WIRELESS NETWORK CONSULTING

Vertical Bridge

ID-5108 Fish Creek / Verizon FISH-CREEK Site

Capacity and Coverage Cell Split

SCANNER DRIVE TEST REPORT 08/15/2024

Certification

This analysis and report was completed by Steven Kennedy a Radio Frequency Engineer with over 35 years of experience in Wireless Network Engineering.

I certify that the attached RF analysis and report is correct to the best of my knowledge, and all calculations, assumptions and conclusions are based on generally acceptable engineering practices

Steven E Kennedy

Drive Test Overview

- This test was performed to show what the coverage is in the field to validate the propagation models and show the carriers signal strength around the proposed site
- A roof mount external antenna and GPS antenna was utilized with an industry standard scanner (PCTEL G-Flex Scanner)
- A 2nd scanner (WilsonPro Cellular Network Scanner 5G Kit-910060) was used in a stationary location to review the active channels in the area and validate against the PCTEL blind scan
- A separate phone was connected to a streaming session to keep an active session on the mobile on the Verizon network
- The drive test was completed August 5th, 2024.
- The scanner processed signal detail from AT&T, T-Mobile and Verizon networks
- The drive route was created based on the primary coverage objective for the site as well as the propagation of the proposed

Blind Scan

- A “blind scan” was completed at a stationary location that has visibility to all (3) major carriers to decode active channels in the area prior to drive testing
- The drive test scanner gear decodes the following for each channel:
  - Date/Time
  - GPS Coordinates
  - Cell ID/PCI
  - For Sync, Reference Signal and, Physical Broadcast Channel (PBCH)
    - Reference Signal Received Power (RSRP)
    - Reference Signal Received Quality (RSRQ)
    - Signal to Interference & Noise Ratio (SINR)
- To show the signal levels, this report will focus on the RSRP from the transmitters as this is the value that shows the coverage from the sites
- The bands/channels shown in this deck are: 700MHz low band, 2100MHz mid band and, 3800MHz high band

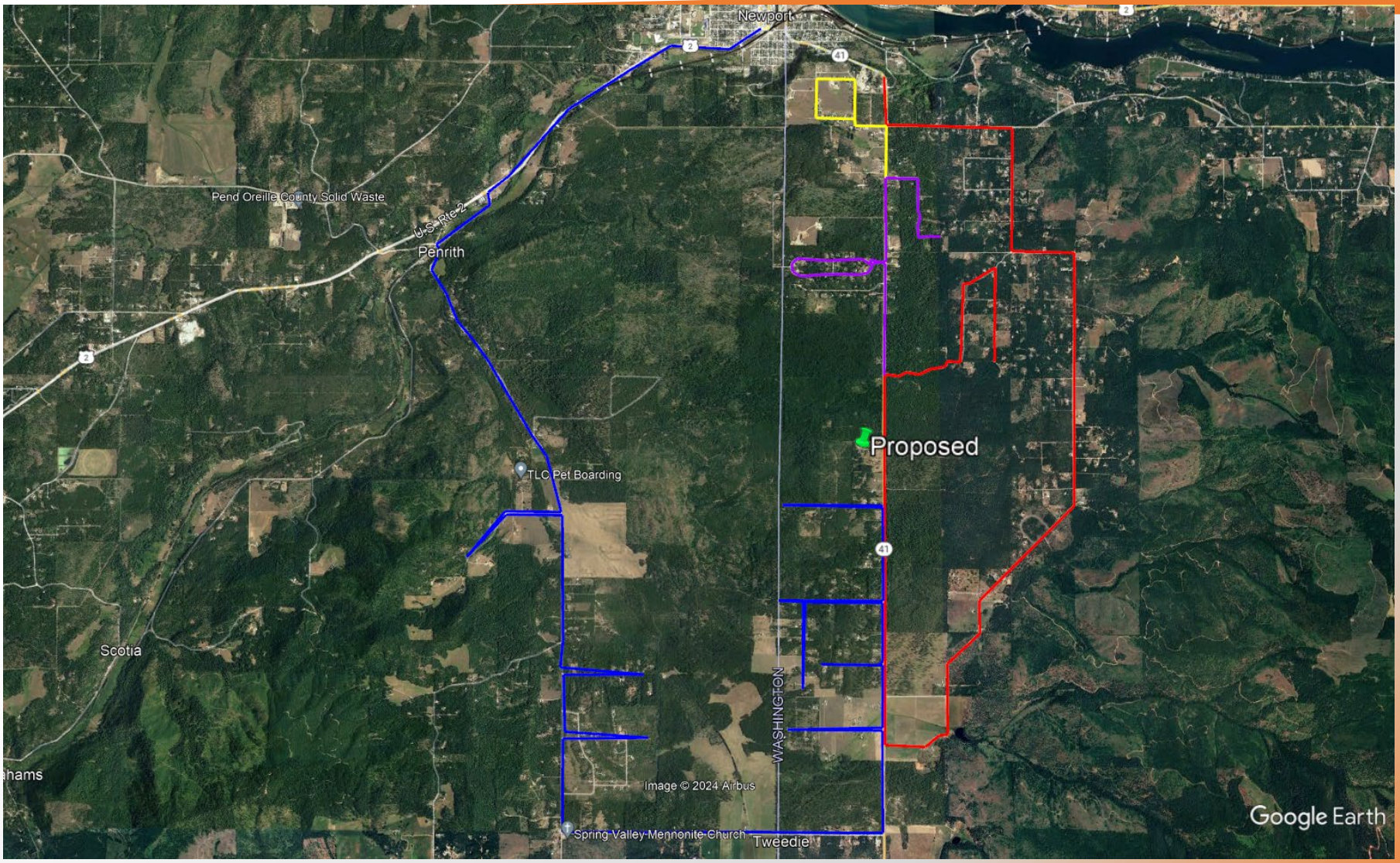
Frequency Bands/Channels

- Below are the active frequency bands and channels for the area

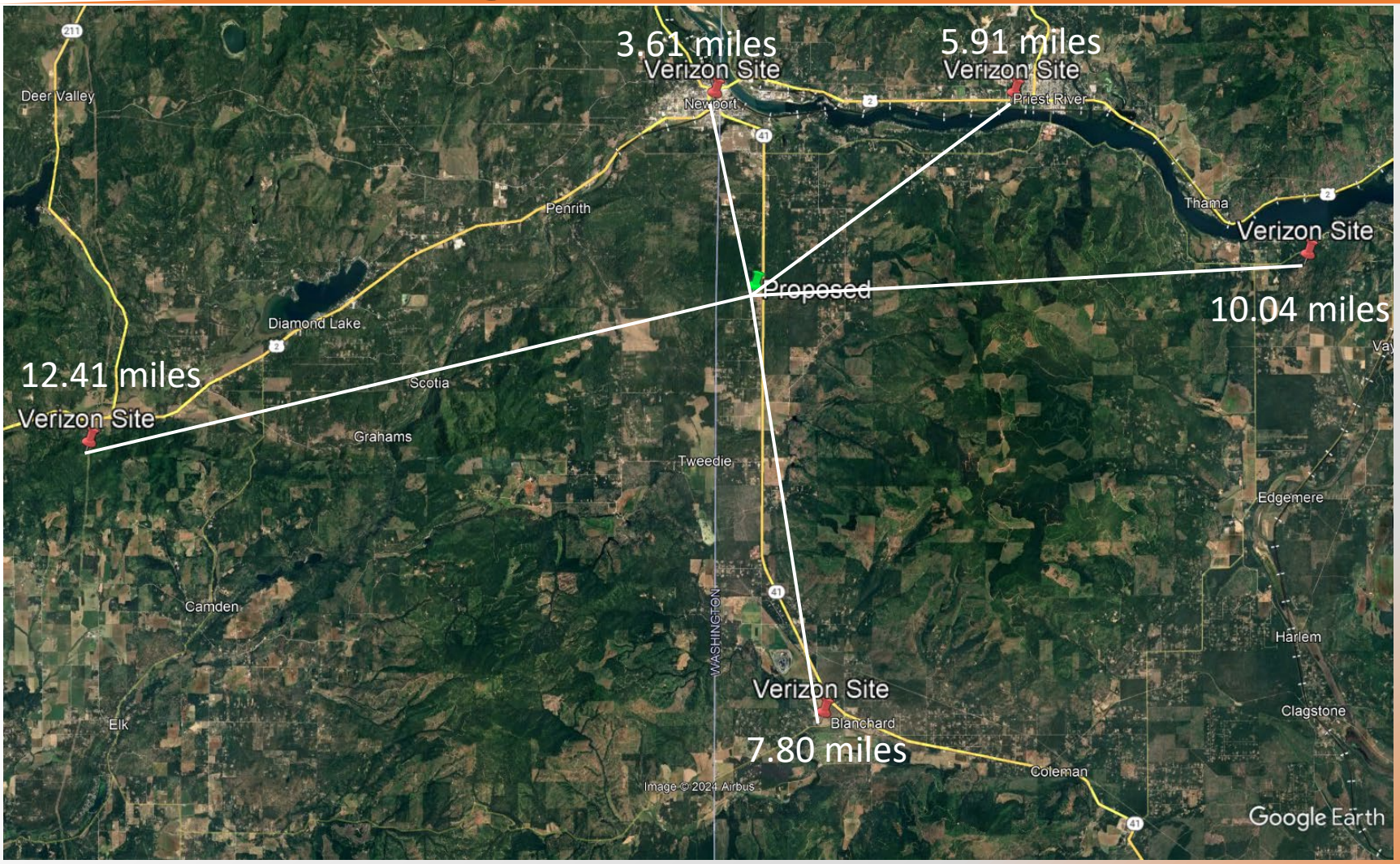
			Frequency	Downlink	Channel	
Carrier	Technology	Band	Block	Frequency (MHz)	Bandwidth (MHz)	EARFCN
AT&T	4G	12	700	739	10	5110
AT&T	4G	14	700	763	10	5330
AT&T	4G	2	PCS	1935	10	650
AT&T	4G	2	PCS	1982.5	15	1125
AT&T	4G	66	AWS	2115	10	2000
T-Mobile	4G	12	700	731.5	5	5035
T-Mobile	4G	2	PCS	1952.5	5	825
T-Mobile	4G	4	AWS	2145	20	2300
T-Mobile	5G	41	2.5	2510.55	90	502110
Verizon	4G	13	700	751	10	5230
Verizon	4G	5	850	885	10	2560
Verizon	4G	2	PCS	1945	10	750
Verizon	4G	4	AWS	2125	10	2100
Verizon	5G	77	C-Band	3730.08	100	648672
Verizon	5G	77	C-Band	3809.28	100	653952

- EARFCN – EUTRA Absolute radio-frequency channel number

Drive Test Route Overview

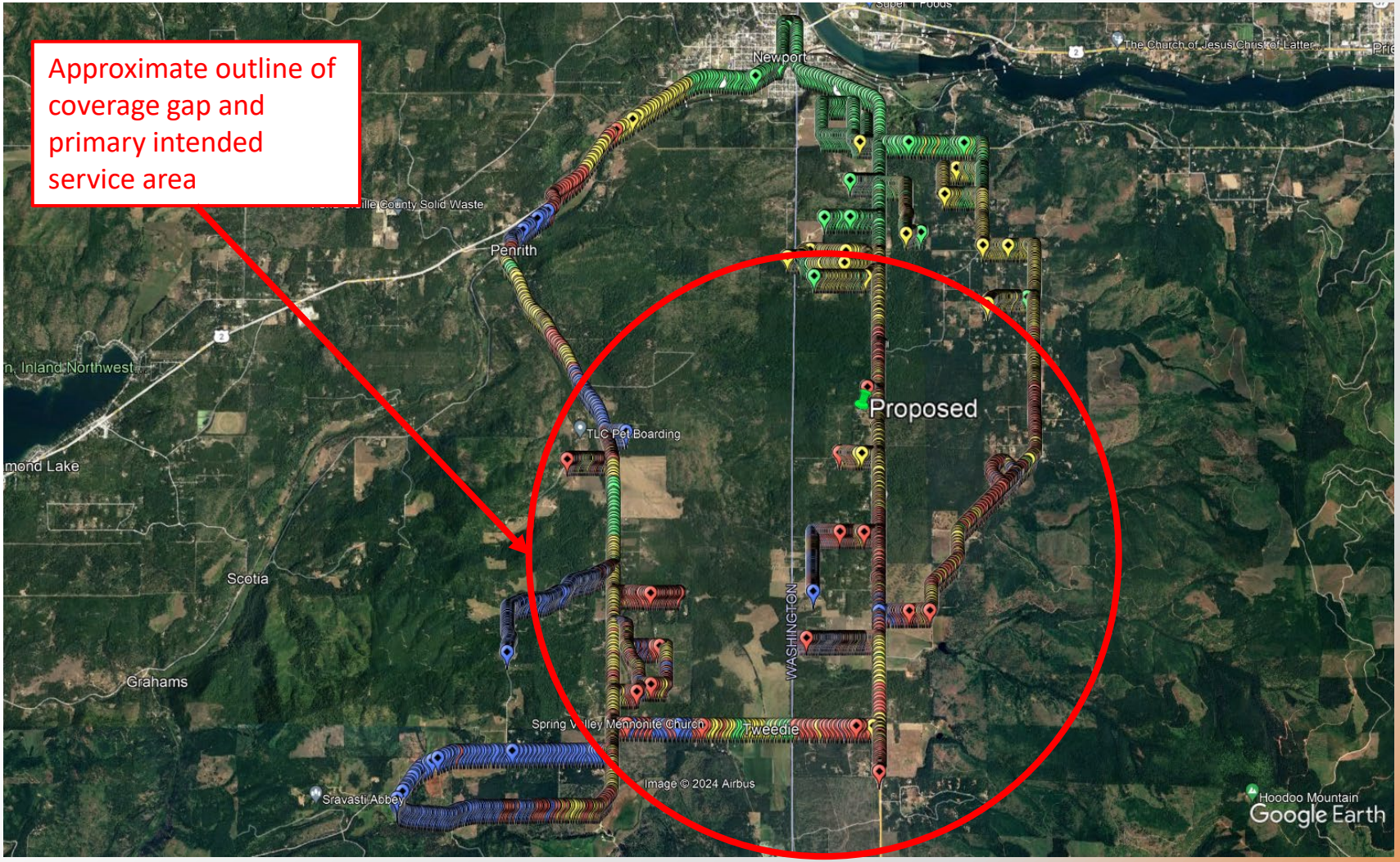


Distance from proposed to Verizon neighbor sites



Verizon 751 MHz channel Scanner Data - Overview

LEGEND	
	In-Building (-85 dbm)
	In-Vehicle (-95 dbm)
	Outdoor (-106 dbm)
	Marginal (<-106 to -120 dbm)
	Low to No Service (<-120 dbm)



Verizon 2125 MHz channel Scanner Data - Overview

LEGEND	
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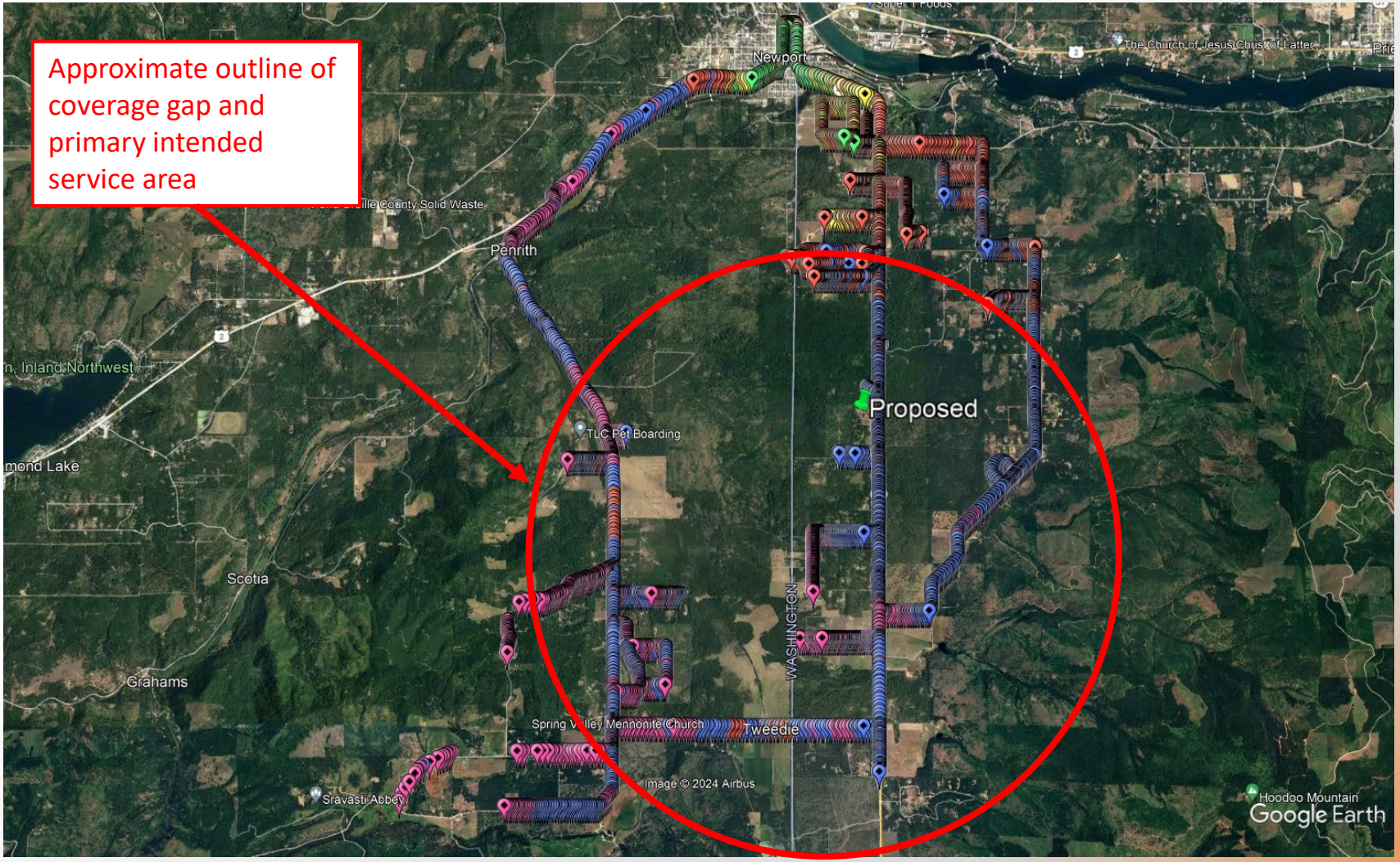
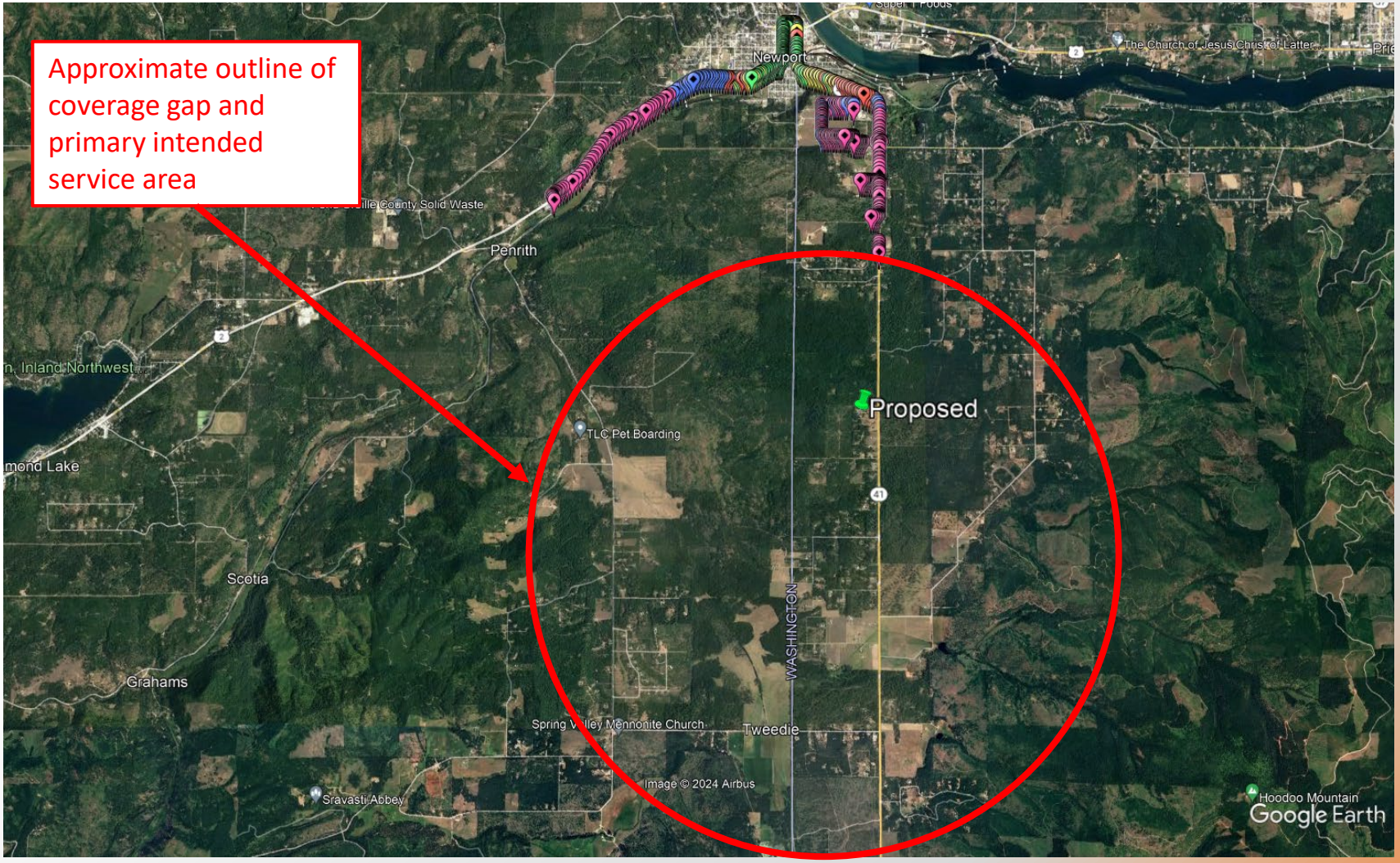
	In-Vehicle (-95 dbm)
	Outdoor (-106 dbm)
	Marginal (<-106 to -120 dbm)
	Low to No Service (<-120 dbm)



07/03/2024

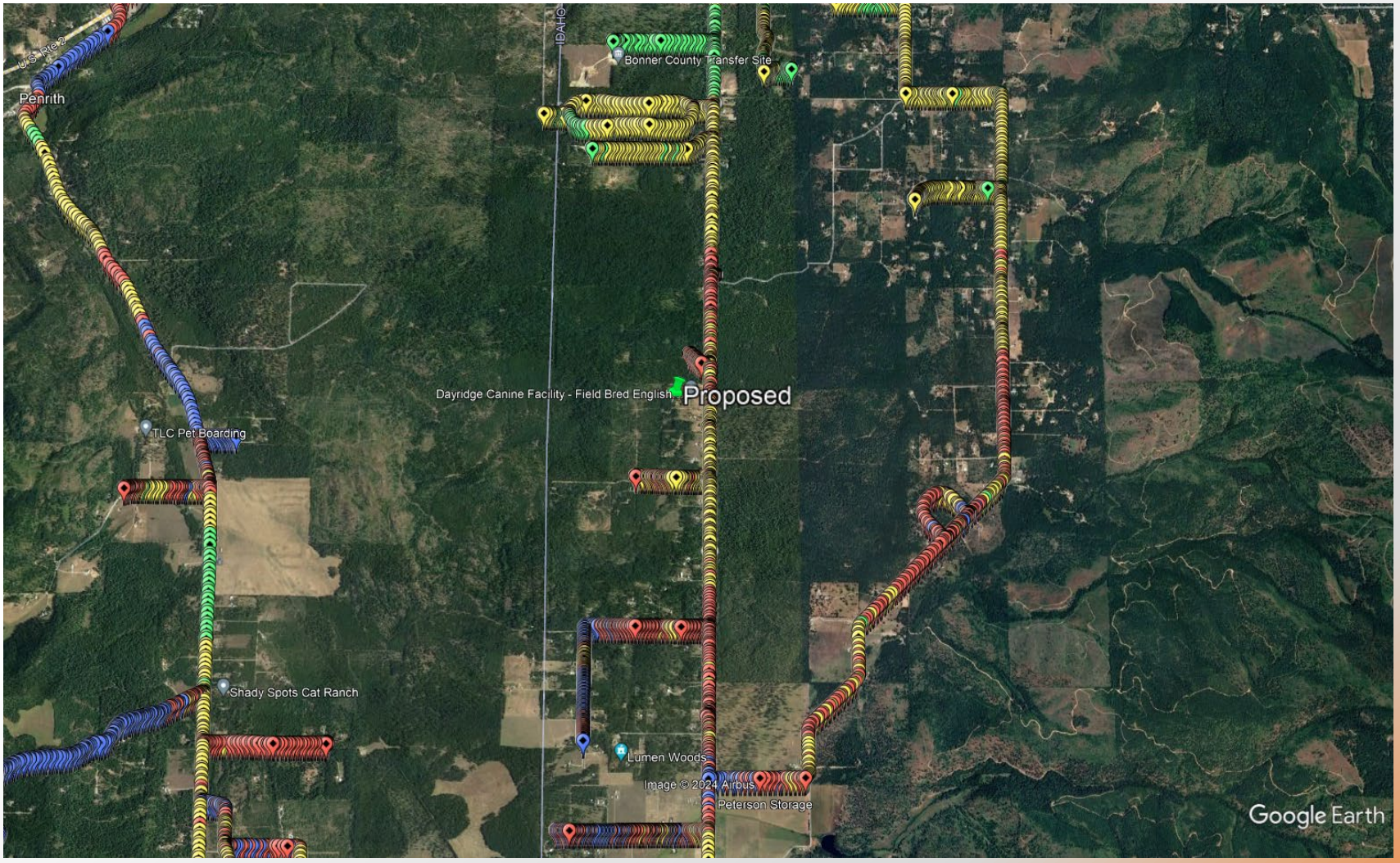
Verizon 3730.08 MHz channe
Scanner Data - Overview

LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



Verizon 751 MHz channel Scanner Data - Zoom

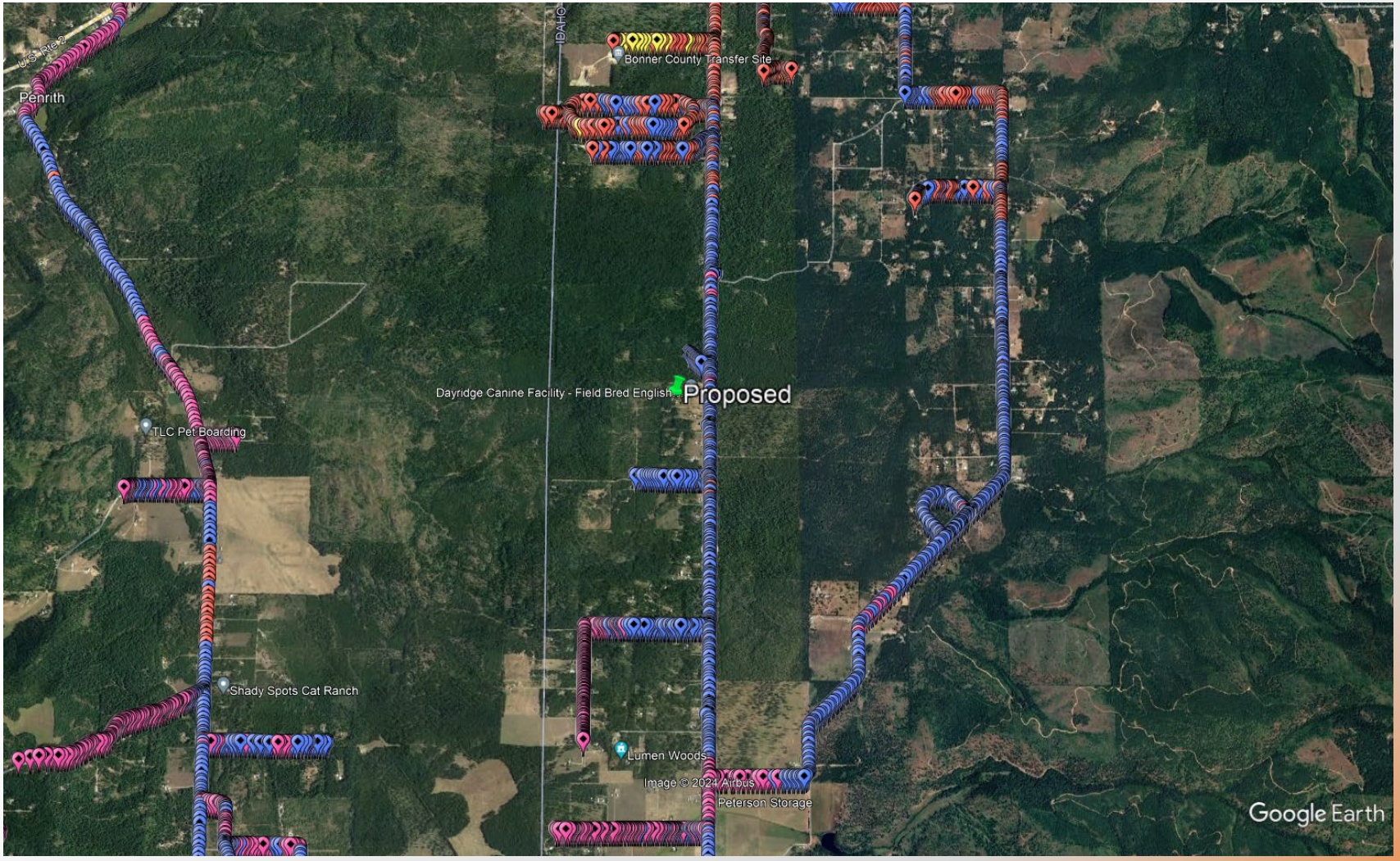
LEGEND	
	In-Building (-85 dbm)
	In-Vehicle (-95 dbm)
	Outdoor (-106 dbm)
	Marginal (<-106 to -120 dbm)
	Low to No Service (<-120 dbm)



07/03/2024

Verizon 2125 MHz channel Scanner Data - Zoom

LEGEND	
	In-Building (-85 dbm)
	In-Vehicle (-95 dbm)
	Outdoor (-106 dbm)
	Marginal (<-106 to -120 dbm)
	Low to No Service (<-120 dbm)



Verizon 3730.08 MHz channe
Scanner Data - Zoom

LEGEND
In-Building (-85 dbm)
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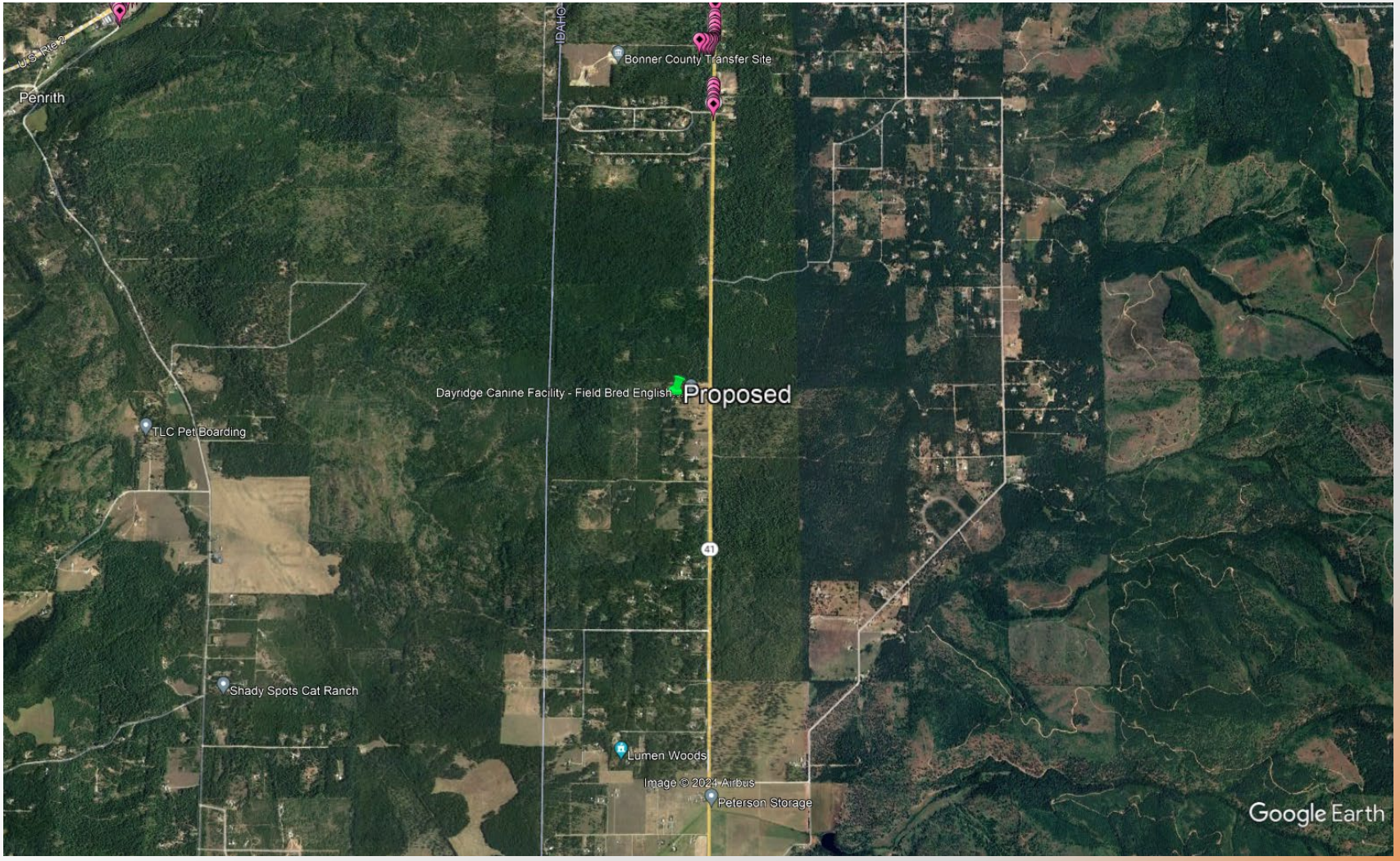
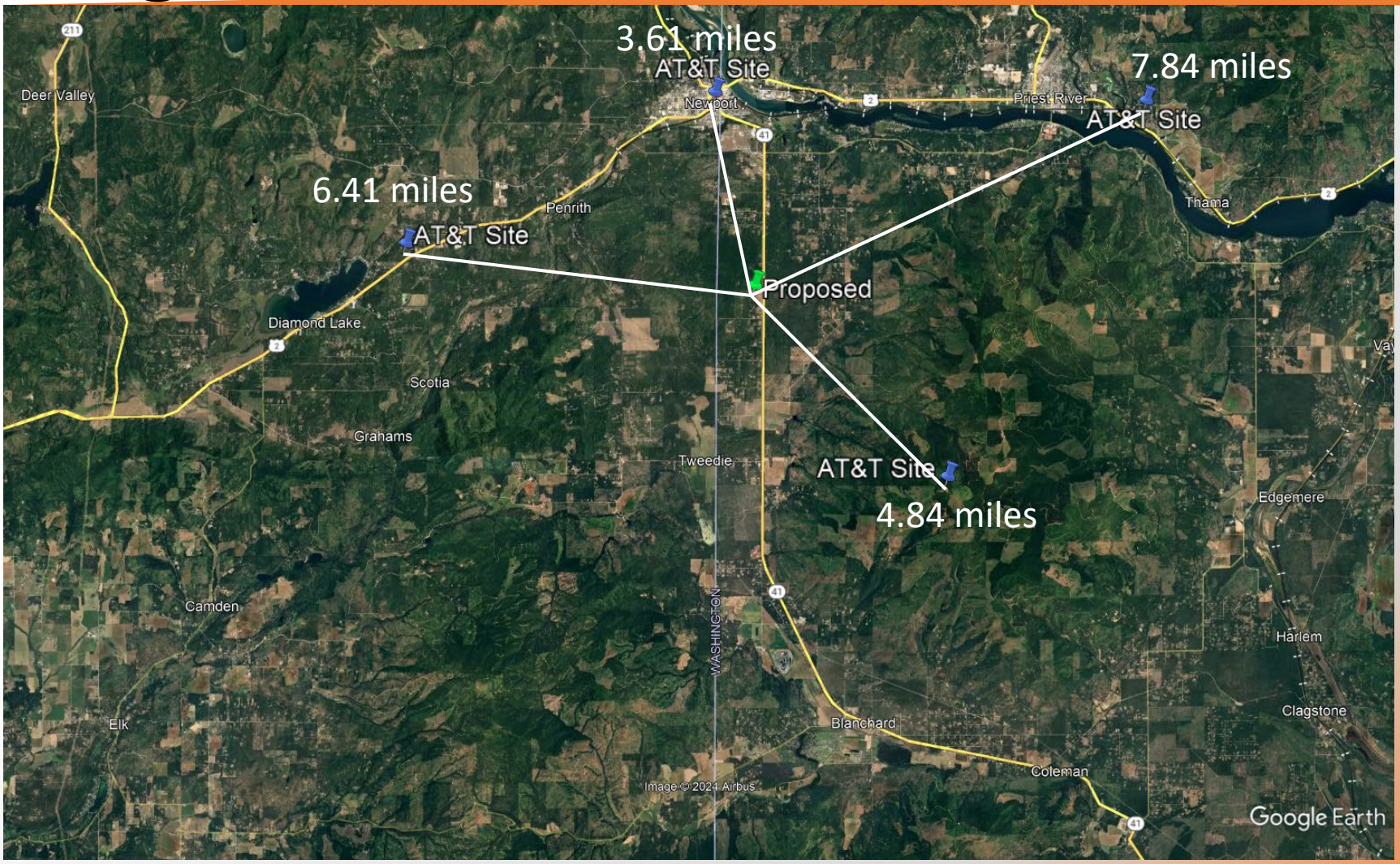
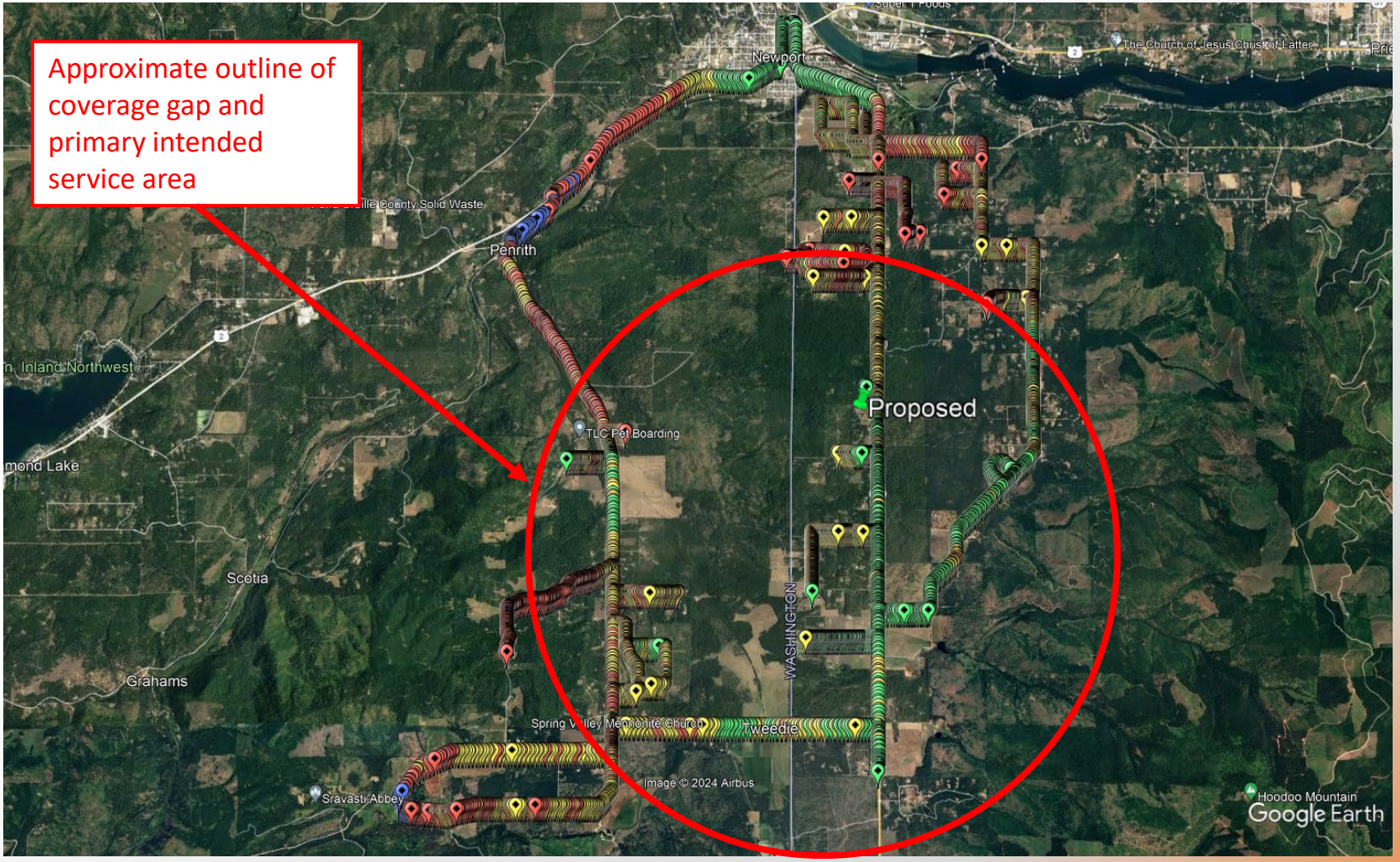


Distance from proposed to AT&T neighbor sites



AT&T 739MHz channel Scanner Data - Overview

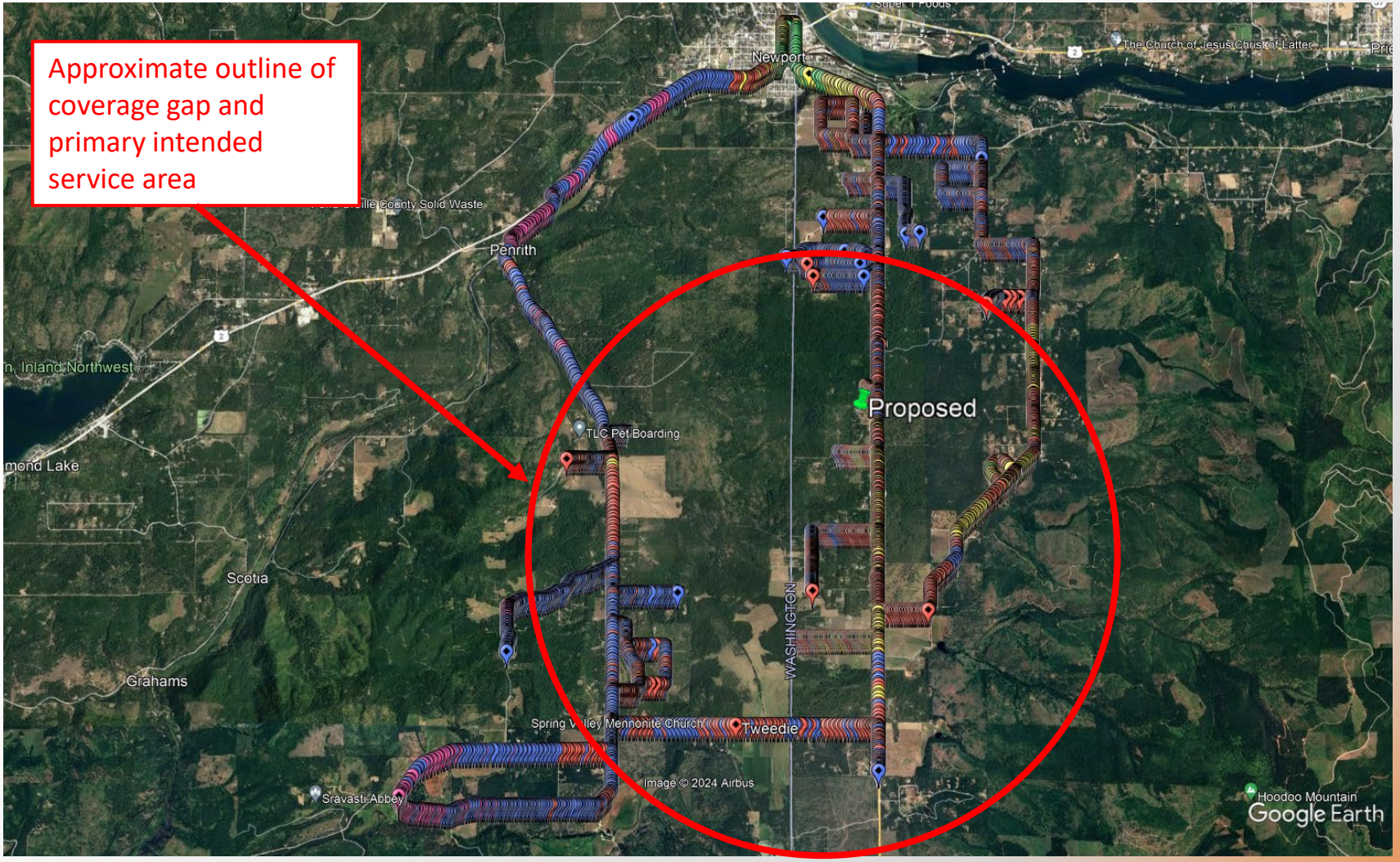
LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



07/03/2024

AT&T 2115MHz channel Scanner Data - Overview

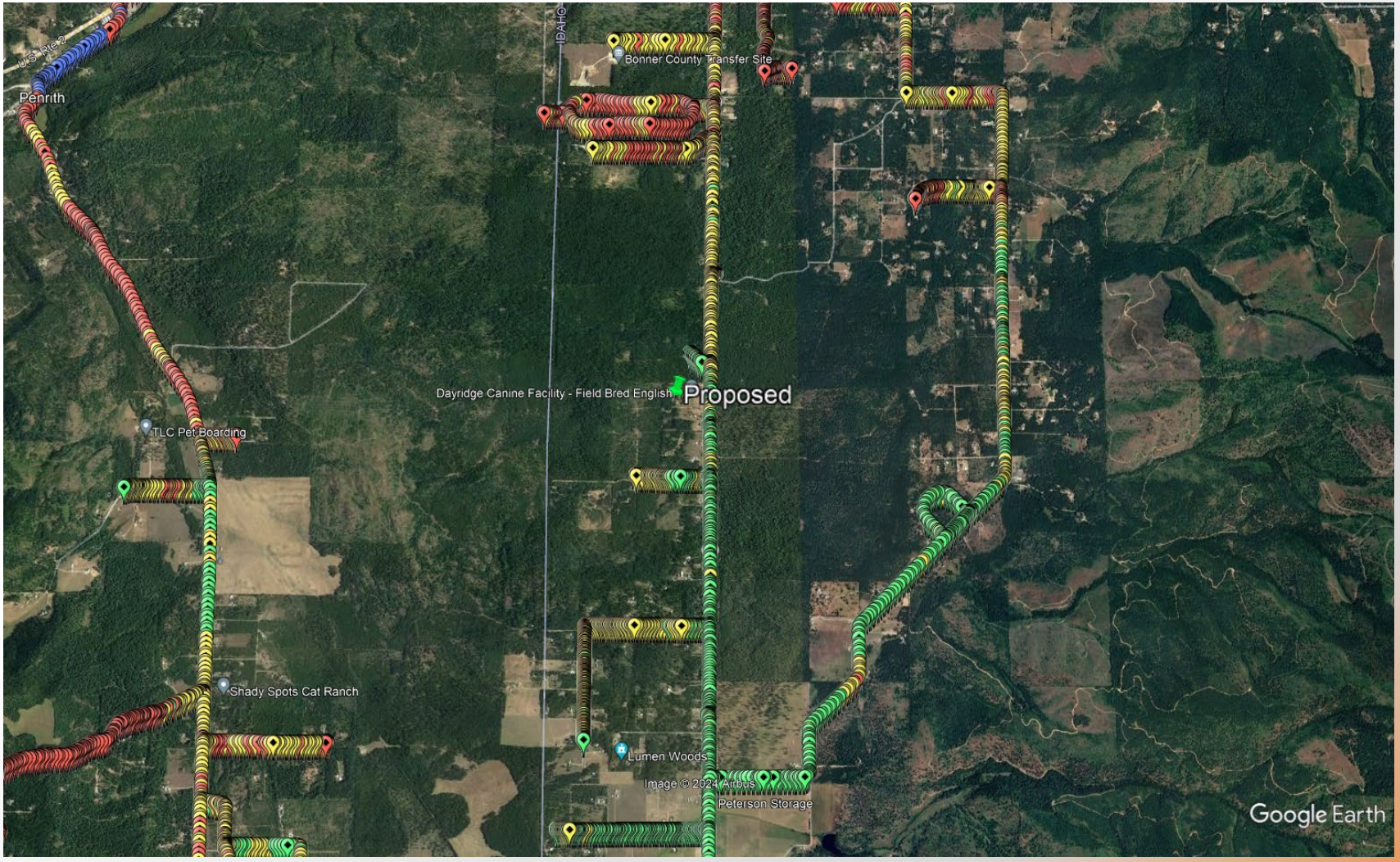
LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



07/03/2024

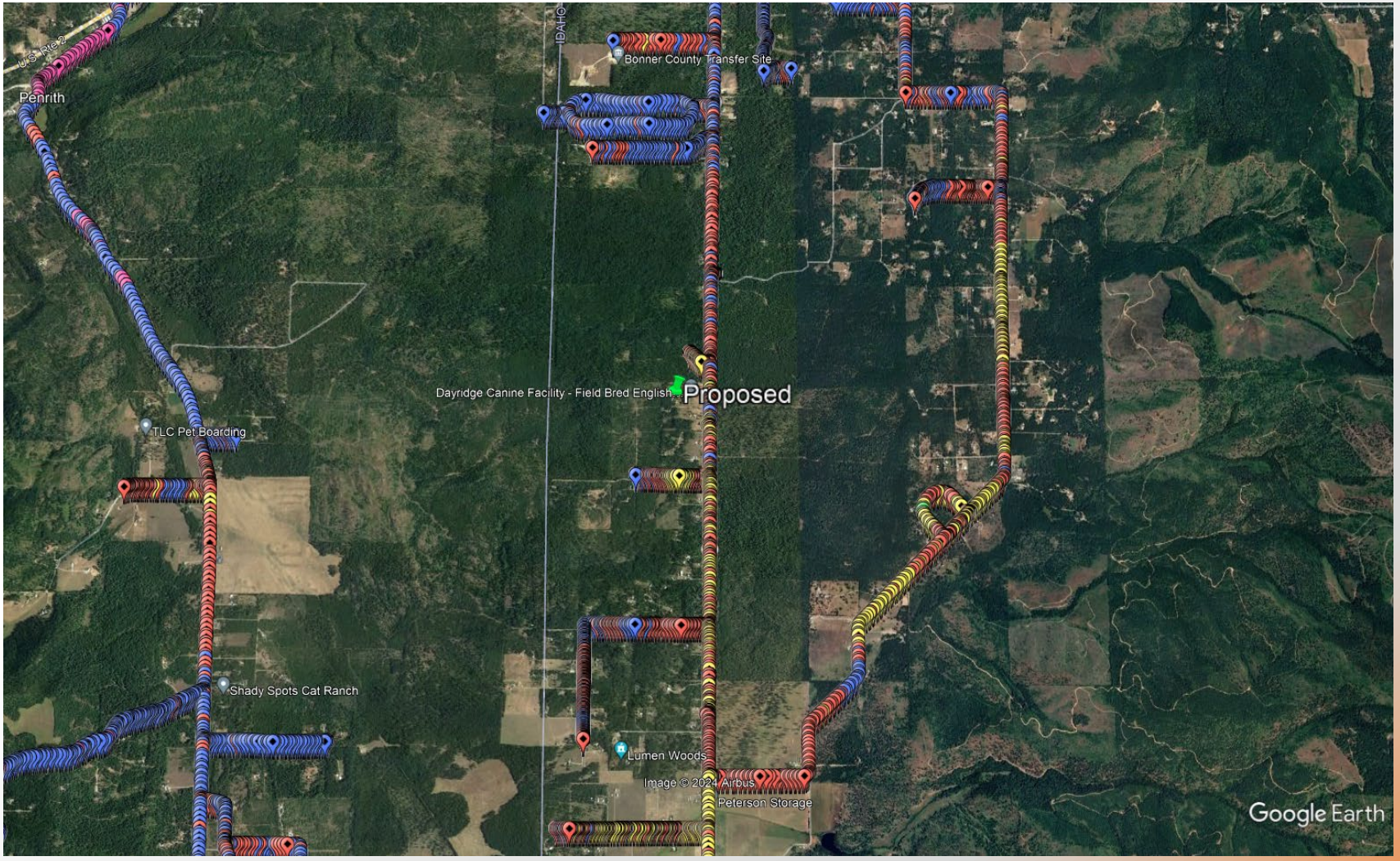
AT&T 739MHz channel Scanner Data - Zoom

LEGEND	
	In-Building (-85 dbm)
	In-Vehicle (-95 dbm)
	Outdoor (-106 dbm)
	Marginal (<-106 to -120 dbm)
	Low to No Service (<-120 dbm)

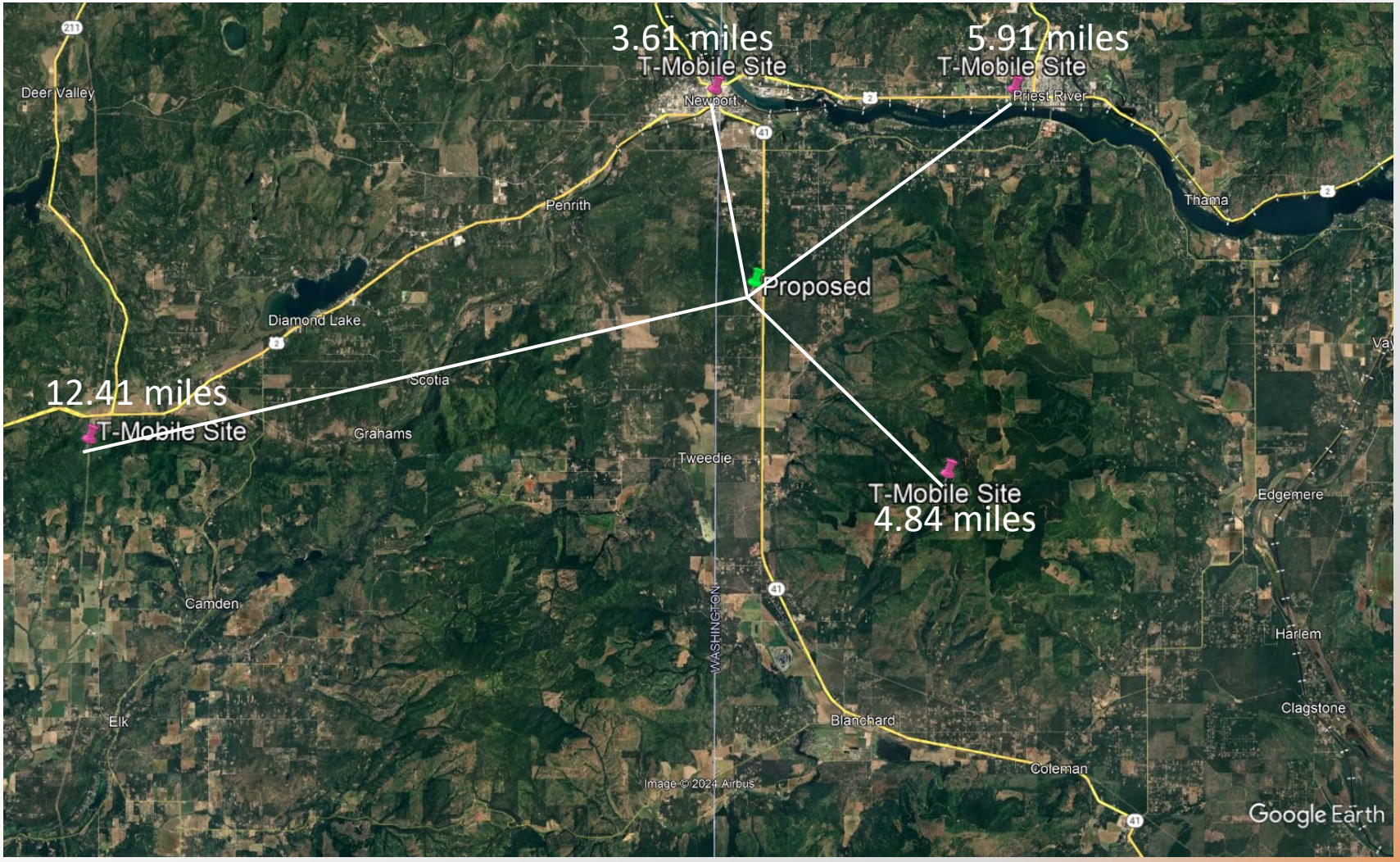


AT&T 2115MHz channel Scanner Data - Zoom

LEGEND	
	In-Building (-85 dbm)
	In-Vehicle (-95 dbm)
	Outdoor (-106 dbm)
	Marginal (<-106 to -120 dbm)
	Low to No Service (<-120 dbm)

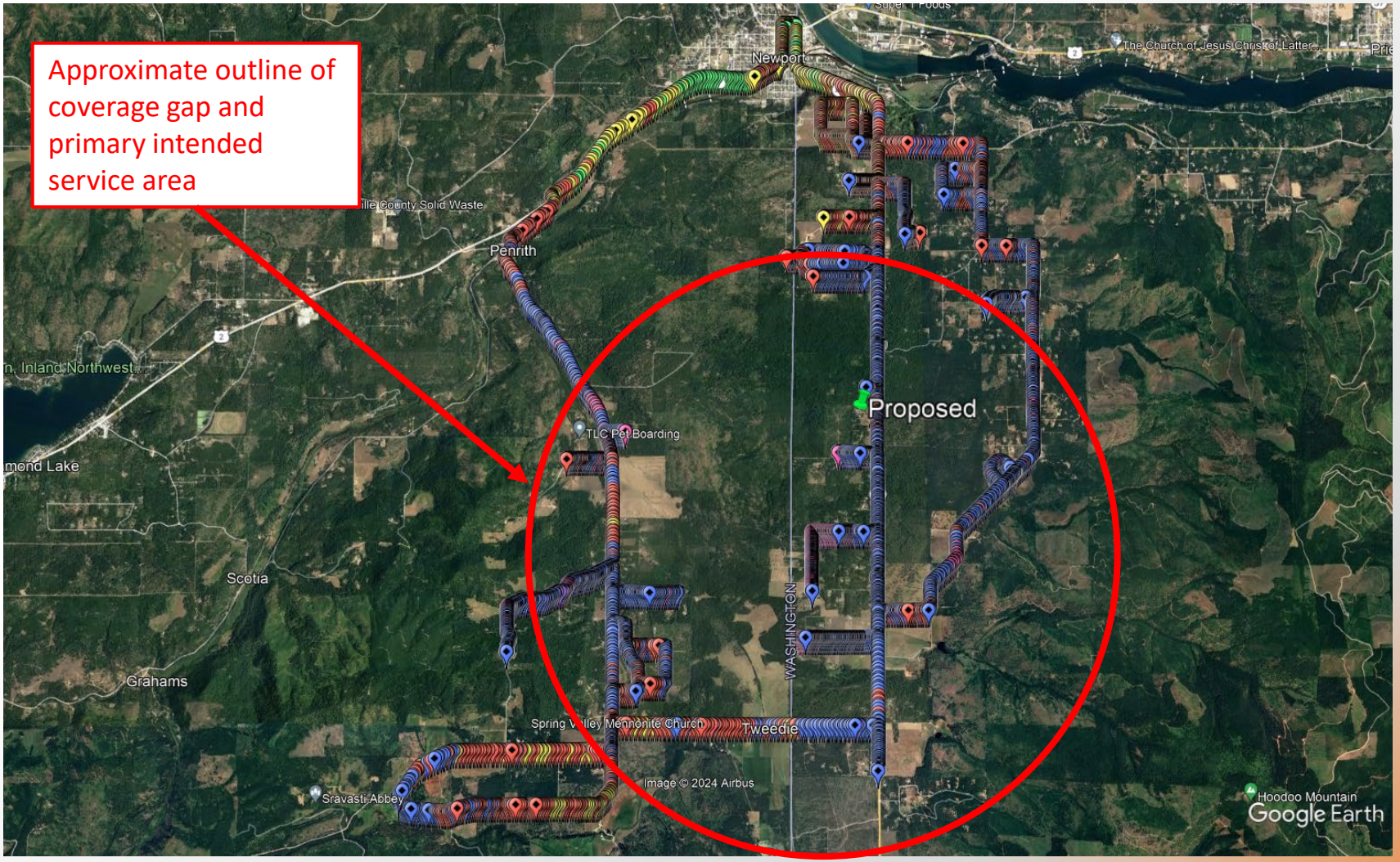


T-Mobile Sites



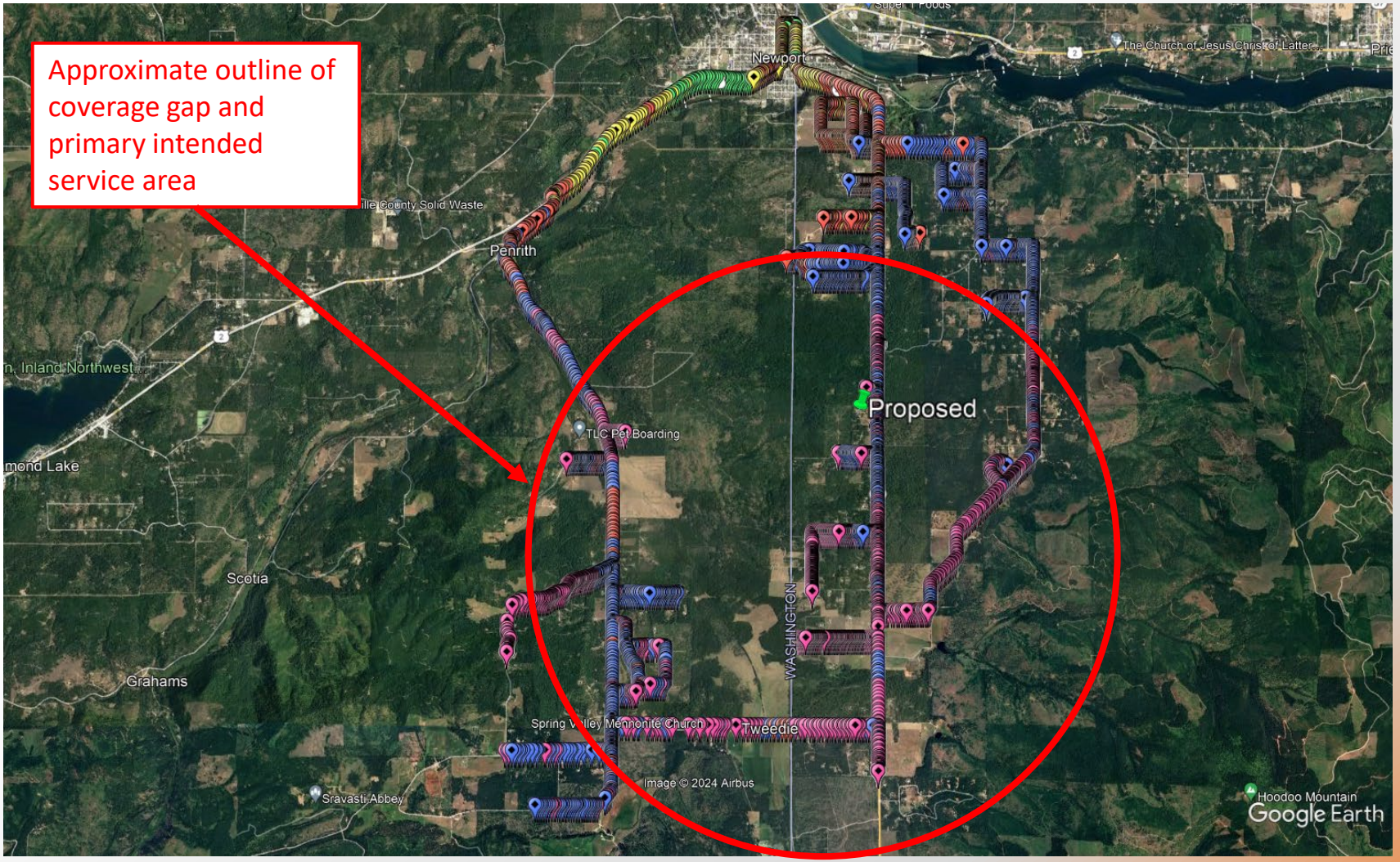
T-Mobile 731.5MHz channel Scanner Data - Overview

LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



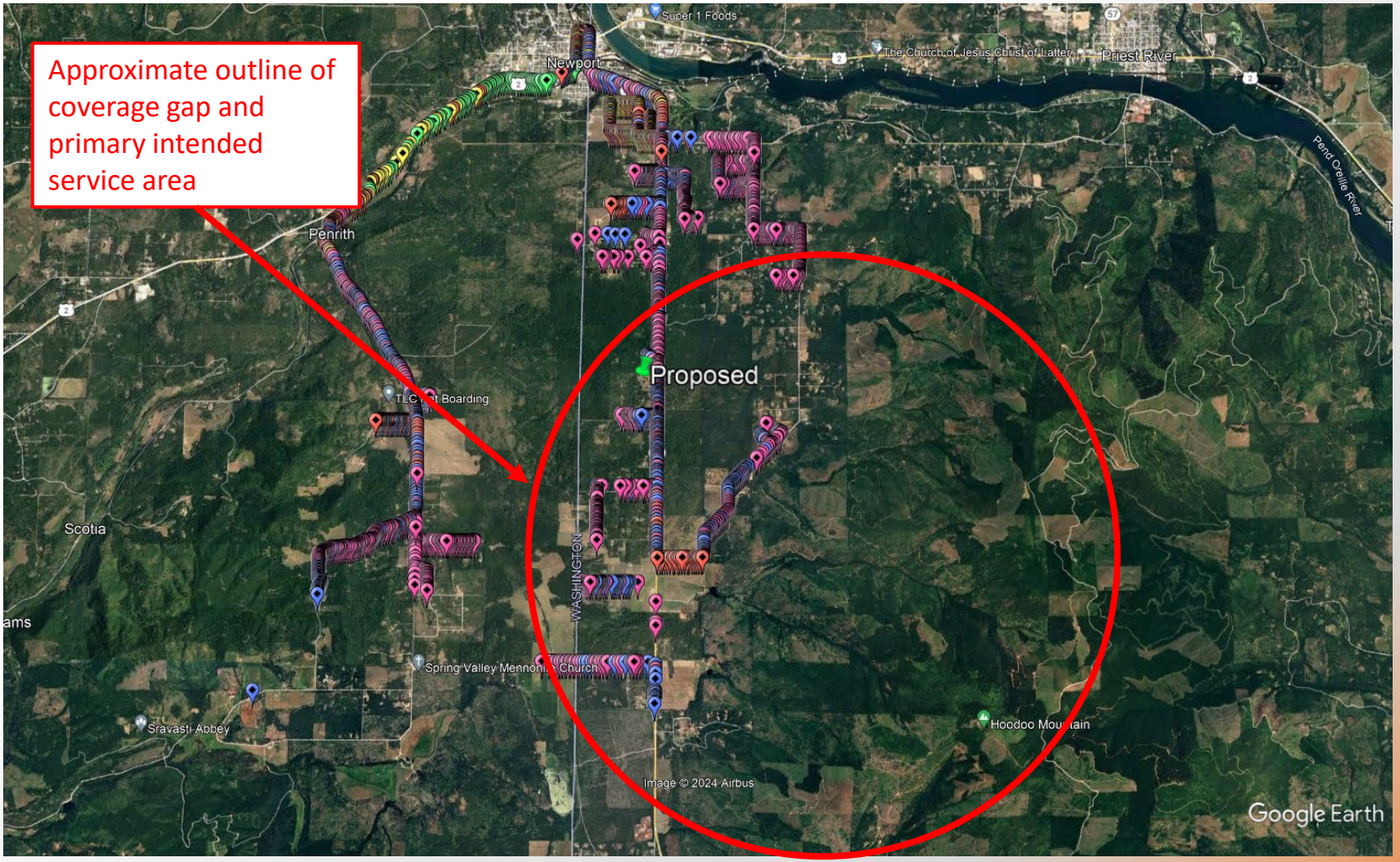
T-Mobile 2145 MHz channel Scanner Data - Overview

LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



T-Mobile 2510.55 MHz chan[illegible] Scanner Data - Overview

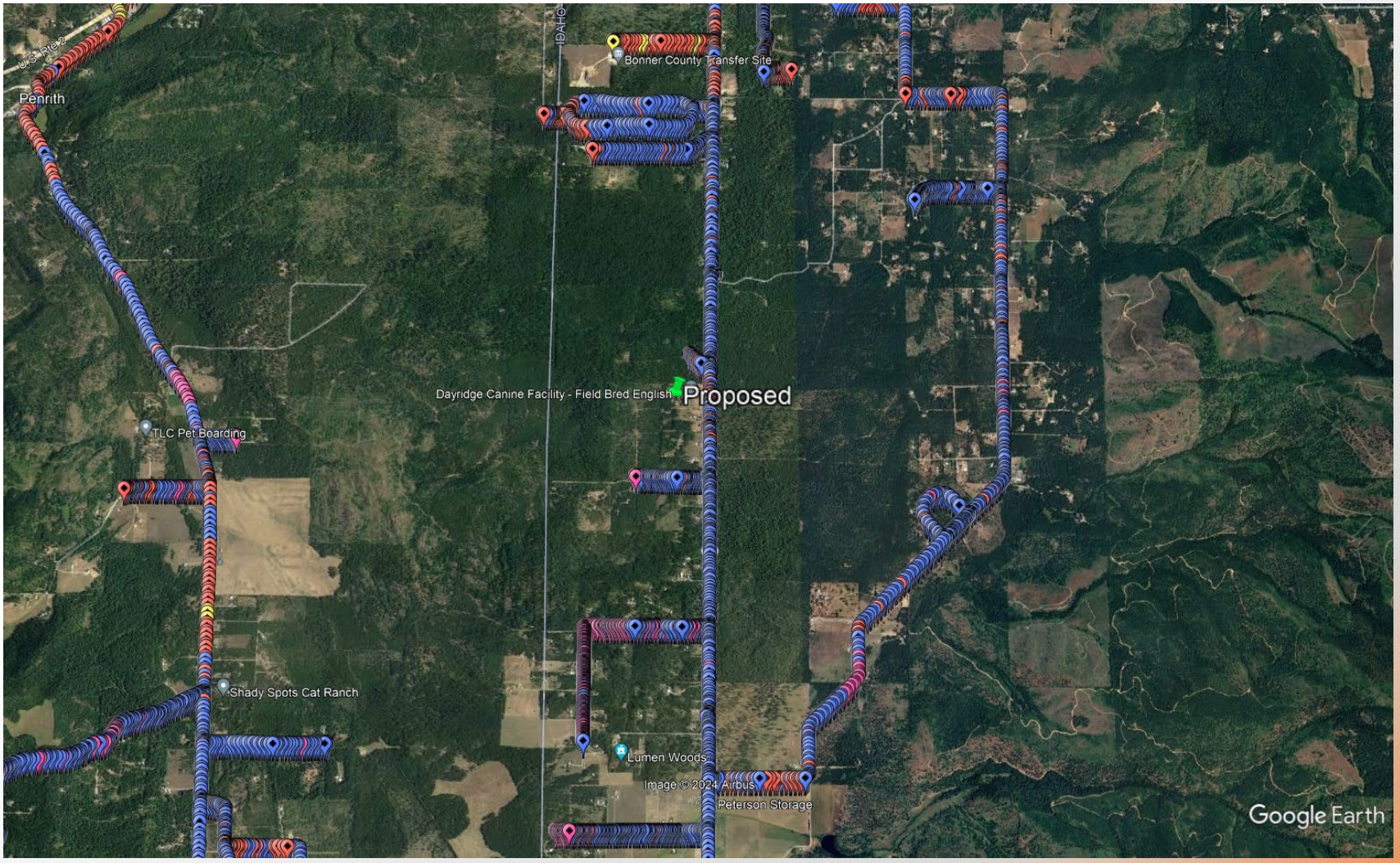
LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



07/03/2024

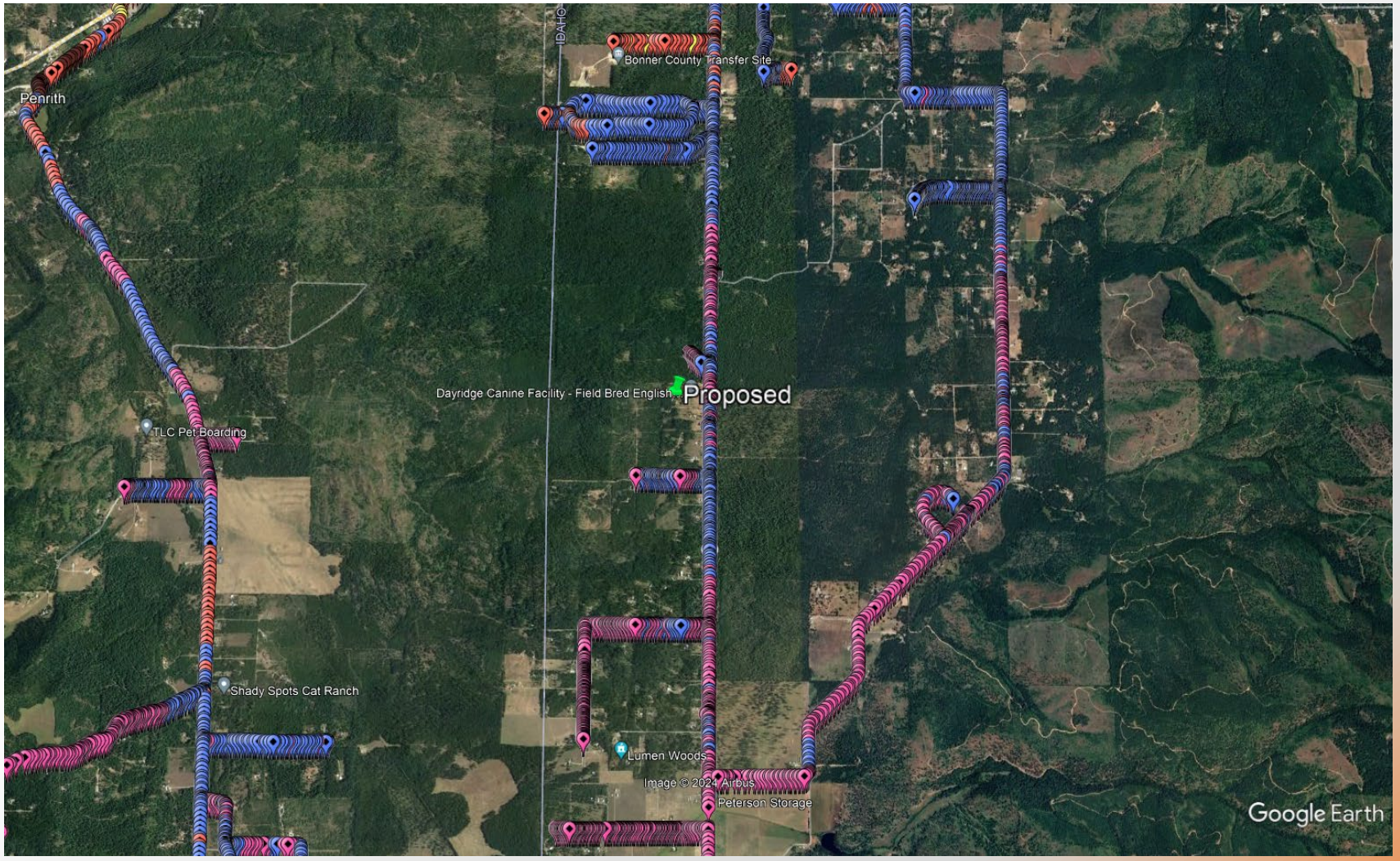
T-Mobile 731.5MHz channel Scanner Data - Zoom

LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



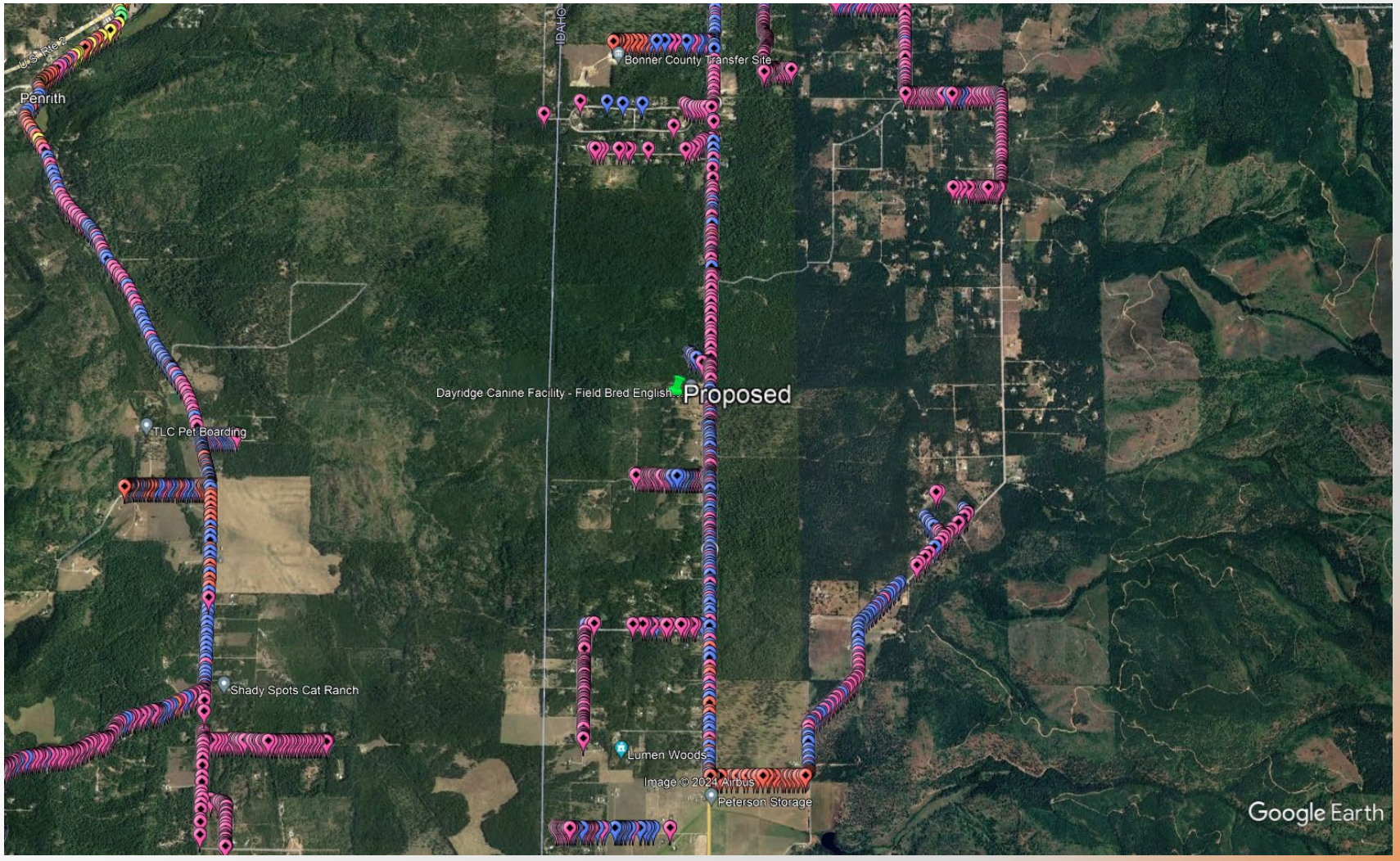
T-Mobile 2145 MHz channel Scanner Data - Zoom

LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



T-Mobile 2510.55 MHz chan[illegible] Scanner Data - Zoom

LEGEND
In-Building (-85 dbm)
In-Vehicle (-95 dbm)
Outdoor (-106 dbm)
Marginal (<-106 to -120 dbm)
Low to No Service (<-120 dbm)



Conclusion

- The Scanner recorded all frequency bands for AT&T, T-Mobile and, Verizon in the area.
- Area shows a significant gap in service of approximately 3 miles along Highway 41 as well as the rural area around the proposed
- Low, Mid and, High band do not provide acceptable quality coverage for any of the carriers in the area South of Newport.

Appendix

Frequency Bands

- For both 4G and 5G there are FCC allocated bands

- 4G – https://en.wikipedia.org/wiki/LTE_frequency_bands

- 5G - https://en.wikipedia.org/wiki/5G_NR_frequency_bands

RSRP

- RSRP is short for Reference Signal Received Power, used when measuring LTE networks. A cellular phone or another LTE-equipped device would display signal strength in RSRP, measured 0dBm (best signal) to -110dBm (weakest/no signal). An RSRP of -95dBm would be a strong signal whereas -115dBm would be very weak. Many devices show RSSI for LTE connections along with RSRP, but RSRP is a better indicator of LTE signal strength.
- Sources
  - https://5gstore.com/blog/2021/04/08/understanding-rssi-rsrp-and-rsrq/
  - https://blog.solidsignal.com/tutorials/what-is-rsrp/

RSRQ (a ratio using RSRP)

- RSRQ is Reference Signal Received Quality. This again only applies to LTE networks and is a measure of the signal quality of a cellular connection. RSRQ is typically displayed in a range from 0dB (highest quality) to -20dB (lowest quality). Typically better signal quality results in a more reliable connection.
- Sources
  - https://5gstore.com/blog/2021/04/08/understanding-rssi-rsrp-and-rsrq/
  - https://blog.solidsignal.com/tutorials/what-is-rsrp/

SINR (a ratio using RSRP)

- SINR (Signal to Interference & Noise Ratio) measures signal quality: the strength of the wanted signal compared to the unwanted interference and noise. Mobile network operators seek to maximize SINR at all sites to deliver the best possible customer experience, either by transmitting at a higher power, or by minimizing the interference and noise.
- Sources
  - https://5gstore.com/blog/2021/04/08/understanding-rssi-rsrp-and-rsrq/
  - https://iscointl.com/sinr-optimization/