Plainsboro Public Library — WiFi Site Survey

Passive site survey findings · 27 August 2026 · Tarun Cherukuri
Findings derived from the exported NetSpot project database.

Executive summary

A passive wireless site survey of the Ground and Second floors recorded 67 measurement locations and 1,523 individual network observations, identifying eight access points serving the public Plainsboro-Public-Library network.

Coverage is not the problem. Every measured location on both floors met the –67 dBm design threshold on 5 GHz, with a mean best-signal of –49.7 dBm (Ground) and –51.3 dBm (Second). No dead zones were found.

Channel planning is the problem. Five of eight access points share 2.4 GHz channel 6, and three share 5 GHz channel 149 at mismatched widths. At a typical location the survey device could hear seven library radios simultaneously at usable strength, peaking at thirteen. This is a well-covered network whose access points are competing with one another for airtime rather than one that needs more hardware.

The principal recommendations are therefore configuration changes at no hardware cost: rebalance the 2.4 GHz plan across channels 1/6/11, move the 5 GHz radios out of the crowded UNII-3 band into the unused UNII-1 and UNII-2 ranges, standardise channel widths, and consider reducing transmit power rather than adding capacity.

1. Scope and method

Item	Detail
Site	Plainsboro Public Library, 9 Van Doren Street, Plainsboro NJ — a three-level, 46,500 sq ft building completed May 2010 (BKSK Architects)
Date / times	27 August 2026. On site 15:30–19:00 local. Ground floor snapshot created 16:22, Second floor 17:11 (database timestamps are UTC; converted here to local time).
Survey type	Passive. Broadcast beacon measurement only; no association testing, no traffic capture, no interaction with library infrastructure
Authorisation	Verbal permission from library staff, requested on arrival and again for the Community Room after its scheduled event concluded. A group study room was reserved through the library's normal booking system
Coverage	Ground floor (36 points) and Second floor (31 points)
Occupancy	Approximately 50 people in the building during the survey, roughly 25 on the Ground floor. Measurements therefore reflect a moderately loaded network rather than an empty building.
Exclusions	**Third floor (Children's Level)** — not surveyed, by the surveyor's choice, to avoid an unaccompanied adult walking a measurement grid in a children's area. **Mechanical Room** — staff-only, not entered. **Room 210** — booked but still occupied; Room 208 measured instead once vacant.
Tool	NetSpot for Android, Survey mode, passive
Device	Motorola Moto G Stylus 5G (2024) — Wi-Fi 5 (802.11ac), dual-band, 1×1 single spatial stream
Floor plans	Architectural Record, 2011 feature on the building (design drawings, not as-builts). Scale calibrated from the drawings' graphic scale bar.

1.1 Limitations — read this before the findings

- **No 6 GHz visibility.** The survey device is dual-band only. If the library operates Wi-Fi 6E or 7 access points, that band is entirely absent from this data.

- **Single-stream client.** A 1×1 Wi-Fi 5 handset observes lower maximum data rates than a multi-stream client would. No throughput claim here describes the network's capability.
- **Uncalibrated radio.** Consumer chipsets report RSSI with roughly ±3–6 dB of uncertainty. Findings rest on relative comparison under a consistent measurement method, not on absolute accuracy.
- **No spectrum analyser.** Non-WiFi interference cannot be observed directly. The device also reported no noise-floor data, so SNR could not be computed and no SNR-based finding is made.
- **AP positions are estimated.** Access point locations reported here were trilaterated by the software from signal strength and were not physically verified. AP counts and channel assignments, however, are read directly from beacon data and are reliable.
- **Materials are documentary, not measured.** Construction materials (section 2.3) are taken from the building's published product schedule rather than assessed on site, and describe design intent rather than verified as-built condition.
- **Single time sample.** One evening visit. Client load and channel conditions vary by time of day.

2. Environment as found

2.1 Access points

Eight access points were identified by grouping BSSIDs sharing the locally-administered prefixes 8a:15:04 (2.4 GHz radios) and 8a:15:14 (5 GHz radios). Each advertises multiple BSSIDs — the public SSID plus additional hidden ones — from the same physical radio.

AP	2.4 GHz	width	peak	5 GHz	width	peak
AP-01 (51:e6)	ch 1	20 MHz	−37	ch 149	20 MHz	−38
AP-02 (52:1c)	ch 11	20 MHz	−62	ch 149	80 MHz	−70
AP-03 (52:23)	ch 6	20 MHz	−32	ch 153	20 MHz	−41
AP-04 (53:33)	ch 6	20 MHz	−34	ch 36	80 MHz	−41
AP-05 (53:34)	ch 6	20 MHz	−77	ch 149	80 MHz	−86
AP-06 (53:3b)	ch 6	20 MHz	−38	ch 153	80 MHz	−51
AP-07 (53:3c)	ch 11	20 MHz	−35	ch 108	80 MHz	−41
AP-08 (53:49)	ch 6	20 MHz	−30	ch 157	40 MHz	−35

A further four BSSIDs advertising the same SSID were observed on unrelated prefixes (e2:55, e4:55, e6:55) on channels 1, 6, 100 and 108, suggesting one or two additional access points of a different make or product line, which the beacon data alone cannot resolve.

2.2 Measured coverage

Metric	Ground 2.4	Ground 5	Second 2.4	Second 5
Points with a reading	36	35	31	31
Mean best signal	−43.4 dBm	−49.7 dBm	−42.5 dBm	−51.3 dBm
Strongest	−30 dBm	−35 dBm	−32 dBm	−38 dBm
Weakest	−68 dBm	−66 dBm	−70 dBm	−63 dBm
Meeting −67 dBm	97%	**100%**	97%	**100%**

2.3 Construction materials

Materials below are taken from the published construction record for the building (Architectural Record product schedule, 2011) and corroborated against published photography, rather than from on-site assessment. They are stated here because they govern RF propagation and are the inputs a predictive model requires.

Element	Specified material	RF significance
Exterior walls (wings)	Brick cavity wall over CMU backup	High attenuation. The two brick wings are effectively opaque to 5 GHz; coverage in those volumes must be served from within them.
Central volume	EFCO 5600 metal-and-glass curtain wall, Guardian SN 68 tinted glazing	SN 68 is a low-emissivity coated glass. The metallic coating attenuates RF substantially more than plain glass, so the glazed entrance and reading room leak less signal outdoors than their transparency suggests.
Interior partitions	Gypsum wall board (painted), some glazed	Low attenuation, a few dB. Consistent with the study room measurement, where signal inside Room 208 remained strong.

Element	Specified material	RF significance
Ceilings	Armstrong Optima acoustical tile on suspended grid in enclosed rooms; exposed painted steel deck and structure in the double-height volumes	Determines mounting options. Tile ceilings permit concealed placement; exposed structure means visible mounting.
Community Room	Bamboo flooring, exposed brick, bamboo pivoting wall panels with fabric-wrapped homosote	Hard reflective surfaces with an acoustically absorbent panel system. Reflective for RF; relevant if the room is used at capacity.
Feature walls	Dry-stack Pennsylvania fieldstone and calcium silicate units on CMU backup	Dense masonry. Localised high attenuation near the entry.
Vertical structure	Double-height central reading room, open between levels	The propagation path identified in F-05.

Because these figures come from a design-stage product schedule rather than measurement, they are suitable as starting inputs for a predictive model but should be calibrated against the measured survey data rather than trusted outright.

3. Findings

F-01 — 2.4 GHz channel plan is heavily unbalanced [High]

Observation	Five of the eight access points (AP-03 through AP-06, AP-08) operate on 2.4 GHz channel 6. Two use channel 11 and one uses channel 1. Across the whole survey, 24 distinct BSSIDs were heard at −80 dBm or stronger on channel 6, against 16 on channel 1 and 7 on channel 11.
Probable cause	Channels 1, 6 and 11 are the only non-overlapping options in 2.4 GHz. Concentrating five access points on one of the three forces them to share a single collision domain.
Impact	Co-channel contention: the affected radios can hear one another and must take turns transmitting. Aggregate throughput on 2.4 GHz falls as client count rises, even though signal strength is excellent.
Recommendation	Redistribute the eight radios evenly across channels 1, 6 and 11 — roughly three, three and two. No hardware cost.

F-02 — 5 GHz radios are concentrated in UNII-3 with mismatched widths [High]

Observation	Three access points share channel 149 (AP-01 at 20 MHz, AP-02 and AP-05 at 80 MHz) and two share channel 153 (AP-03 at 20 MHz, AP-06 at 80 MHz). AP-08 uses channel 157 at 40 MHz. Only AP-04 (ch 36) and AP-07 (ch 108) sit outside this range.
Probable cause	An 80 MHz channel with primary 149 occupies the spectrum from 149 to 161, overlapping 153 and 157 entirely. Six of eight radios are therefore contending within one crowded band segment while UNII-1 (36–48) and UNII-2 (52–144) sit almost unused.
Impact	Both co-channel and adjacent-channel interference in the band that should be carrying most client traffic. Mixed 20/40/80 MHz widths on overlapping channels compound this.
Recommendation	Move radios into the unused UNII-1 and UNII-2 ranges and standardise on a single channel width. In a dense multi-AP deployment, 40 MHz is usually the better trade than 80 MHz — it halves the per-client peak rate but doubles the number of non-overlapping channels available.

F-03 — Access point density exceeds coverage requirement [Medium]

Observation	At a typical measurement location the survey device could hear 7.3 library radios on 2.4 GHz and 6.6 on 5 GHz at −75 dBm or stronger. The peak was 13 simultaneously audible library BSSIDs. Meanwhile 100% of measured points met the −67 dBm design threshold on 5 GHz with substantial margin.

Probable cause	The deployment appears to have been designed for coverage on a floor plan rather than tuned for a multi-AP environment. High transmit power on every radio maximises overlap.
Impact	Every additional audible co-channel radio is another participant in the same contention domain. Excess overlap also encourages sticky-client behaviour, where devices hold onto a distant access point instead of roaming to a nearer one.
Recommendation	Consider reducing transmit power so cells overlap by roughly 15–20% rather than blanketing each floor. Combined with F-01 and F-02, this addresses the contention without touching the hardware. **Do not add access points** — the data does not support a coverage-gap argument.

Corroborating evidence. While associated to the public network at approximately –50 dBm, the client reported a transmit link rate of 96 Mbps and a receive rate of 78 Mbps. The survey device is capable of 433 Mbps on an 80 MHz channel. A link rate roughly a fifth of the device ceiling under near-ideal signal conditions is consistent with airtime contention rather than a signal problem, and was measured independently of the beacon survey.

F-04 — Hidden BSSIDs advertise a legacy security capability [Medium — verify]

Observation	Eighteen BSSIDs on the library's access points broadcast with no SSID and a capability string that Android renders as WEP. The eighteen visible Plainsboro-Public-Library BSSIDs report no encryption at all.
Probable cause	Android reports 'WEP' when a beacon sets the privacy bit without carrying a modern RSN information element. That is consistent with genuine WEP, but also with certain captive-portal and legacy configurations. **This finding is not confirmed and should not be presented as fact without verification.**
Impact	If these are genuinely WEP-secured networks, WEP has been considered broken since 2001 and offers no meaningful protection. Hiding the SSID is not a security control — all eighteen BSSIDs were enumerated passively during a routine survey. Separately, Android's own network list labelled the public Plainsboro-Public-Library network 'Security: weak', its classifier for an unencrypted network — an independent confirmation of the open-network observation above.
Recommendation	Recommend the library's IT provider verify the actual security configuration of the non-broadcast networks. If WEP is in use anywhere, migrate to WPA2 or WPA3. Separately, consider Enhanced Open (OWE) for the public network, which encrypts guest traffic without requiring a password.

F-05 — Access point coverage propagates freely between floors [Medium]

Observation	Six of the eight access points are audible on both surveyed floors at –67 dBm or better. Three radios whose strongest readings are on the Second floor still reach –42, –46 and –49 dBm on the Ground floor, across essentially every Ground floor measurement point. AP-08, strongest on the Ground floor at –30 dBm, is still heard at –51 dBm throughout the Second floor.
Probable cause	The building's central volume is a double-height reading room open between levels, confirmed visually during the survey and consistent with the architect's cross section. A vertical void of this kind propagates signal between floors far more freely than the surrounding floor slabs do.
Impact	The two floors do not behave as separate RF domains. Channel planning that treats each floor independently will produce co-channel conflicts between vertically adjacent access points, and the overlap contributes directly to the contention measured in F-03. It also gives clients near the void a large set of similarly-strong candidate access points, which encourages sticky-client behaviour.
Recommendation	Plan channels for the building as a single three-dimensional volume rather than floor by floor. When applying the F-01 and F-02 channel changes, ensure vertically adjacent access points near the atrium are assigned different channels, not merely different ones from their same-floor neighbours.

F-06 — External RF environment is active but not dominant [Low]

Observation	Thirty-plus non-library networks were detected, the strongest at –51 dBm. These include two Canon printers and two HP printers broadcasting direct-connect SSIDs, at least three personal phone hotspots, xfinitywifi, and several residential networks.
Probable cause	The architect's site plan places attached single-family residences directly adjacent to the building, which accounts for the residential SSIDs. Printer direct-connect radios are commonly left enabled by default.
Impact	Modest additional 2.4 GHz contention, concentrated on channels 1 and 6 where the residential networks also sit. Not a primary driver of the issues in F-01 and F-02, which are internal.
Recommendation	Disable the direct-connect wireless radios on library printers that are network-attached anyway. Factor neighbouring residential channel usage into the 2.4 GHz replan under F-01.

4. Recommendations by effort

Tier	Action	Addresses
No cost configuration	Rebalance 2.4 GHz across channels 1/6/11 Move 5 GHz radios into UNII-1 and UNII-2 Standardise 5 GHz channel width (40 MHz suggested) Reduce transmit power to tighten cell overlap Plan channels as one three-dimensional volume, not floor by floor Disable printer direct-connect radios	F-01 to F-03, F-05, F-06
No cost verification	Confirm the security configuration of the eighteen non-broadcast BSSIDs Confirm whether any 6 GHz equipment exists (outside this survey's reach)	F-04, limitations
Low cost	Evaluate Enhanced Open (OWE) for the public network	F-04
Not recommended	Adding access points. The measured data shows no coverage deficit; additional radios would worsen the contention identified in F-01 to F-03.	—

5. Extending this study

- Build a NetSpot Planning model of the same floor plans to test the proposed channel and power changes predictively before recommending them — measured problem alongside modelled solution, on identical geometry.
- A second snapshot at a different time of day would separate load-dependent effects from fixed ones, on the same measurement grid.
- The Third floor and the 6 GHz band remain outside this survey's scope, and any conclusions here apply only to the two floors and two bands measured.

6. Appendices

- **Appendix A** — Survey Data Pack (xlsx): AP inventory, per-point coverage, coverage summary, channel usage, external networks, and all 1,523 raw readings.
- **Appendix B** — Signal level, SNR and SIR heatmaps, both floors, exported from NetSpot.
- **Appendix C** — Client-side evidence: Android network list showing the public SSID classified 'Security: weak', and the associated link-rate reading cited in F-03.
- **Appendix D** — Floor plans, credited to Architectural Record (2011) and BKSK Architects.
- **Appendix E** — Raw NetSpot project export (.netspu).

Note: no photographs of access point hardware were taken during the survey, so AP models and mount types are not documented. Interior views available online are third-party images of unknown date and are not included as survey evidence. Screenshots containing the library's internal IP addressing have been deliberately excluded.