flexible mount allows a truck to bump into the antenna with less chance of breaking it. Attach a bright piece of flag tape to the antenna to alert driver's that the antenna is present. Mount AP#3 on the same ceiling beam in a NEMA enclosure. Mount the AP as close to the main warehouse building as possible. Connect the AP to the antenna using the 20' coax cable.
Coverage	This antenna provides coverage for the Warehouse, the Dry Kiln output area, and the areas around the warehouse.
Cabling	AP#4 requires an Ethernet drop in the warehouse office on the opposite side of the building. This office does not currently have an Ethernet drop but one is planned. Run a CAT-5 Ethernet or fiber-optic line through the center of the warehouse to the AP. This cable run is roughly 375' (will require a hub if using copper wire). Power the AP using the existing AC power from the warehouse. Telxon recommends adding a small UPS to filter the power for the AP.
Note	If a truck does bump into the suspended antenna it will temporarily affect the RF coverage. While the antenna moves its coverage area will shift and it may be difficult to get reliable data transmissions. When the antenna position stabilizes then the coverage pattern will stabilize also.

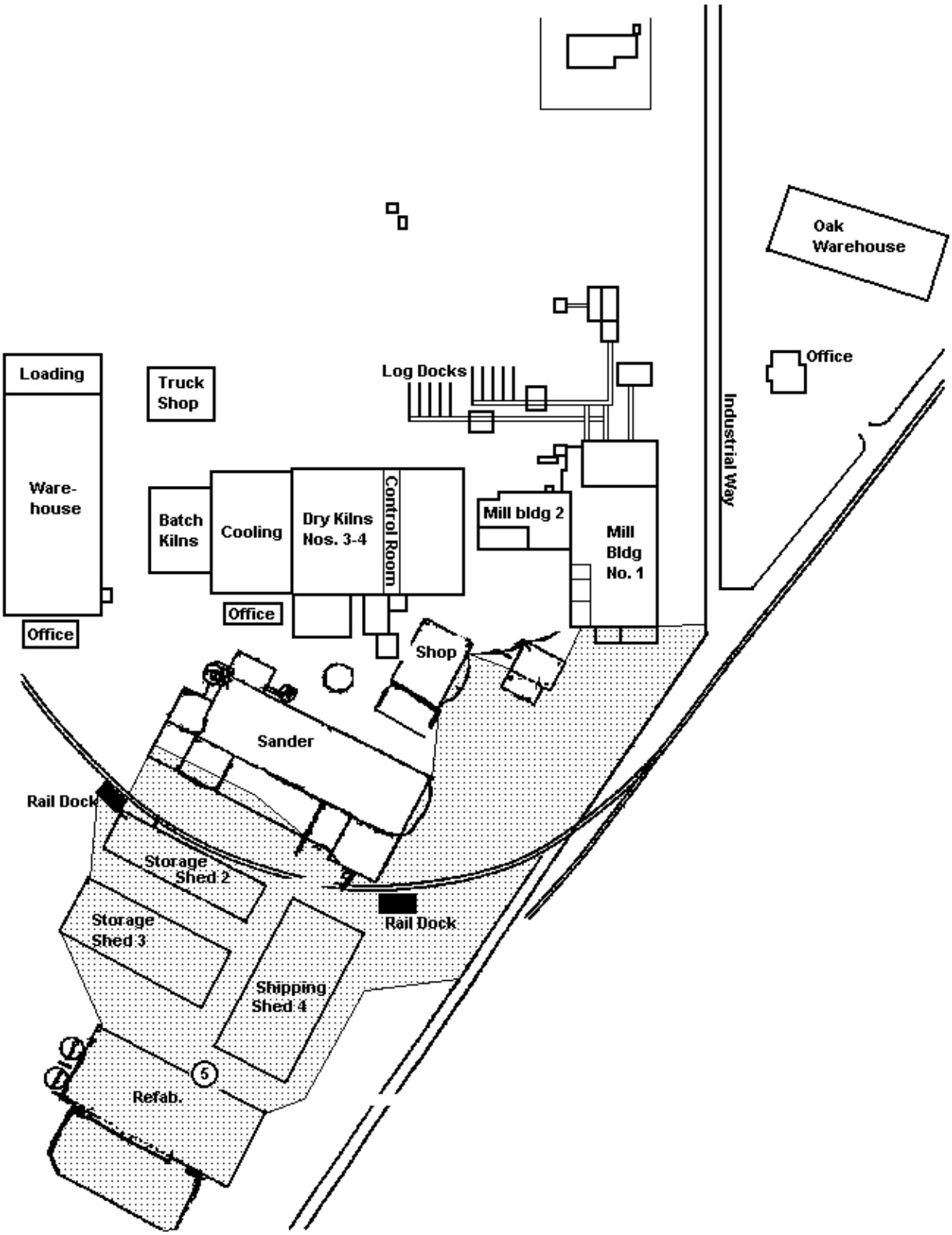

Oak
Warehouse
Office
Industrial Way
Log Docks
Truck
Shop
4
Ware-
house
Batch
Kilns
Cooling
Dry Kilns
Nos. 3-4
Control Room
Mill bldg 2
Mill
Bldg
No. 1
Office
Office
Shop
Sander
Rail Dock
Storage
Shed 2
Rail Dock
Storage
Shed 3
Shipping
Shed 4
Refab.

4.5 Equipment Placement: Refab (AP#5)

Access Point #5	
Equipment	900 MHz Arlan 630 Access Point, 3dB MaxRad omni-directional antenna, lightning arrestor, and 20' coax extension cable. The temperature range for the 630 AP is -4°F to 122°F. If the temperatures in the kiln control room are outside of this operating range then the AP will require a NEMA enclosure.
Location	Mount the antenna on the left side of the door with the antenna in the open doorway area. The bottom of the antenna must be below the top of the doorway. This configuration allows the signal to travel inside the building and also allows the antenna to provide coverage in the adjacent buildings. Mount AP#5 in a NEMA enclosure on the inside wall of the Refab building. Connect the AP to the antenna using the 20' coax cable.
Coverage	This antenna provides coverage for Refab, Storage Sheds 2, 3, and 4, and for the storage area in front of Industrial Way.
Cabling	Connect AP#5 to the hub in the Refab office. Run a CAT-5 Ethernet cable along the rafters to connect the AP to the hub (roughly 230' of cable). Power the AP using the existing AC power (breaker under AP). Telxon recommends adding a small UPS to filter the power for the AP or making sure the AP is connected to a clean circuit..
Note	AP#5 acts as the base AP for AP#7. While AP#7 covers most of Refab it will not have a reliable base AP if AP#5 is removed. If in an emergency condition use AP#7 as a "hot spare" and not AP#5.

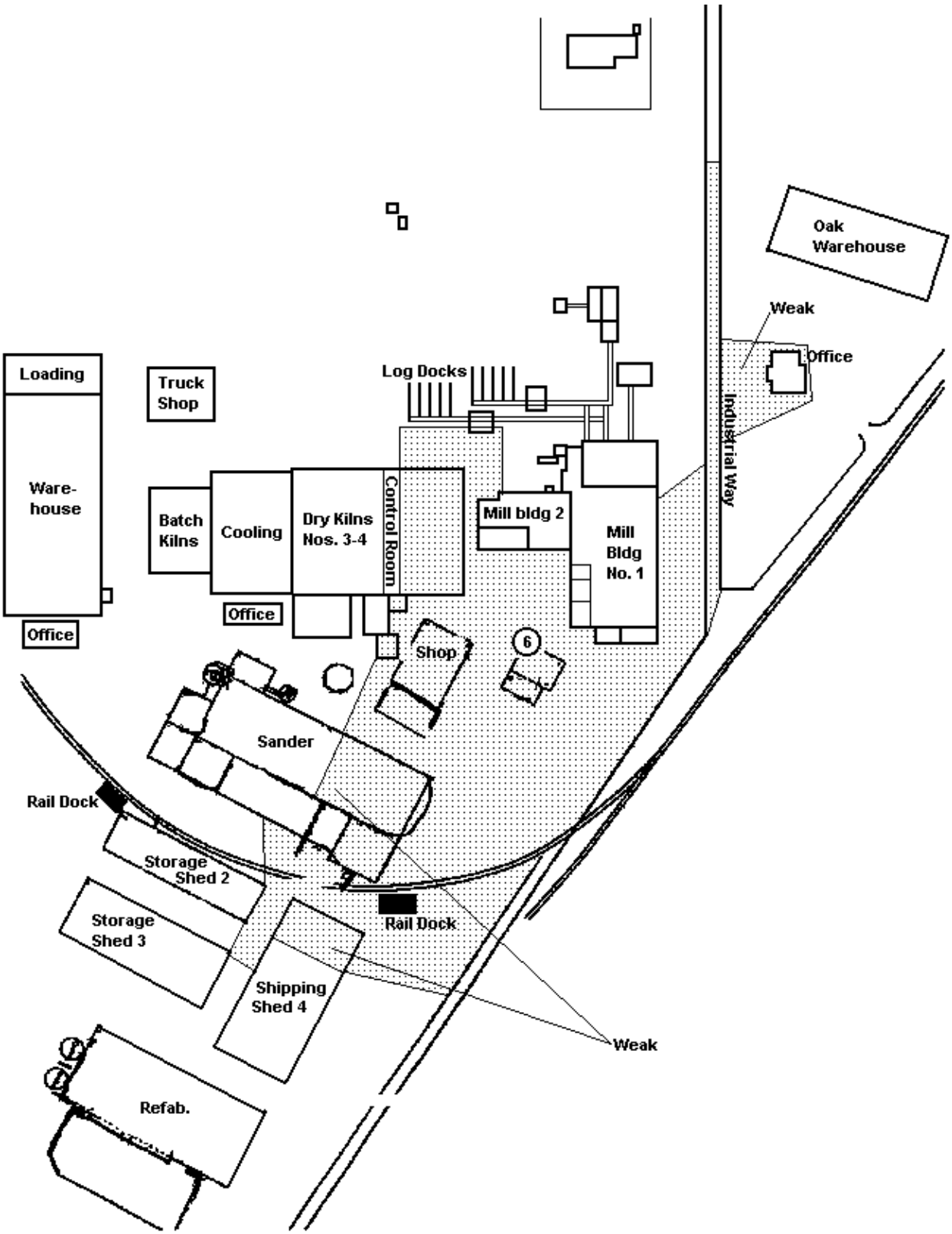
Refab Front View




Oak
Warehouse
Office
Industrial Way
Log Docks
Loading
Truck
Shop
Ware-
house
Office
Batch
Kilns
Cooling
Dry Kilns
Nos. 3-4
Control Room
Office
Mill bldg 2
Mill
Bldg
No. 1
Shop
Sander
Rail Dock
Storage
Shed 2
Storage
Shed 3
Rail Dock
Shipping
Shed 4
Refab.

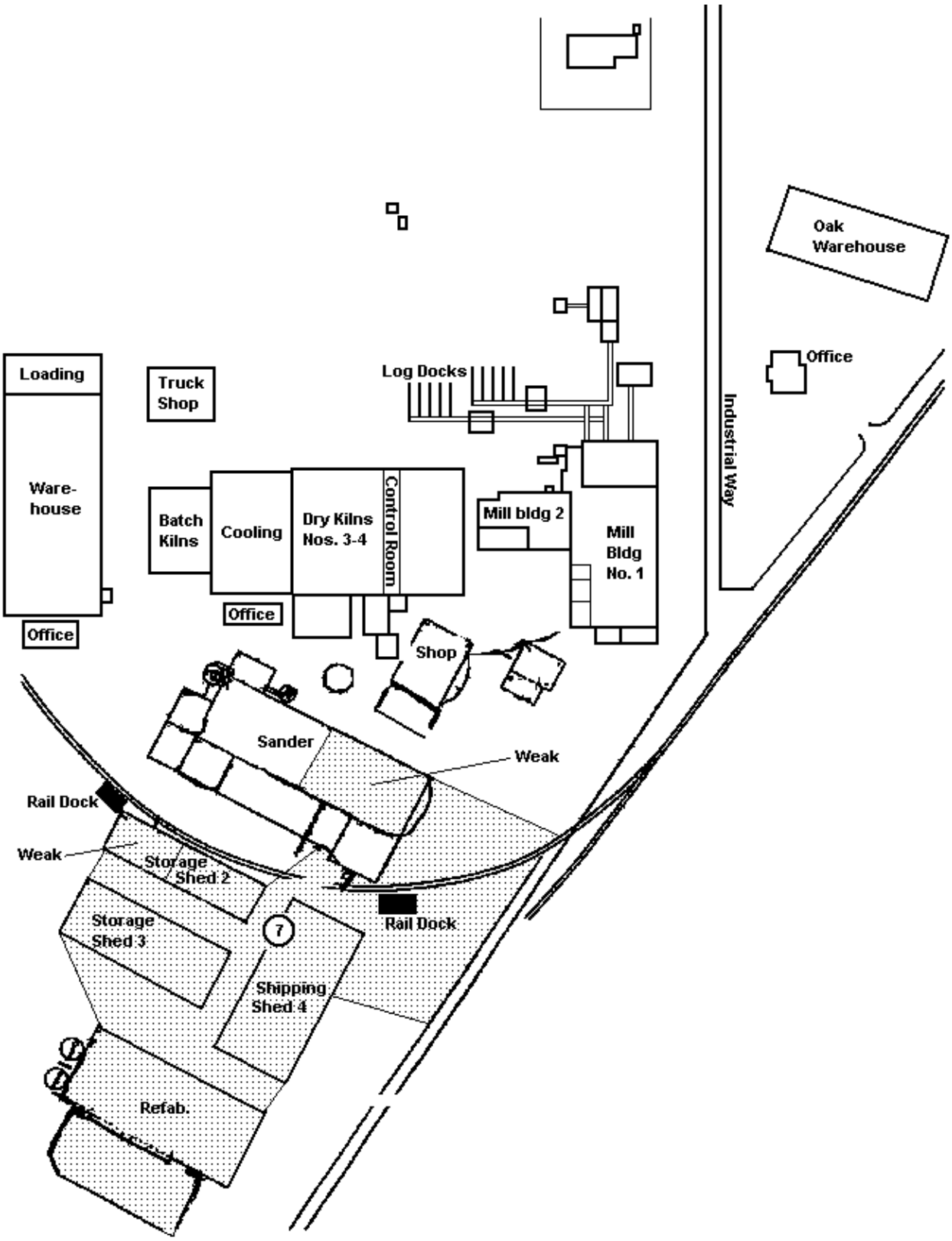
4.6 Equipment Placement: Shops & Store Room (AP#6)

Access Point #6	
Equipment	900 MHz Arlan 630 Access Point, 3dB MaxRad omni-directional antenna, lightning arrestor, and 20' coax extension cable.
Location	Mount the antenna on the corner of the building closest to Mill Building No. 2. Mount the antenna on the corner of the roof using a small mast. Mount AP#6 inside the Shop. Connect the AP to the antenna using the 20' coax cable.
Coverage	This antenna covers the area in the center of the mill, the area in front of the Dry Kiln, and the storage area along Industrial Way. AP#6 can link to AP#1 if the network connection fails.
Cabling	Connect AP#6 to the Ethernet cable that runs through the Shop. Power the AP using the existing AC power. Telxon recommends adding a small UPS to filter the power for the AP or making sure the AP is connected to a clean circuit.
Note	The area in front of Mill Building No. 2 receives very weak coverage from two other APs. This AP was required to give this area reliable coverage.


Oak Warehouse
Weak
Office
Industrial Way
Log Docks
Loading
Truck Shop
Ware-house
Office
Batch Kilns
Cooling
Dry Kilns Nos. 3-4
Control Room
Mill bldg 2
Mill Bldg No. 1
Office
Shop
6
Sander
Rail Dock
Storage Shed 2
Storage Shed 3
Rail Dock
Shipping Shed 4
Weak
Refab.

4.7 Equipment Placement: Shipping Shed No. 4 (AP#7)

Access Point #7	
Equipment	900 MHz Arlan 630 Access Point, 3dB MaxRad omni-directional antenna, lightning arrestor, 20' coax extension cable, and NEMA enclosure.
Location	Mount the antenna above the doorway to Shipping Shed No. 4 (on the side closest to Storage Shed No. 2). The bottom of the antenna must be about 6" below the top of the doorway. This configuration allows the signal to travel inside the building and also allows the antenna to provide coverage in the adjacent areas. Mount AP#6 in a NEMA enclosure on the inside wall of the Shipping Shed. Connect the AP to the antenna using the 20' coax cable. Make sure this antenna has a reliable RF link to AP#5 in Refab.
Coverage	This antenna covers the Shipping Shed, the loading area, storage area, part of Storage Sheds 2 and 3, and Refab.
Cabling	AP#7 acts as a wireless repeater (to AP#5 in Refab.). Power the AP using the existing AC power. Telxon recommends adding a small UPS to filter the power for the AP or making sure the AP is connected to a clean circuit..
Note	AP#7 acts as a wireless repeater and connects to AP#5 in the Refab. Building. This AP may also be able to link to AP#3 in the middle of the Sander Building. This AP provides solid coverage for the weak areas in the Shipping Shed and the connected loading area (covered by other APs but with a very weak signal). Since this AP provides redundant (although stronger) coverage it should be used as a backup AP should one of the APs fail. In the worst case users will have increased response time if this AP is not available. The data collection operations should be able to fully function (although not as well) without this AP.


Oak
Warehouse
Office
Industrial Way
Loading
Truck
Shop
Log Docks
Ware-
house
Batch
Kilns
Cooling
Dry Kilns
Nos. 3-4
Control Room
Mill bldg 2
Mill
Bldg
No. 1
Office
Office
Shop
Sander
Weak
Rail Dock
Weak
Storage
Shed 2
Storage
Shed 3
7
Rail Dock
Shipping
Shed 4
Refab.

5. Telxon Equipment List

This list includes the equipment necessary to provide RF coverage for the Hardwood mill. All APs require filtered AC power and optional NEMA enclosures if the expected temperatures are outside of the operating temperature range of the APs.

Equipment	Part Number	Qty	Description
Access Point AP#1, AP#2, AP#3	20961-001 19685-000 P-81419-100 P-81261-501 P-81261-502	7 7 7 1 1	Arlan 630 (900 MHz) Ethernet Access Point Arlan 630 Mounting Kit 100 VAC Power Supply Arlan User's Guide Arlan Mounting Instructions
Antenna	18725-000 P-81257-000 P-81522-000 18590-020	7 7 3 7	3dB 900 MHz Omni-Directional Antenna Mounting Kit for 3dB Omni-Directional Lightning Arrestors 20' Coax Extension Cable
NEMA Enclosures	15872-101	TBD	NEMA enclosure (required if the temperature range exceeds the operating temperature range of the 630 Access Point).