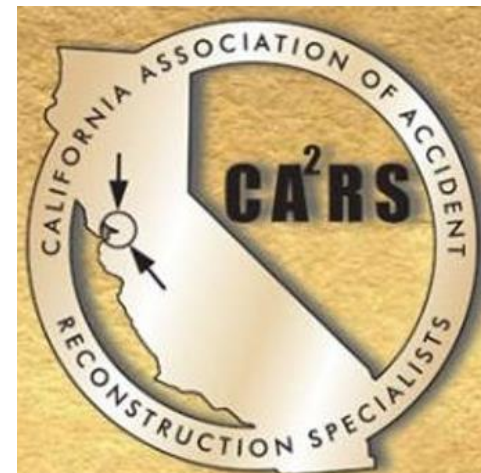


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2021 Conference

California Association of Accident Reconstruction Specialists

2021 Fall Conference
Lake Tahoe
October 20-23, 2021

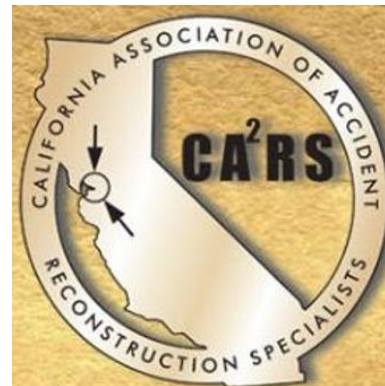


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Cellular Site Analysis

Topic Overview



Topic Overview:

Introduction

The Cellular Network

Legal Process

Overview of Records

Cellular Site Analysis

Do's and Don'ts

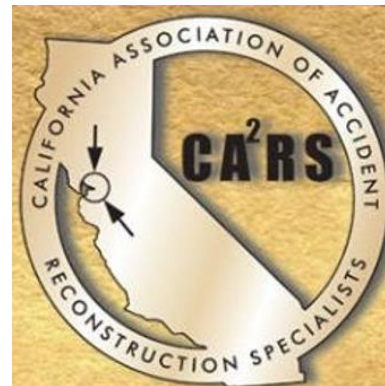
Resources

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Cellular Site Analysis

Introduction



What do you consider a cellular device?



What do you consider a cellular device?

- Cell phones
- Tablets
- Smart watches
- Air-cards & hot-spots
- Surveillance cameras
- Internet of Things (IoT)
- Wi-fi in vehicles
- OnStar

What data is available from a cellular device?



Cellular phone data can come in many forms

- Call logs
- Text messages
- Pictures / videos
- Financials
- App communications
- Contacts
- Geo-location information
- Search history
- Internet history
- Emails

Only seeing half the puzzle...

- Call logs
- Text messages
- Pictures / videos
- Financials
- App communications
- Contacts
- Geo-location information
- Search history
- Internet history
- Emails



Cellular carrier records

- Subscriber information
- Account notes
- Payment & purchase records
- Call/communication detail records
 - Incoming/outgoing call detail
 - Incoming/outgoing text detail
 - Cell site detail
- Network Event Location System (NELOS)
- Voicemails
- Text message content
- Data usage records

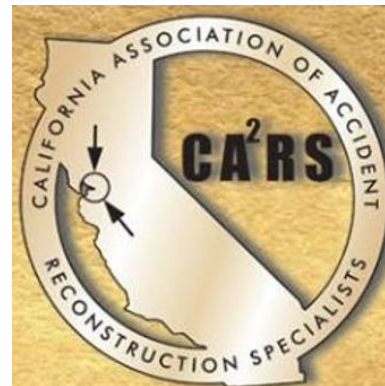


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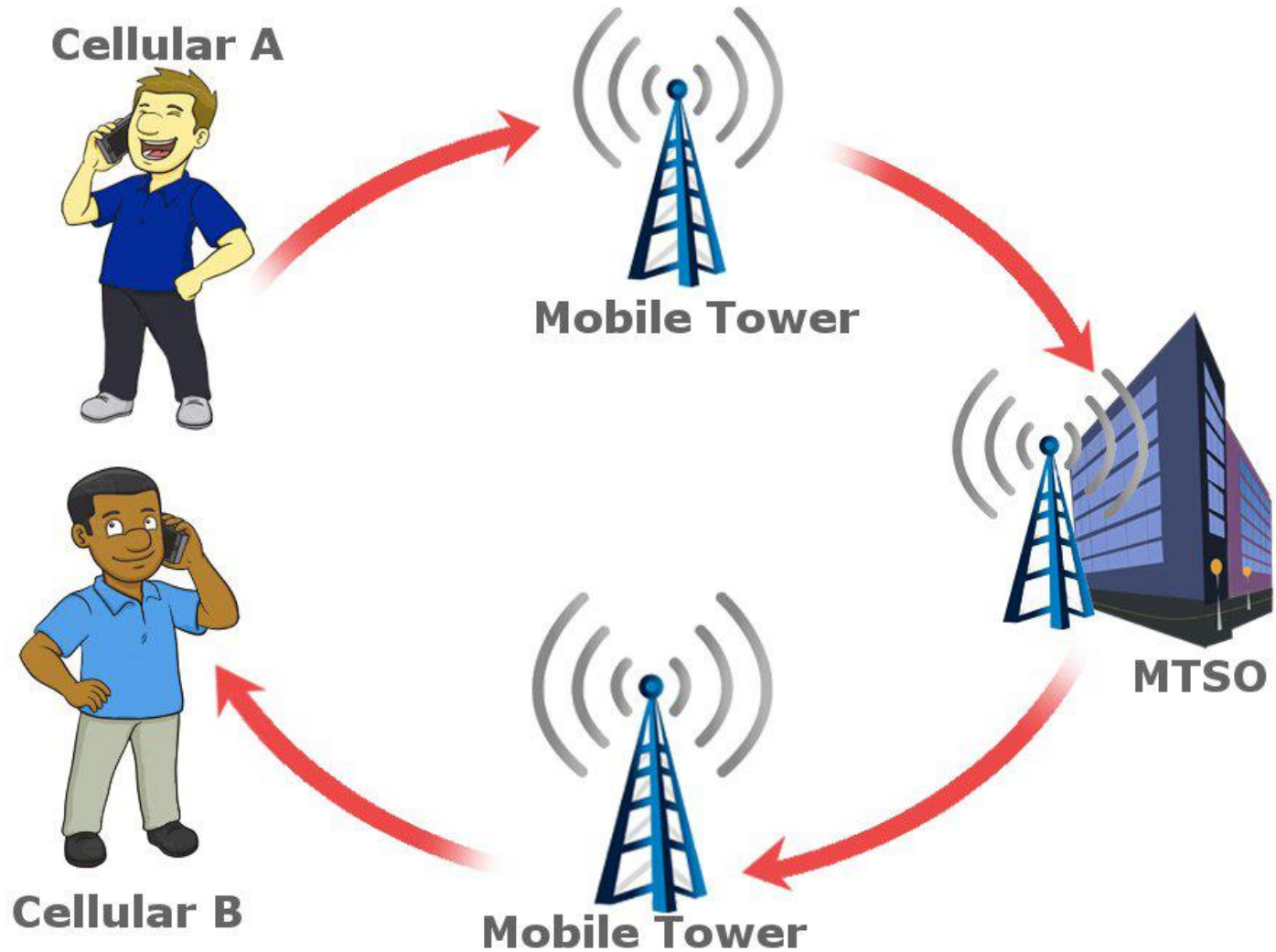
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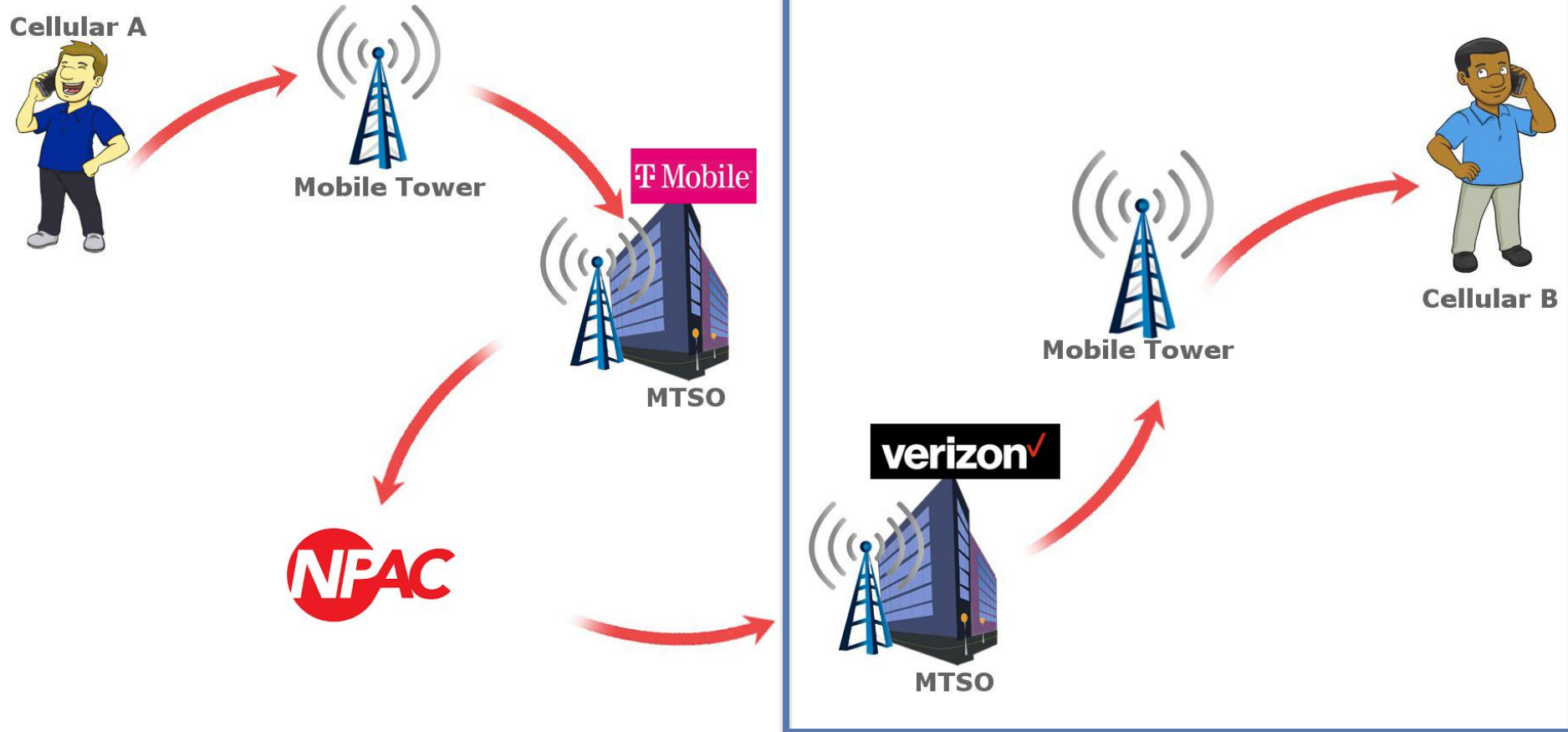
The Cellular Network



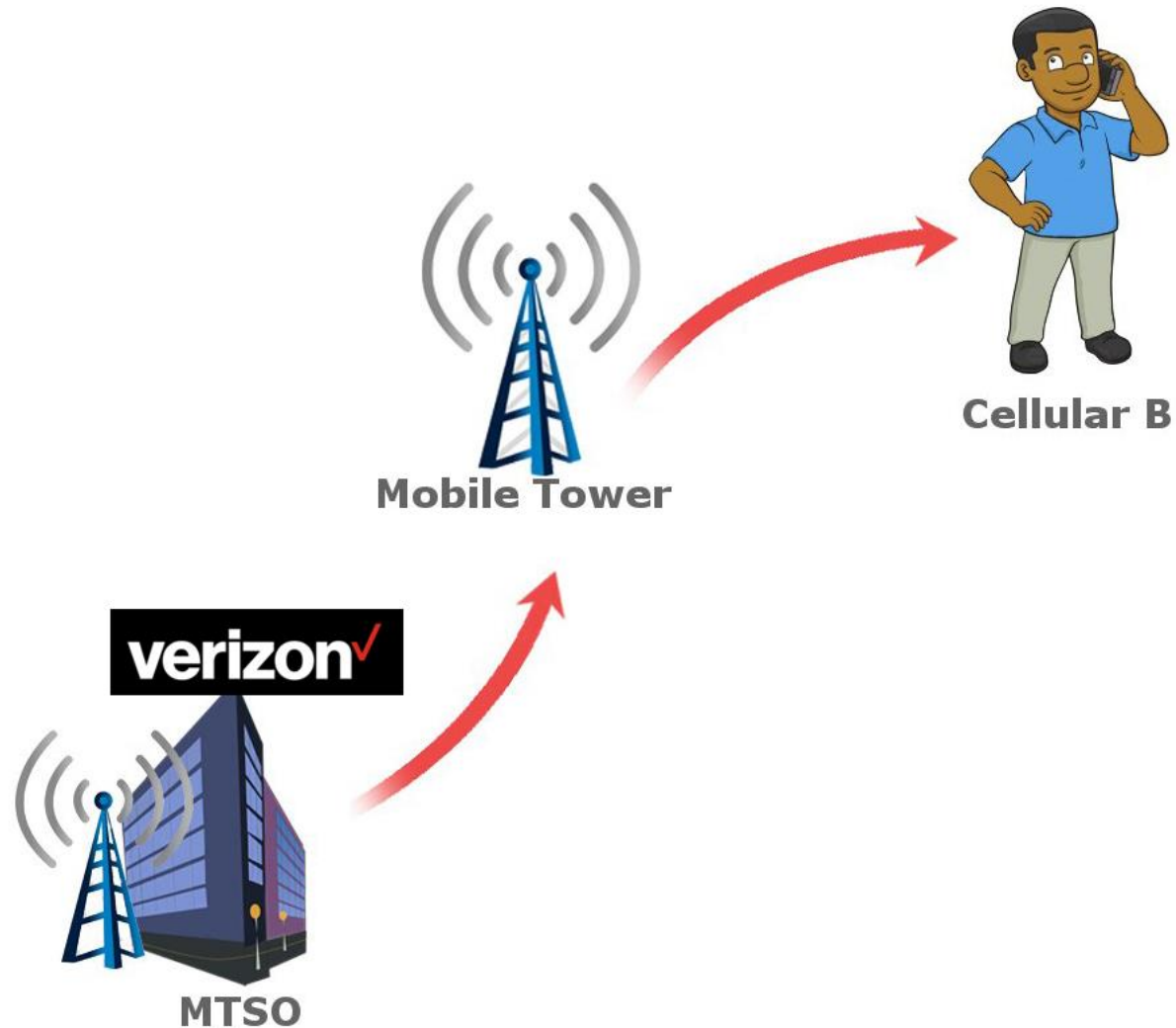
The Cellular Network



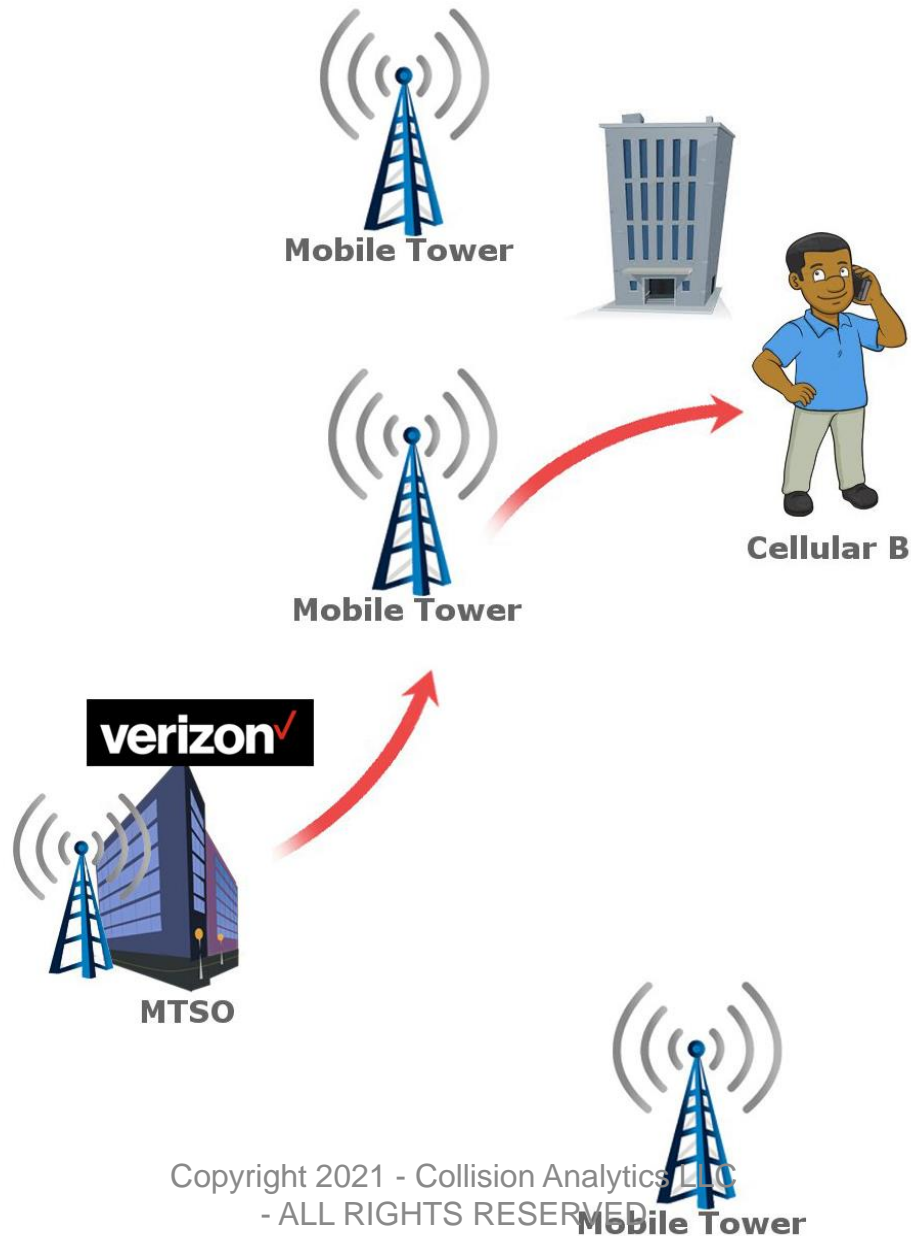
The Cellular Network



The Cellular Network



The Cellular Network

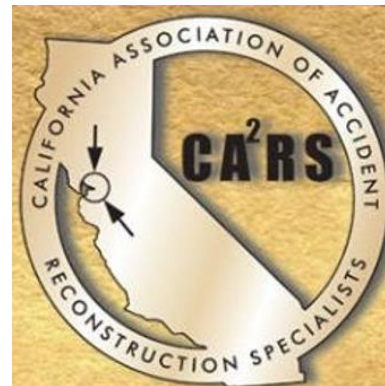


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Cellular Site Analysis

Legal Process



“...because cellphones are such a pervasive part of life “that carrying one is indispensable to participation in modern society,” it can’t really be said that a cellphone user is voluntarily sharing information about his location with his carrier.”

Chief Justice John Roberts; *Carpenter v U.S.* (2018)

Step 1: Preservation

But who to serve?

Fone Finder

Reverse Email Lookup

Search for USA/Canadian telephone numbers



Area Code Prefix -- 4 digits

Search by Number

Enter 10 digits for best search.

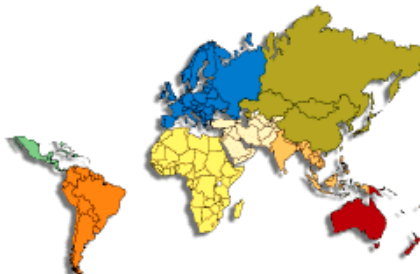
Leave what you don't know blank.

or enter City name

Search by City

or Zip code

Search by Zip



Search international telephone numbers

Int'l Phone Number

Search by Number

Blanks match any value.

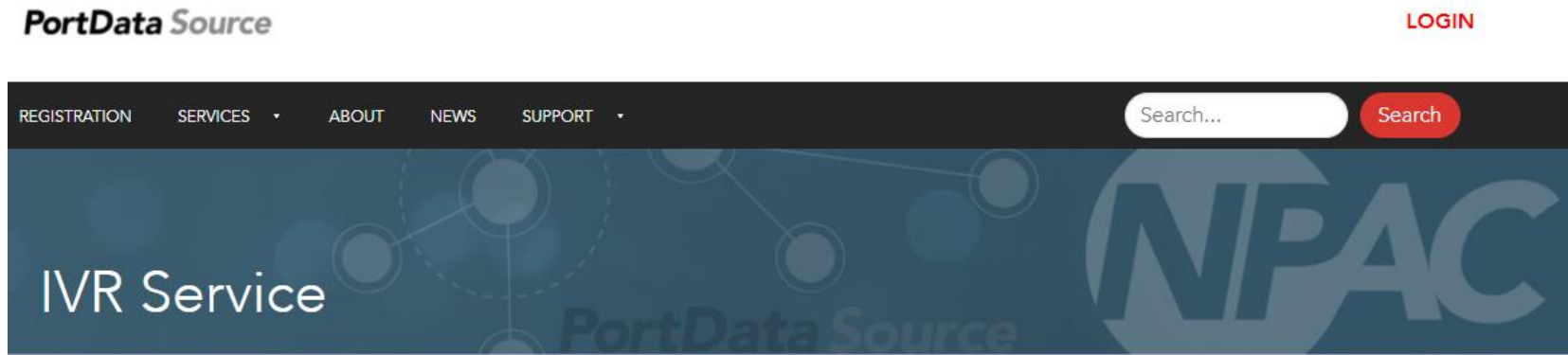
Omit leading "1" or "011".

Country Name

Search by Country

Step 1: Preservation

But who to serve?



Quickly Identify Service Provider of Record

Interactive Voice Response (IVR) Service

Number portability makes it convenient for anyone to switch their telephone service provider — but it can make investigations by law enforcement and public safety personnel more challenging.

The Interactive Voice Response (IVR) is a free, telephone-based service for authorized law enforcement and public safety agencies that indicates the current service provider of record for specific telephone numbers that have been ported. The IVR utilizes the most up to date information from the Number Portability Administration Center (NPAC) database. Users can get that information for up to 20 telephone numbers at a time.

To access the IVR service, registered Users call 877-416-6551. New users get started by filling out and submitting the IVR Registration Form.

If you have questions, please contact iconectiv at IVR@iconectiv.numberportability.com or call 844-511-3537.

Register Now

Step 1: Preservation

But who to serve?

[Home](#)[About Us](#)[Membership](#)[Solut](#)

Select an ISP from the drop-down menu to access contact information:

Sprint Corporation

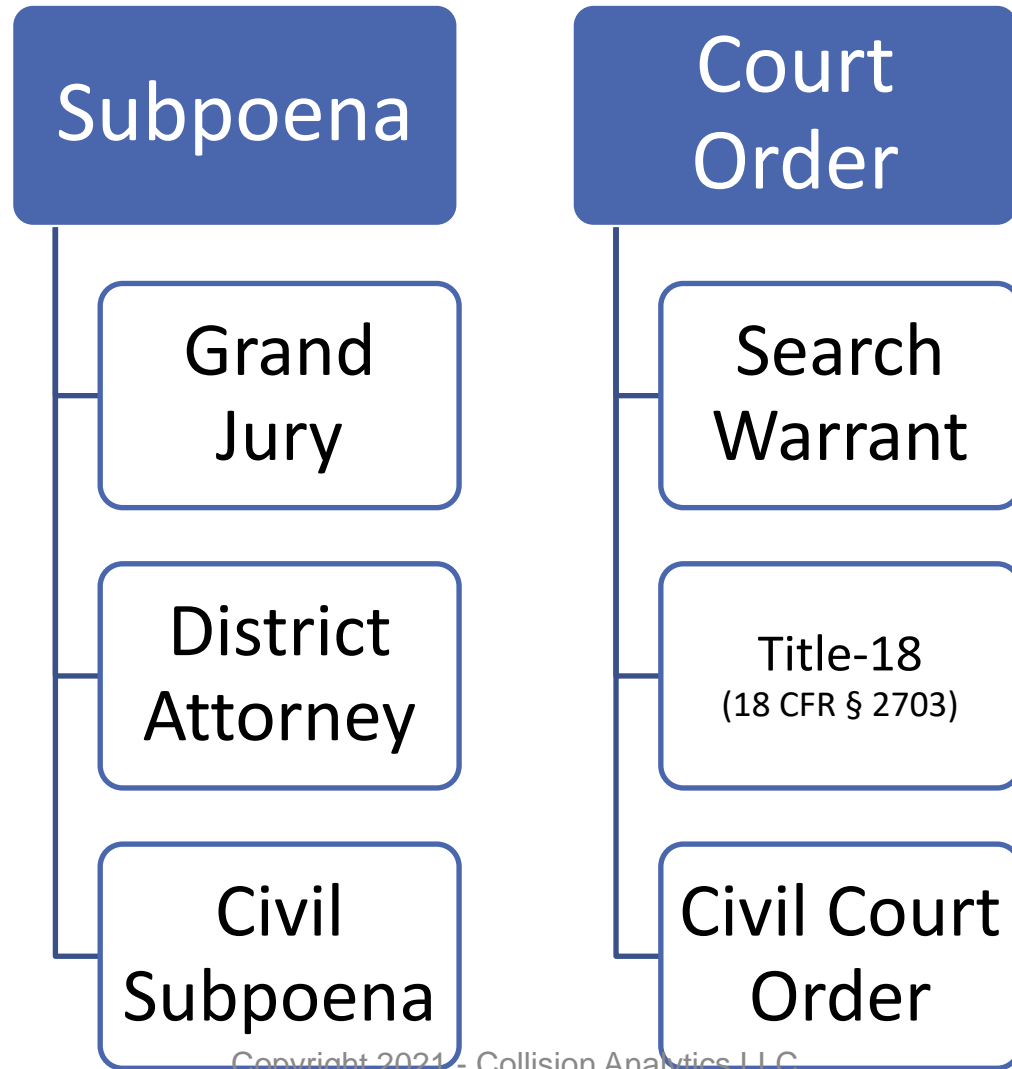
SEARCH

Contact First Name	Tom
Contact Last Name	Koch
Contact Title	Corporate Security
Address	6360 Sprint Parkway
City	Overland Park
State	Kansas
Zip Code	66251
Phone Number	866-537-0911
Email	LERinbound@t-mobile.com

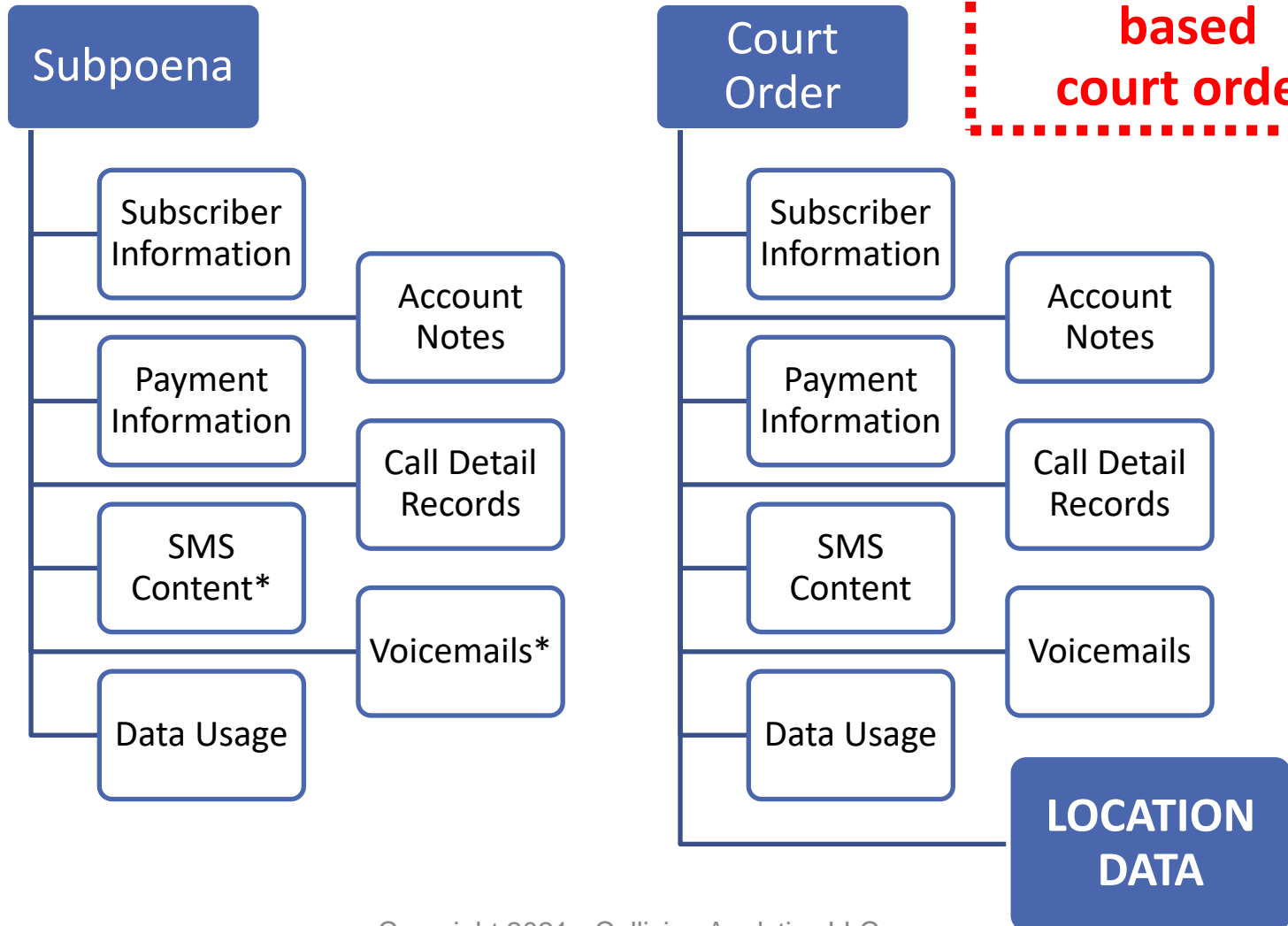
Step 1: Preservation

Data	Verizon Wireless	AT&T	Sprint	T-Mobile	US Cellular
Subscriber Information	Contact Collision Analytics for additional details (815) 260-3721				
Call History					
Call History Locations					
SMS Content					
Tower Dumps					
Range to Tower					

Step 2: Legal Threshold



Step 2: Legal Threshold



Step 3: Service

Search warrant timeline

MVNO's & Roaming

Method

Receipt of records

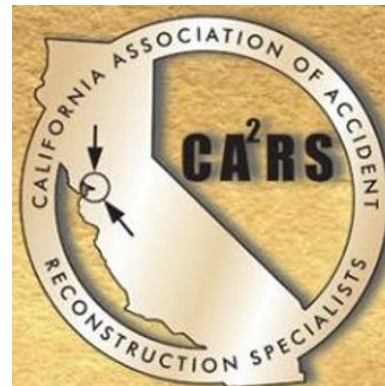


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Cellular Site Analysis

Overview of Records



Follow Best Practices

Chain of Custody

Email preservation

Original documents

Certification of Records



Overview of Records

S

C

[illegible]

What is possible?

Obtain payment / purchase location

Confirm

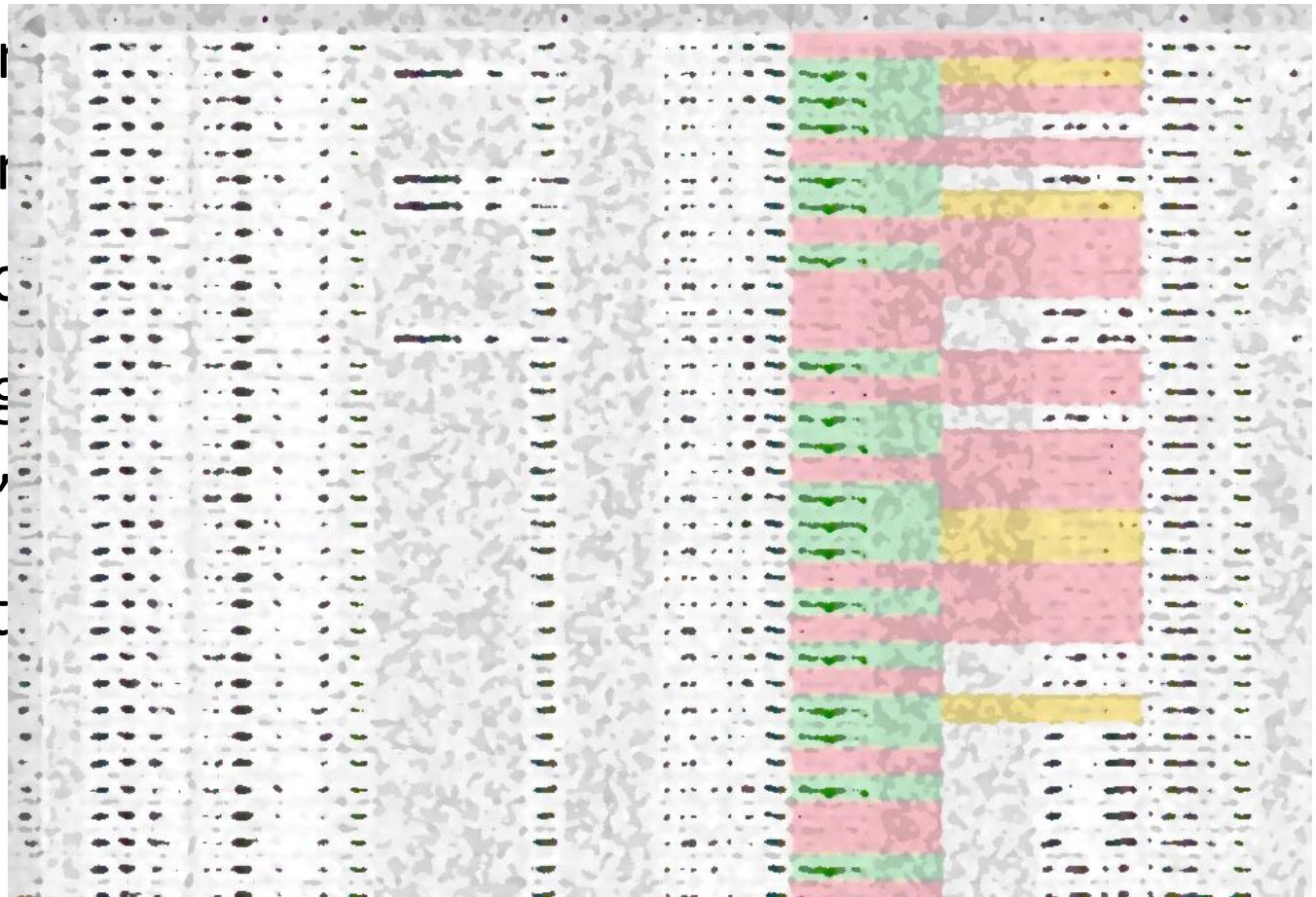
Pattern

Contact

Adding

“Hole”

Cell sit

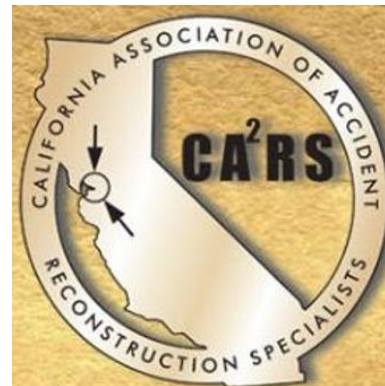


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Cellular Site Analysis

Cell Site Analysis





Effects on cellular connection

Distance

Obstructions

Topography

Maintenance

Network Load

Cellular devices will most often connect to the cellular site with the strongest signal.



Mobile Tower



Mobile Tower

Effects on cellular connection

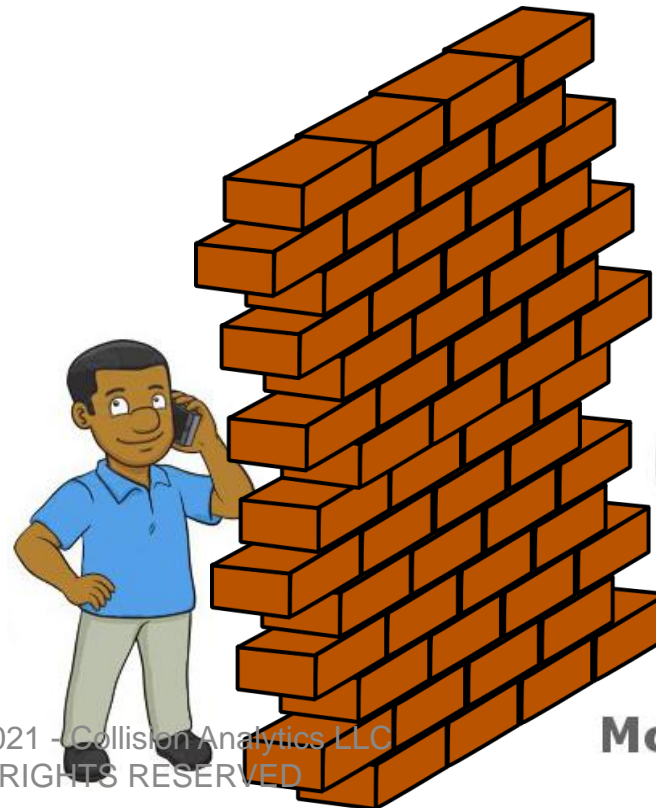
Distance

Obstructions

Topography

Maintenance

Network Load



Effects on cellular connection

Distance

Obstructions

Topography

Maintenance

Network Load



Effects on cellular connection

Distance

Obstructions

Topography

Maintenance

Network Load



Effects on cellular connection

Distance

Obstructions

Topography

Maintenance

Network Load



Effects on cellular connection

Distance

Obstructions

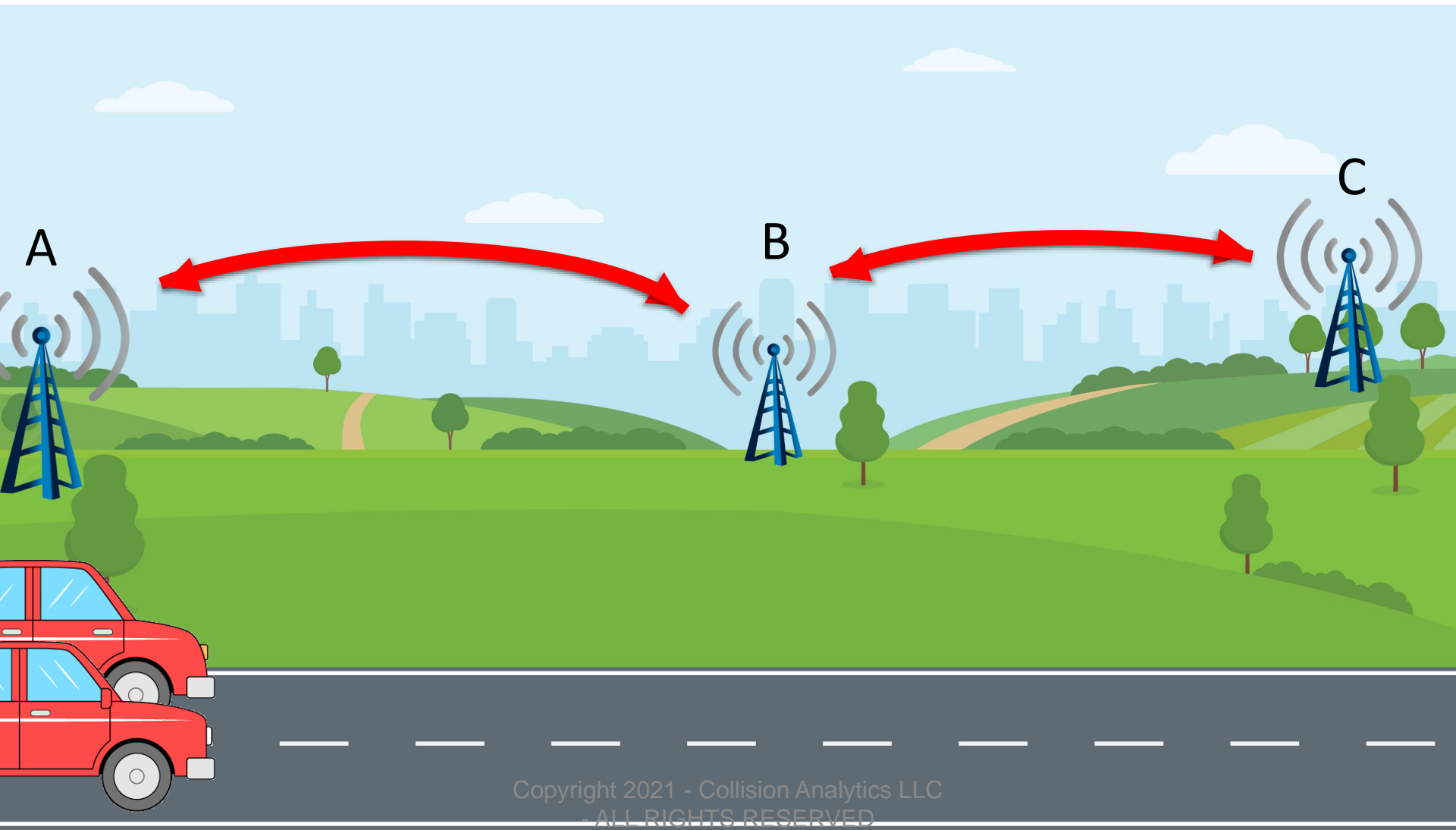
Topography

Maintenance

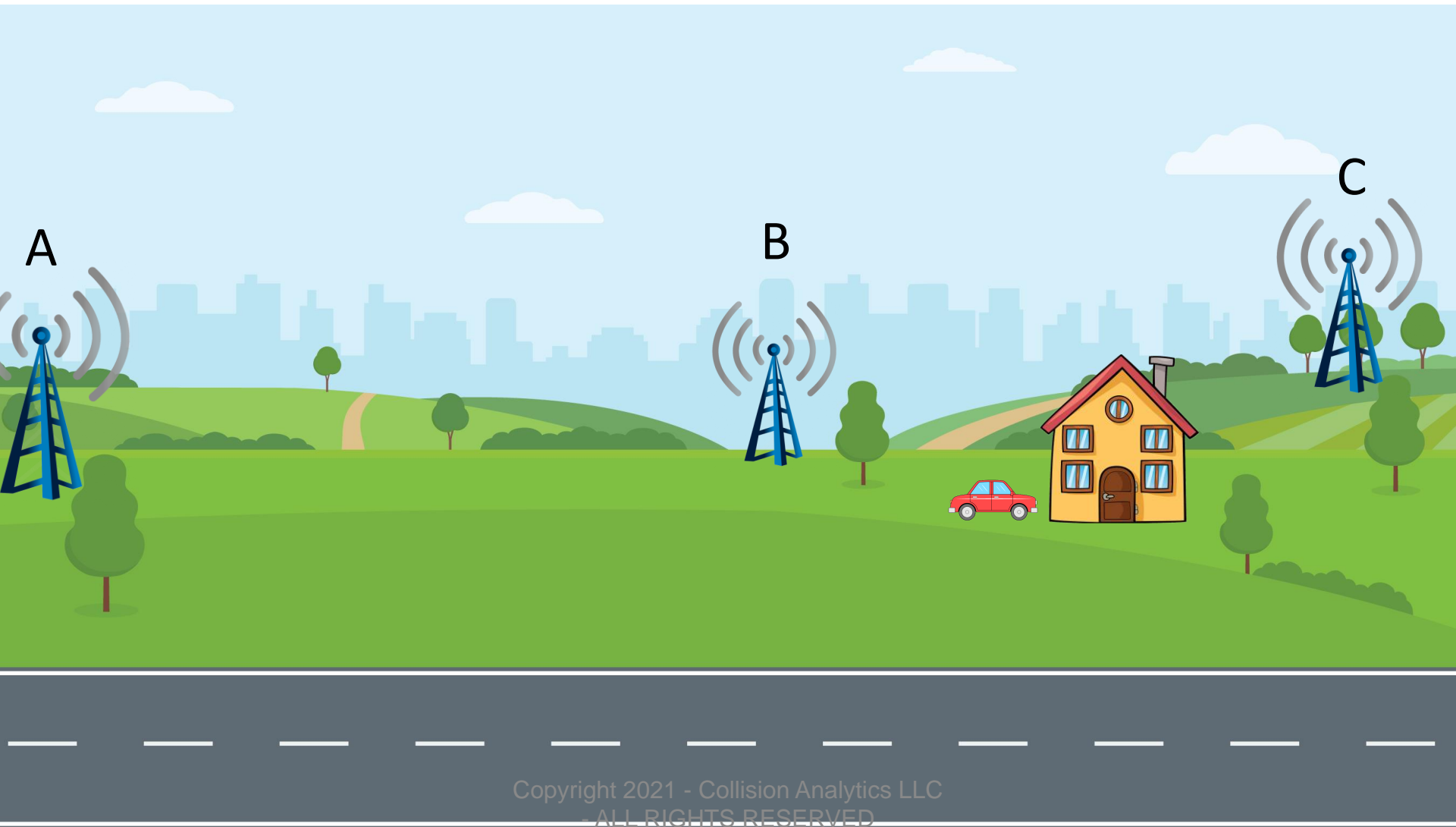
Network Load



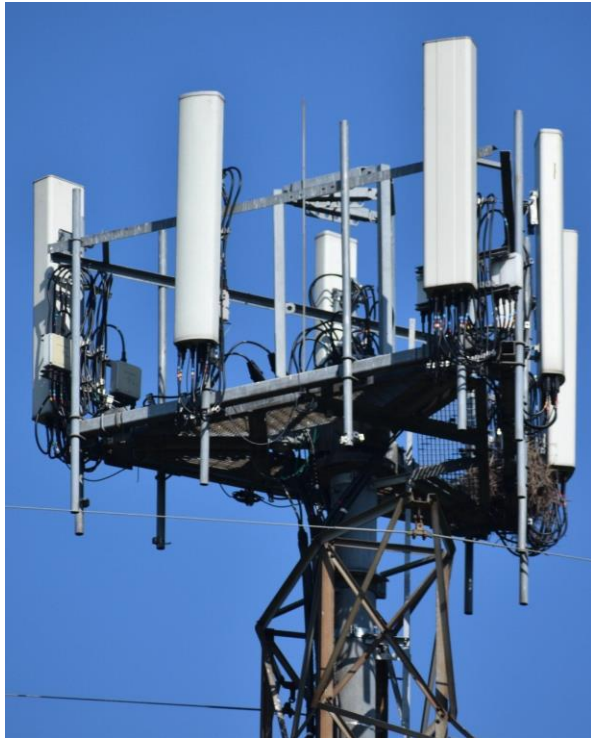
Signal Handoff



Toggling



Cellular Sites



Cellular Sites



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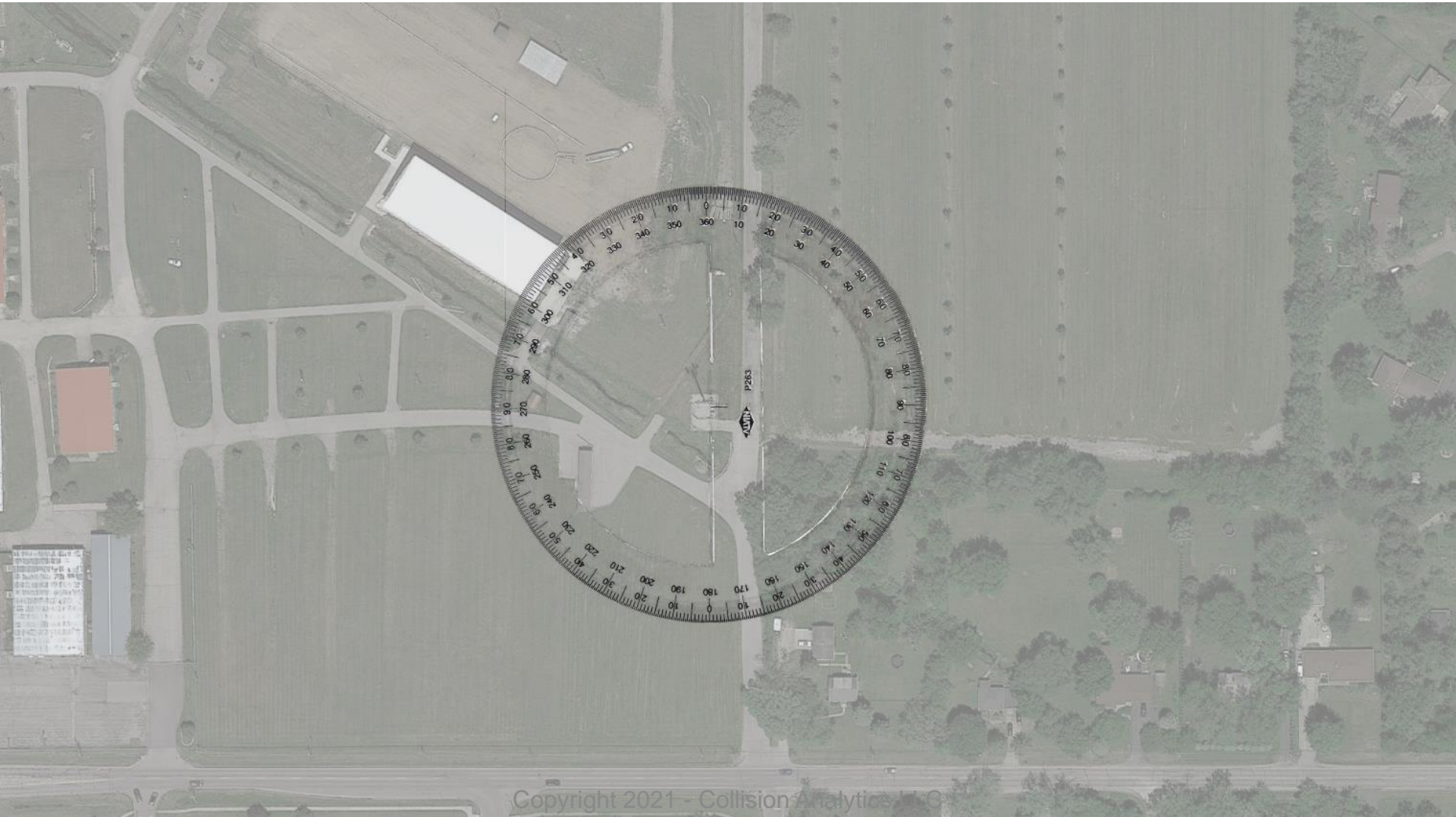


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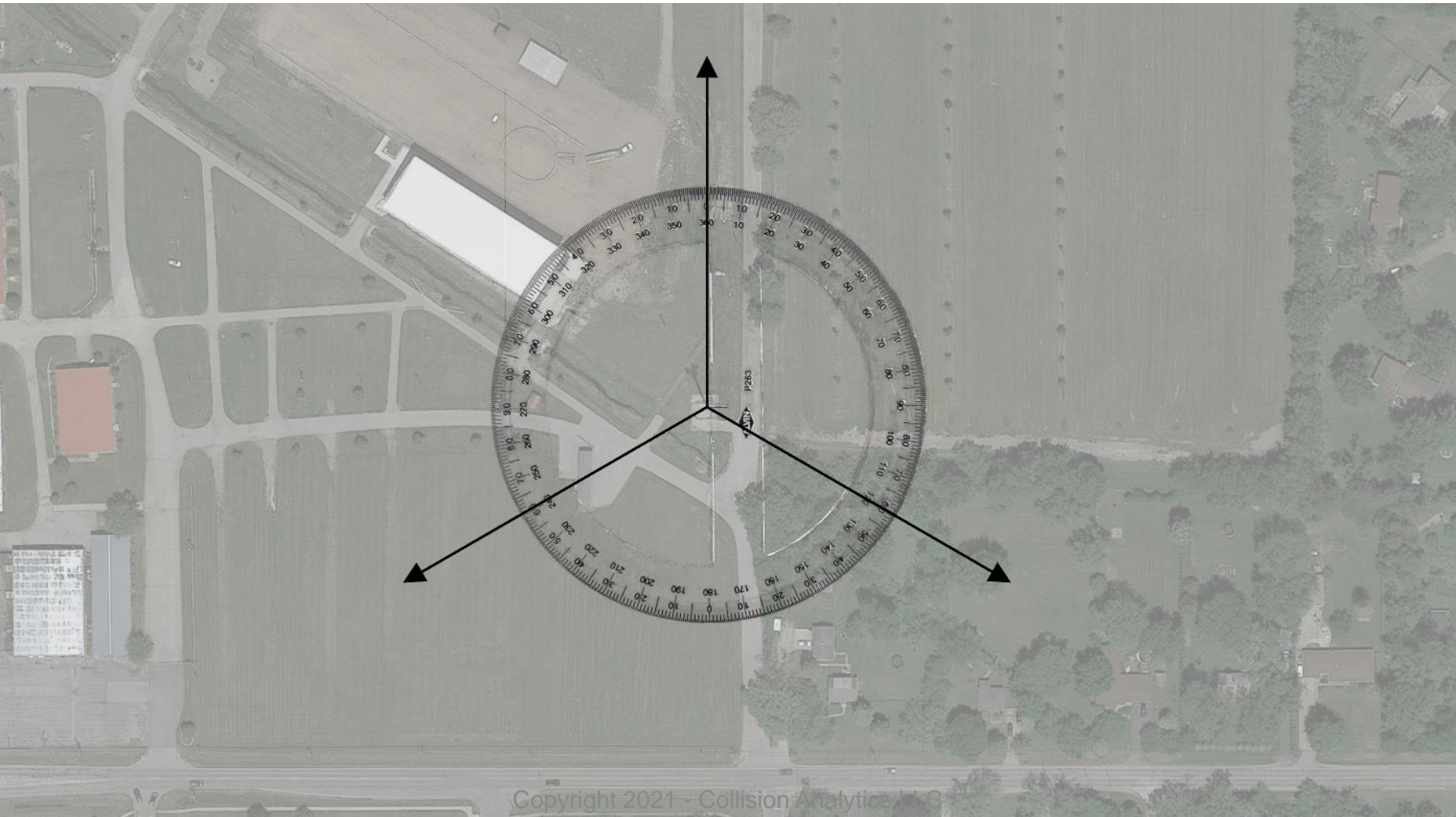
Mapping



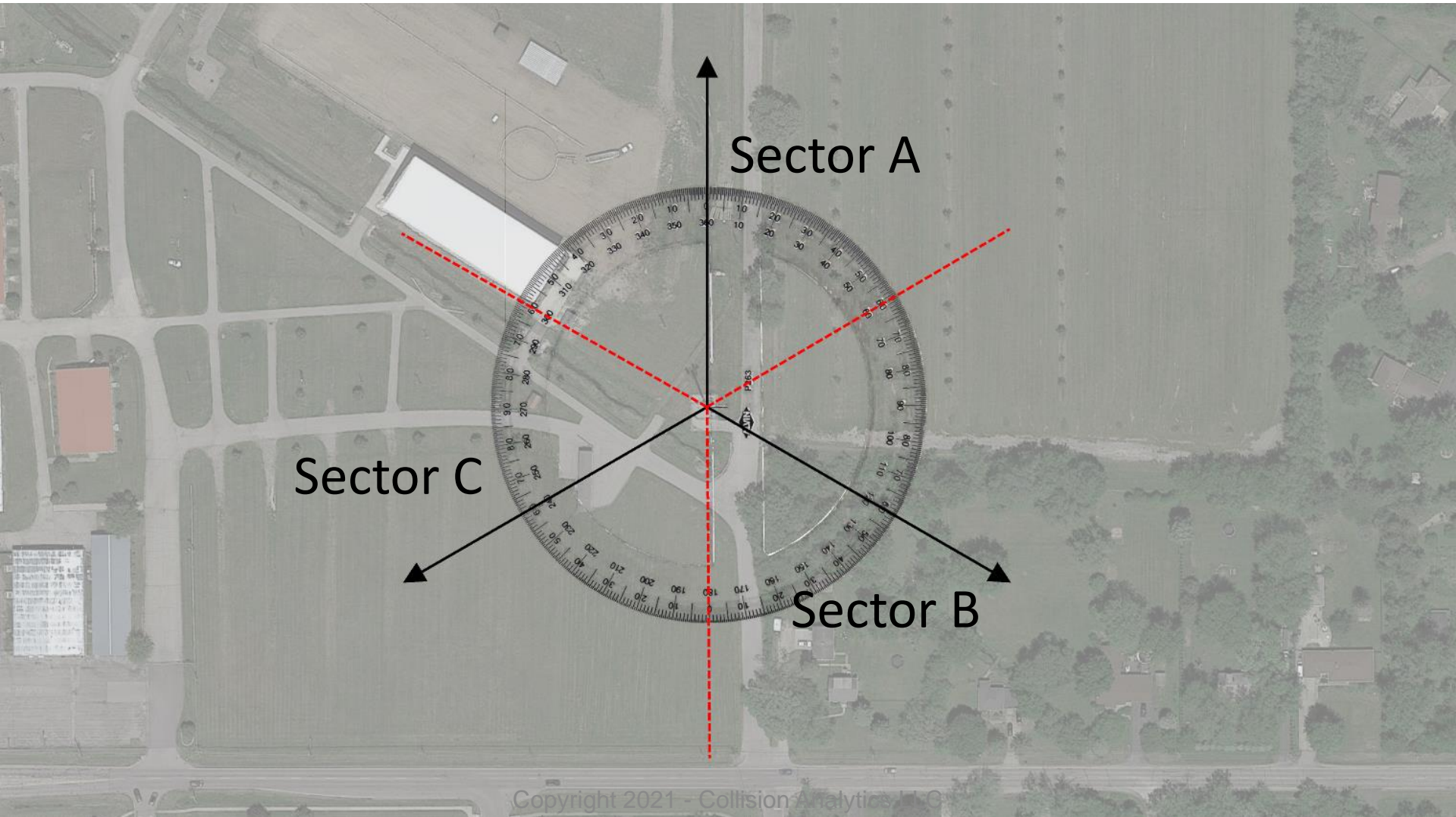
Mapping – Antenna azimuth: 0°, 120°, 240°



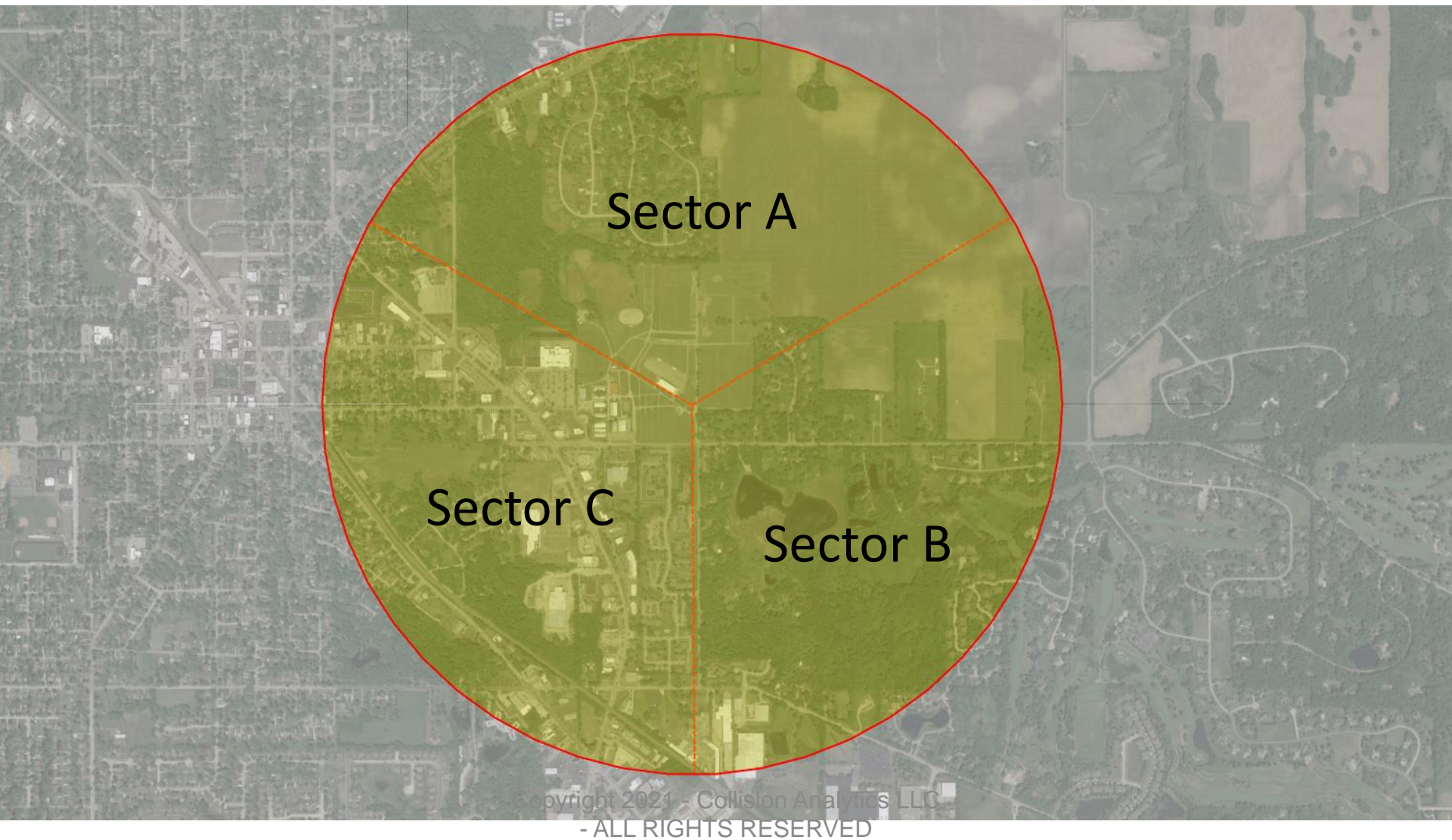
Mapping – Antenna azimuth: 0°, 120°, 240°



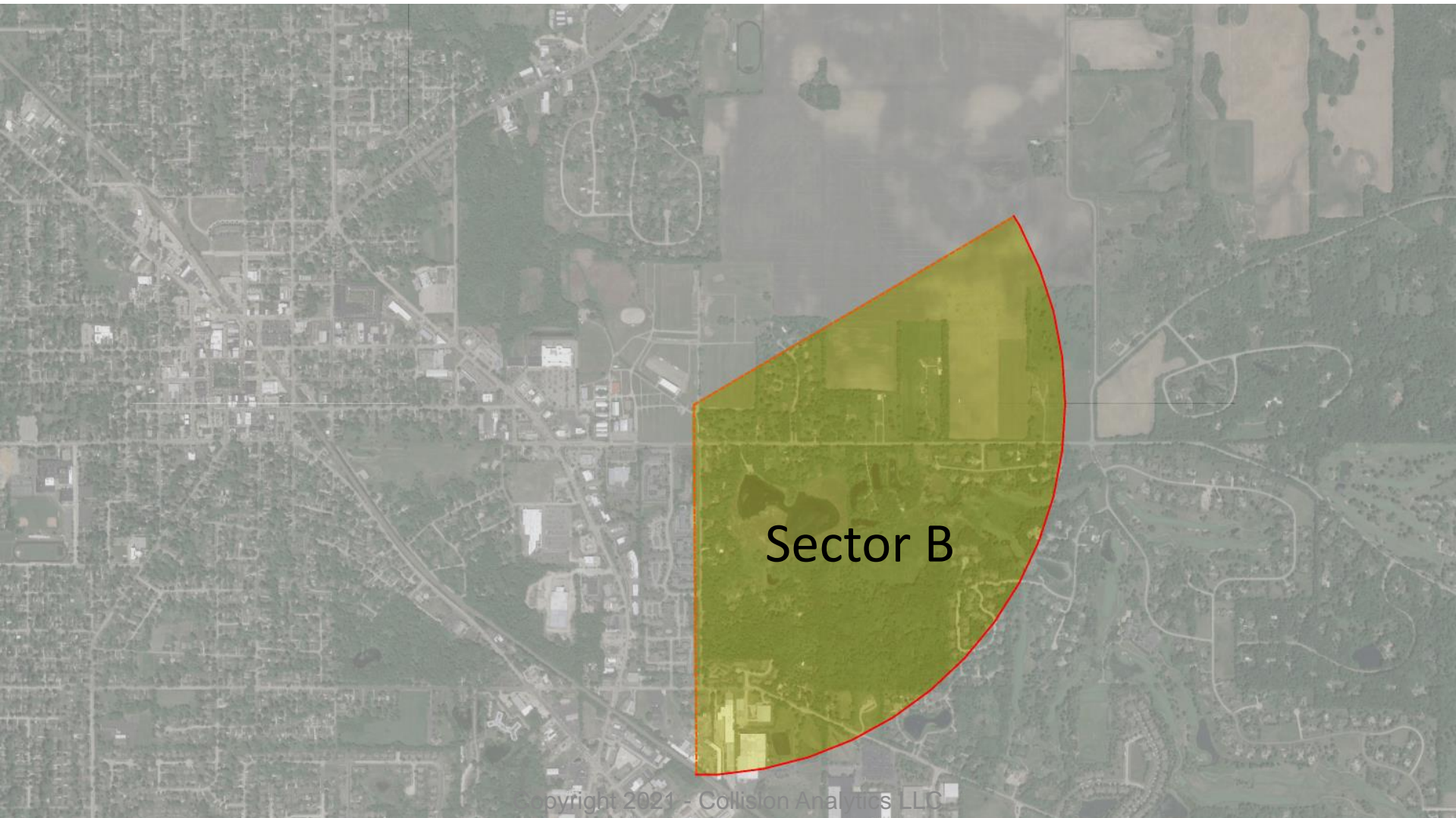
Mapping



Mapping



Mapping



Software



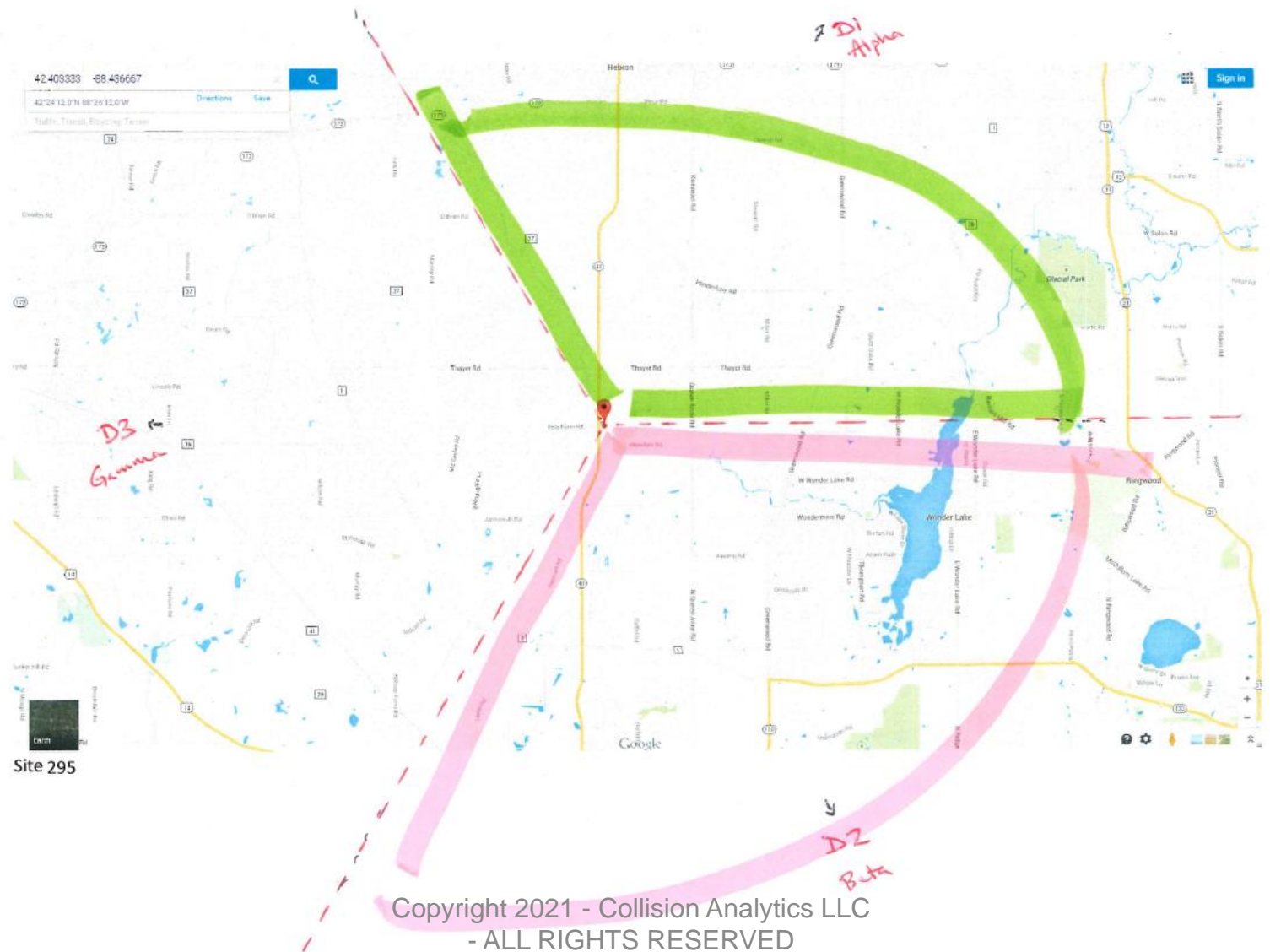
CastViz



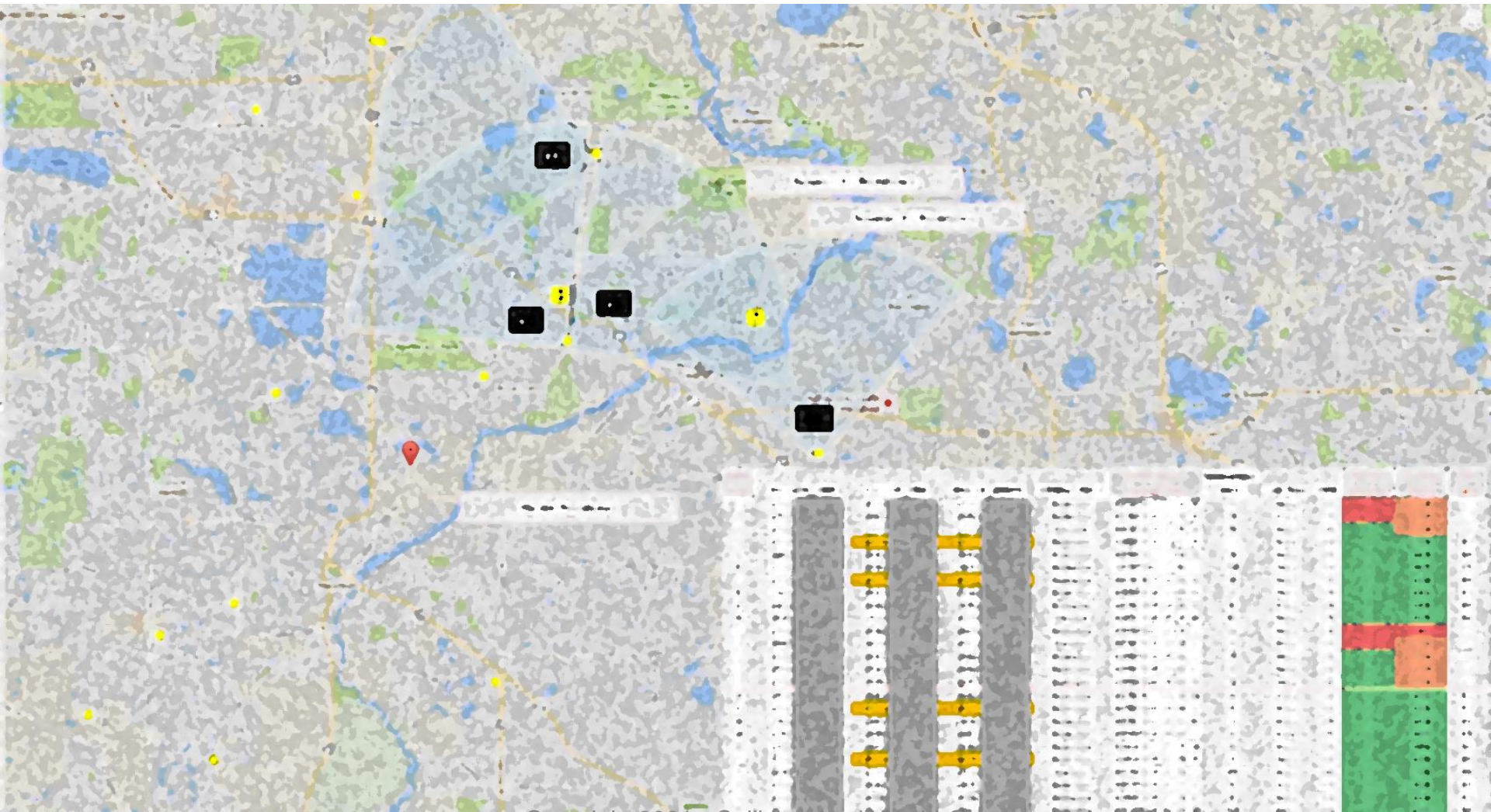
CELLHAWK
POWERED BY HAWK ANALYTICS

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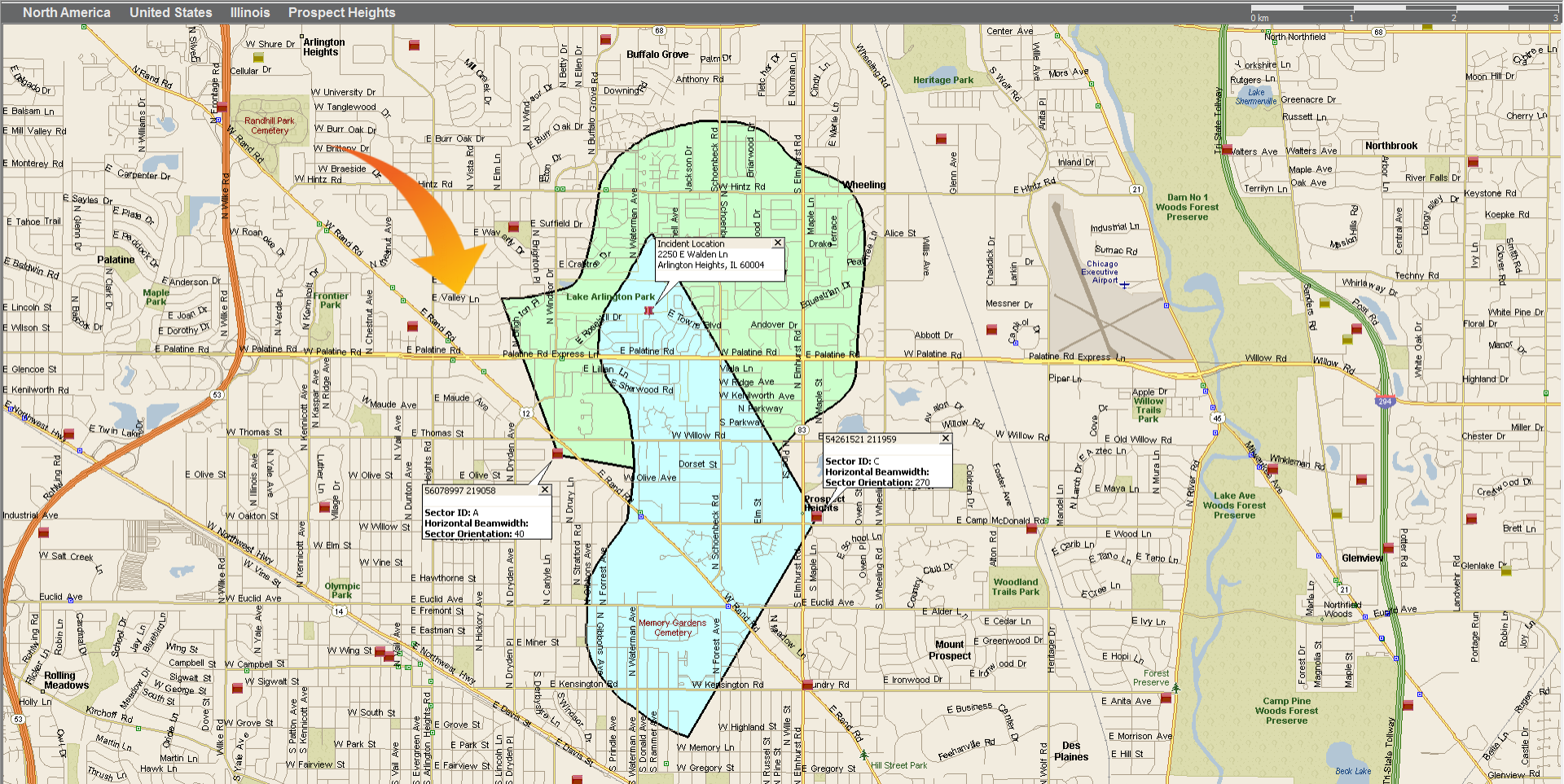
Software



Method

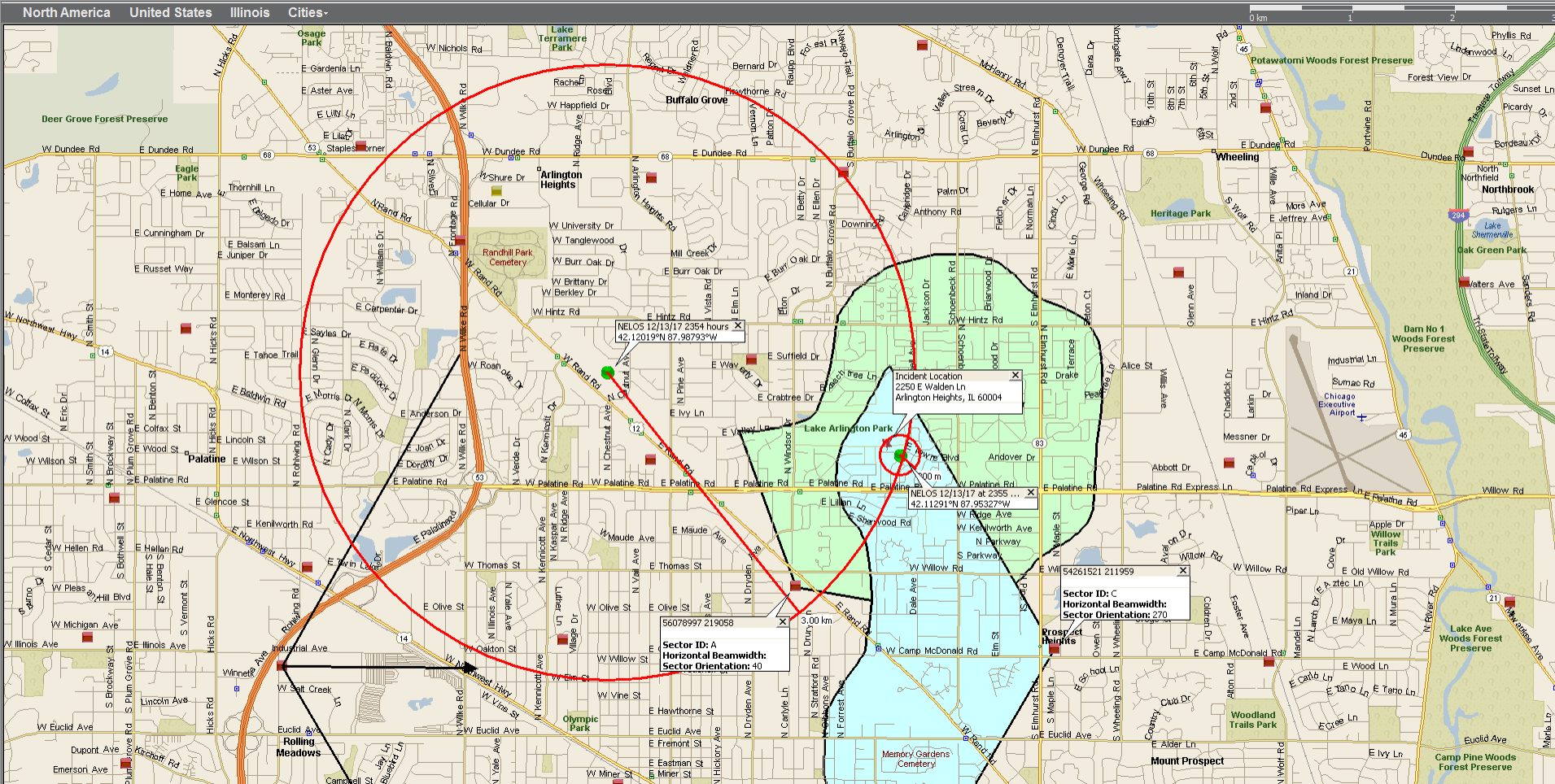


Cell Site Analysis

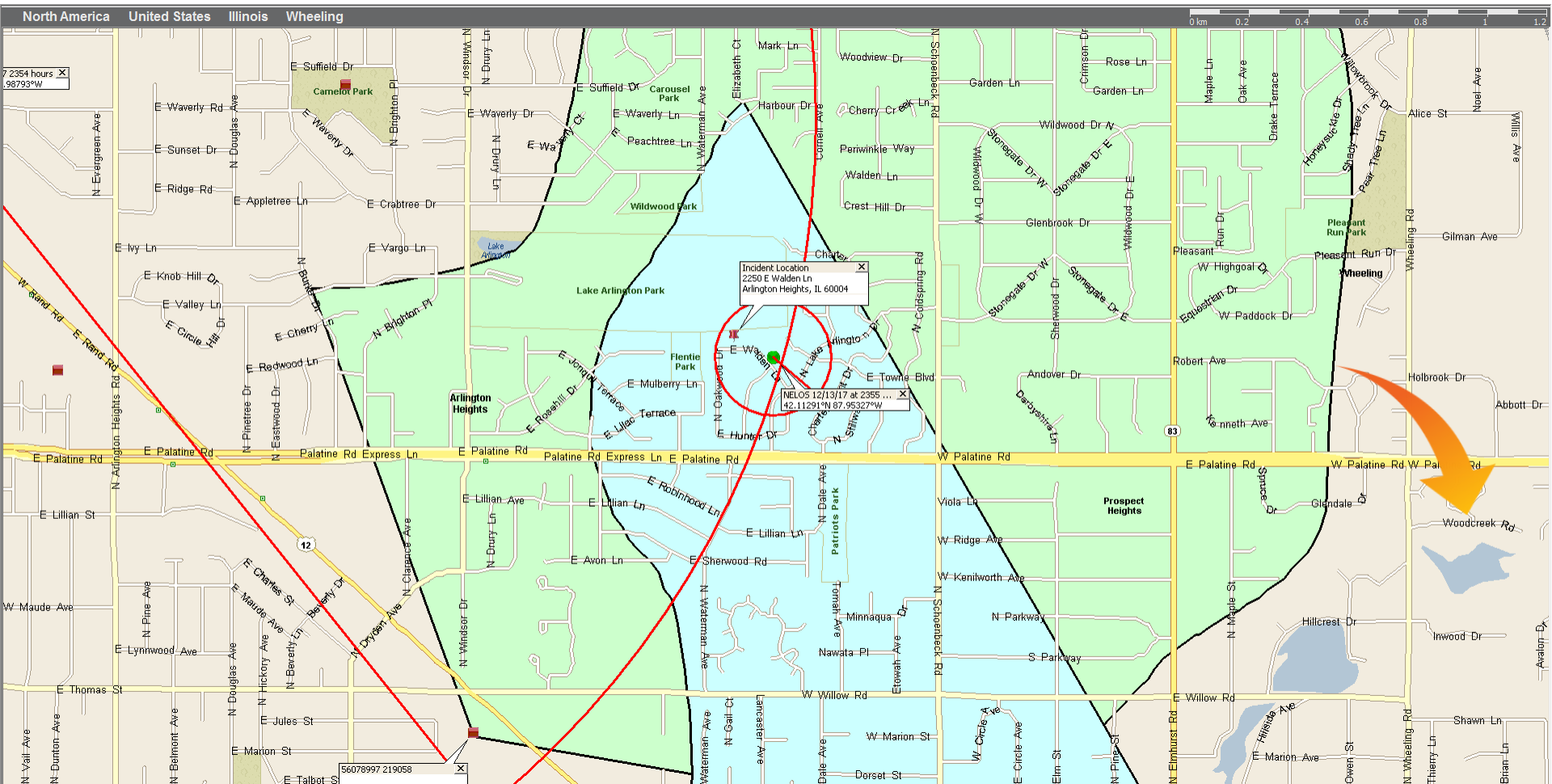




Cell Site Analysis



Cell Site Analysis



Can't we be more accurate?

Ranging Data

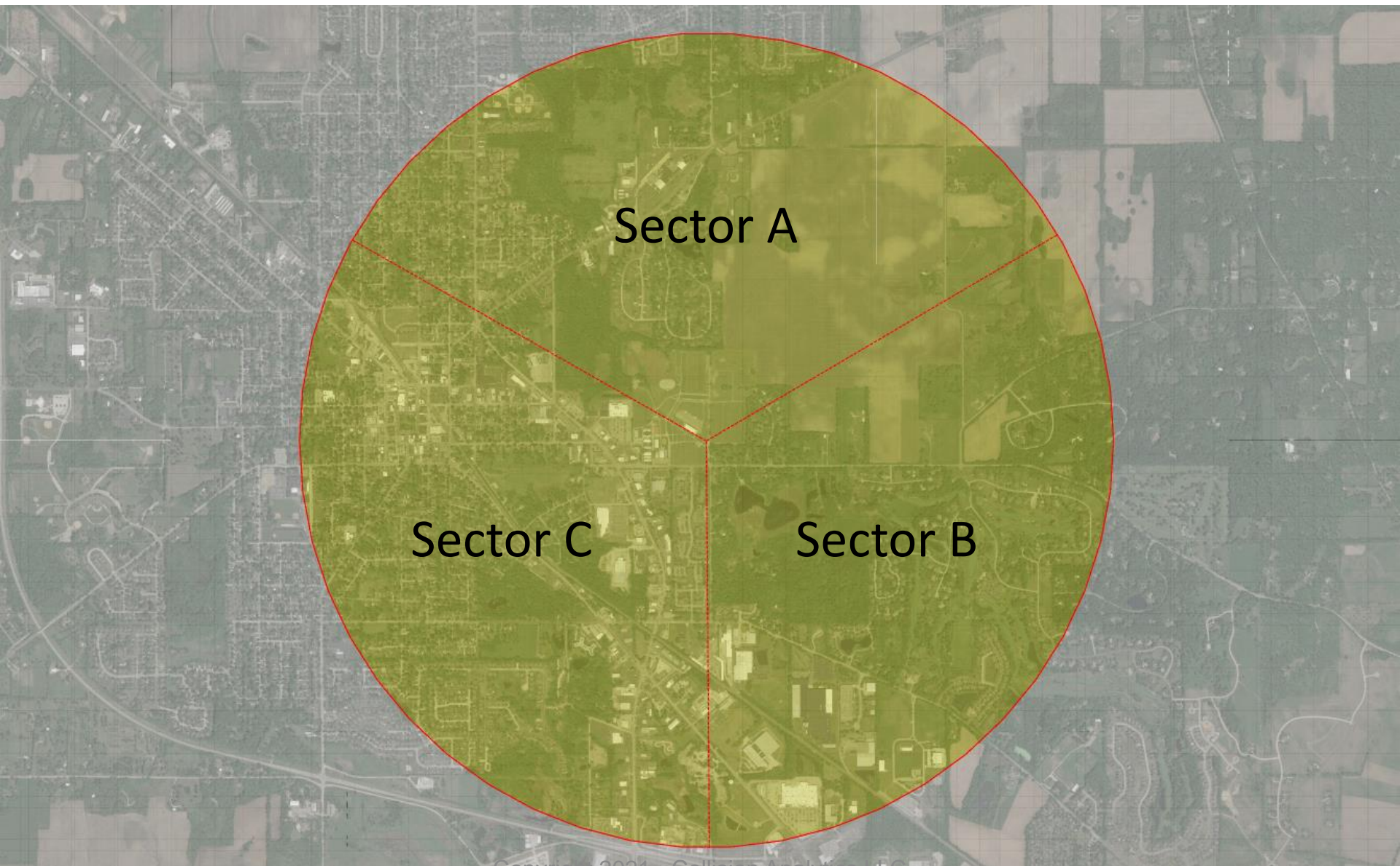
Per Call Measurement Data - Sprint / US Cellular

Round Trip Time (RTT) - Verizon

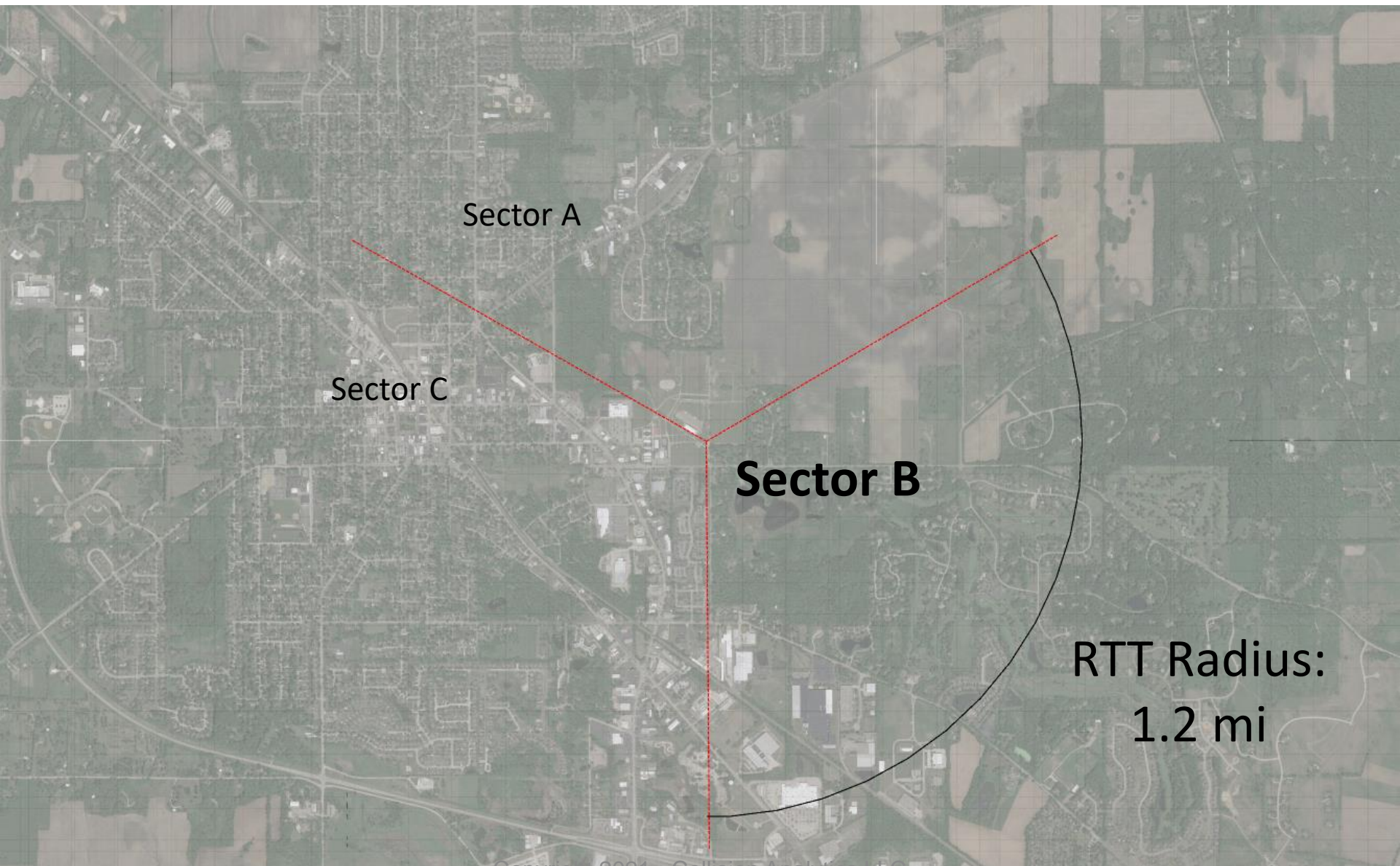
True Call - T-Mobile

1. Locate the cellular site
2. Determine the sector
3. Distance from tower, ± 0.1 mile

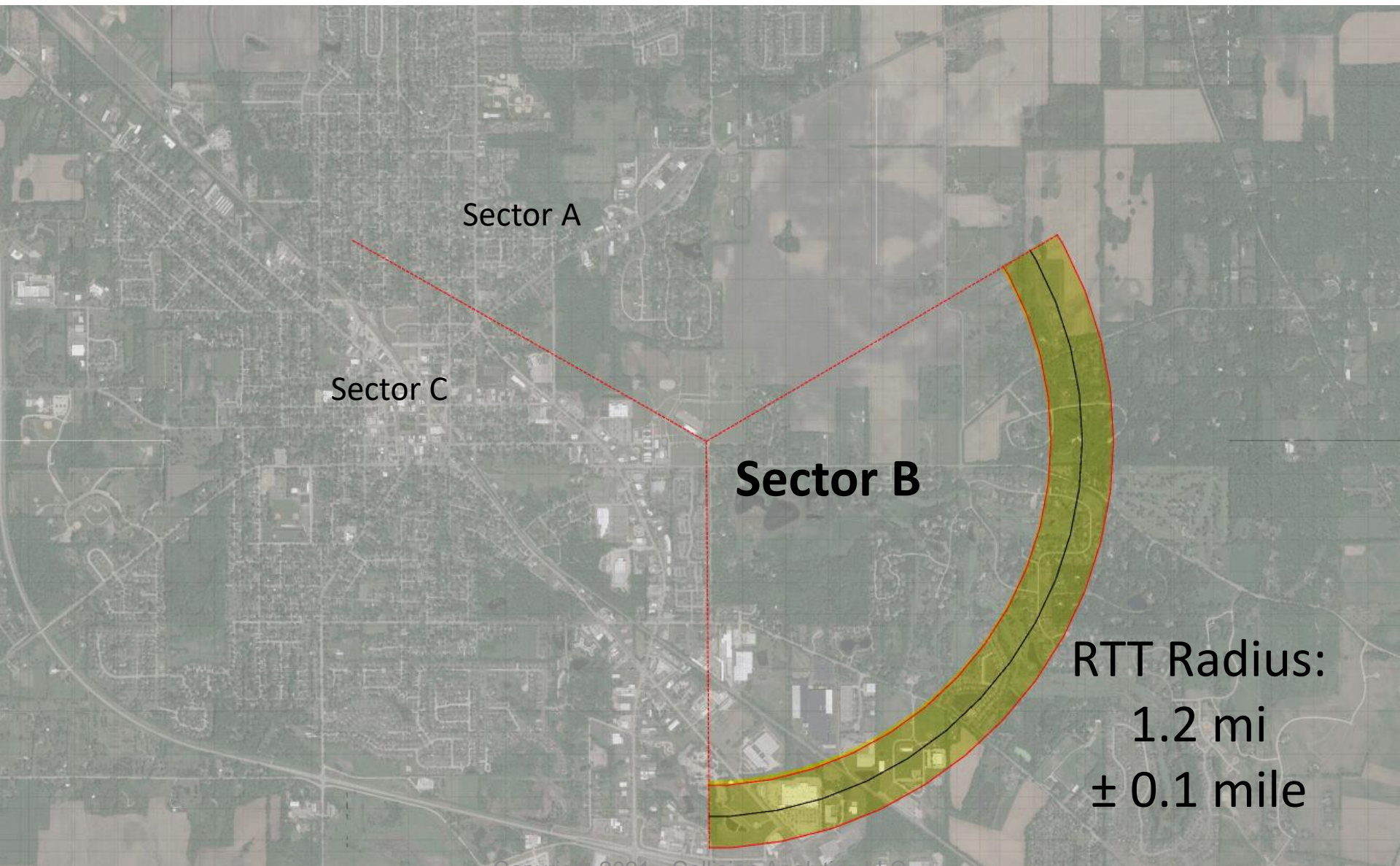
Cell Site Analysis



Cell Site Analysis



Cell Site Analysis

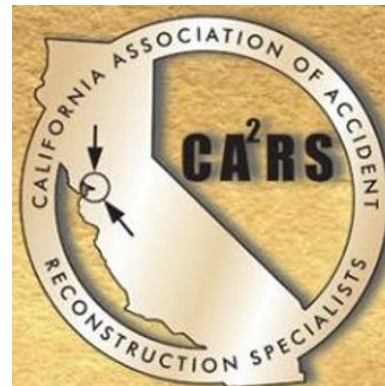


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Cellular Site Analysis

Do's and Don'ts



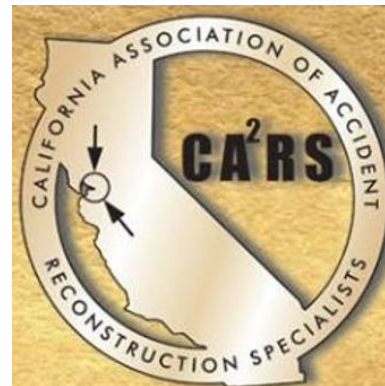
- **Don't** forget to adjust time zones
- **Don't** overstate the accuracy of the records
- **Don't** forget to account for *handoff*
- **Don't** report the location of the user
- **Do** account for antenna direction
- **Do** confirm presence of a cell site
- **Do** confirm realistic movements/speeds
- **Do** get more training

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Cellular Site Analysis

Resources



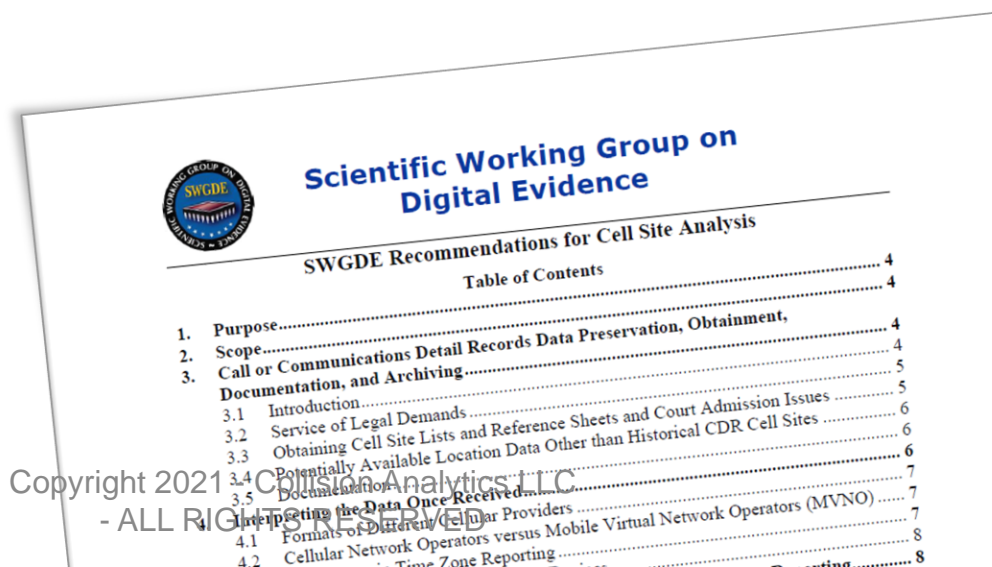
Training

Federal Bureau of Investigation's
Cellular Analysis Survey Team (CAST)



Breck McDaniel
Austin, TX

Best Practices



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(815) 260-3721



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Cellular Site Analysis

