Beyond Shadows: Illuminating Criminal Networks through Social Network Analysis

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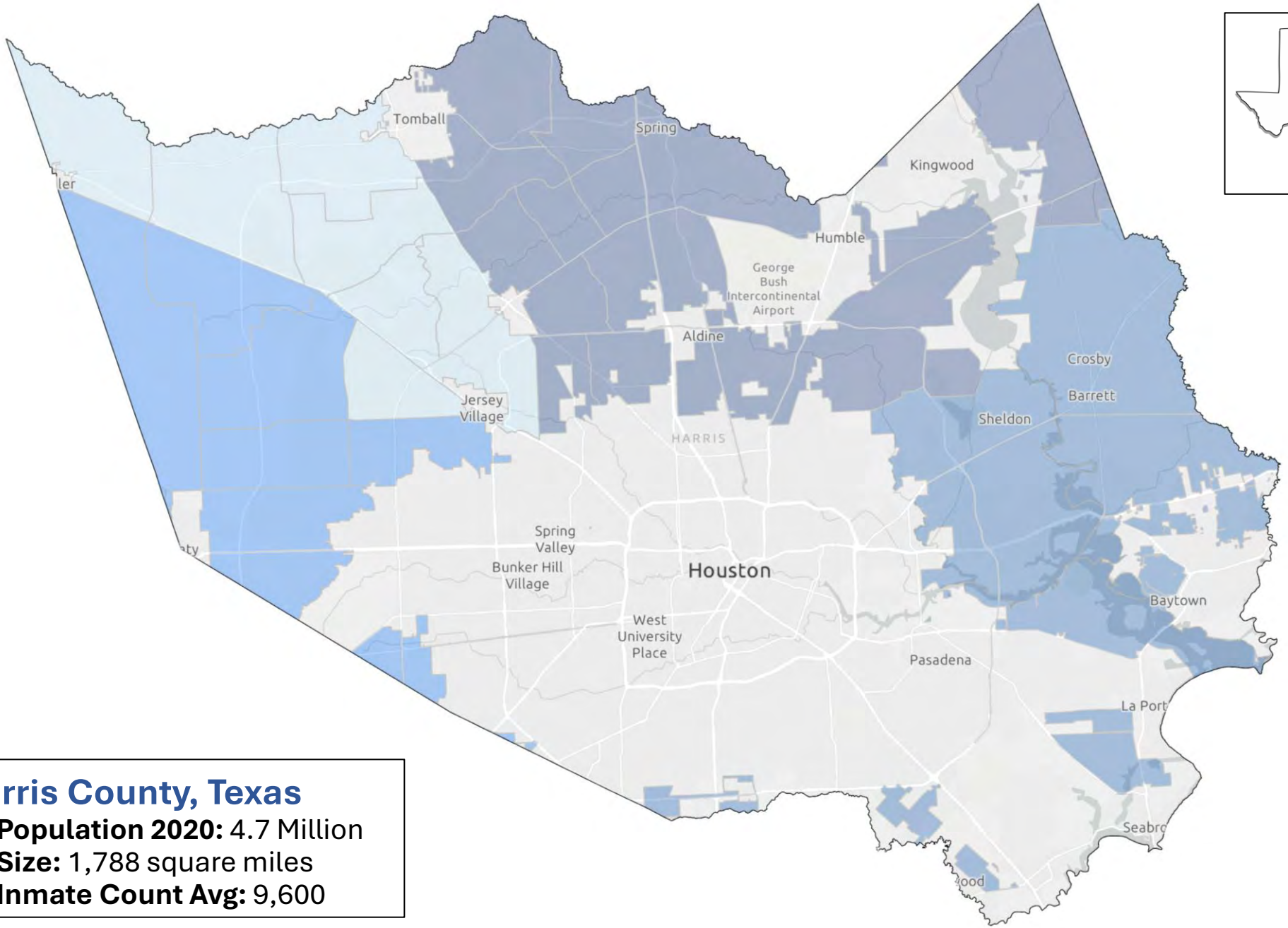
Prepared by:
A. Bush, CAID Analyst

Presenter Biography

Anthony Bush serves as a Criminal Intelligence Analyst within the Harris County Sheriff's Office (HCSO) Criminal Intelligence Analyst Division (CAID) with a tenure of four years. Concurrently, he holds the rank of Technical Sergeant (E6) in the Air Force Reserves, functioning as a Geospatial Intelligence Analyst in Fort Worth, TX supporting the Pacific Fleet.

Anthony specializes in data-driven approaches to tactical and strategic crime analysis. Generating concise easy to read reports.

HCSO Jurisdiction



Harris County, Texas

- **Population 2020:** 4.7 Million
- **Size:** 1,788 square miles
- **Inmate Count Avg:** 9,600

HCSO Agency Summary

Agency Summary

- HCSO is the nation's third-largest Sheriff's Office and staffs about 5,100 employees. With multiple correctional facilities across the county.

- It serves as the equivalent of the county police for over one million people residing in the unincorporated areas of Harris County with jurisdictional overlaps with multiple agencies.

- HCSO's CAID group is called upon to analyze and make insights on tens of millions of data points from various sources and answer outside agency requests.

1200 Baker St, Houston, TX 77002

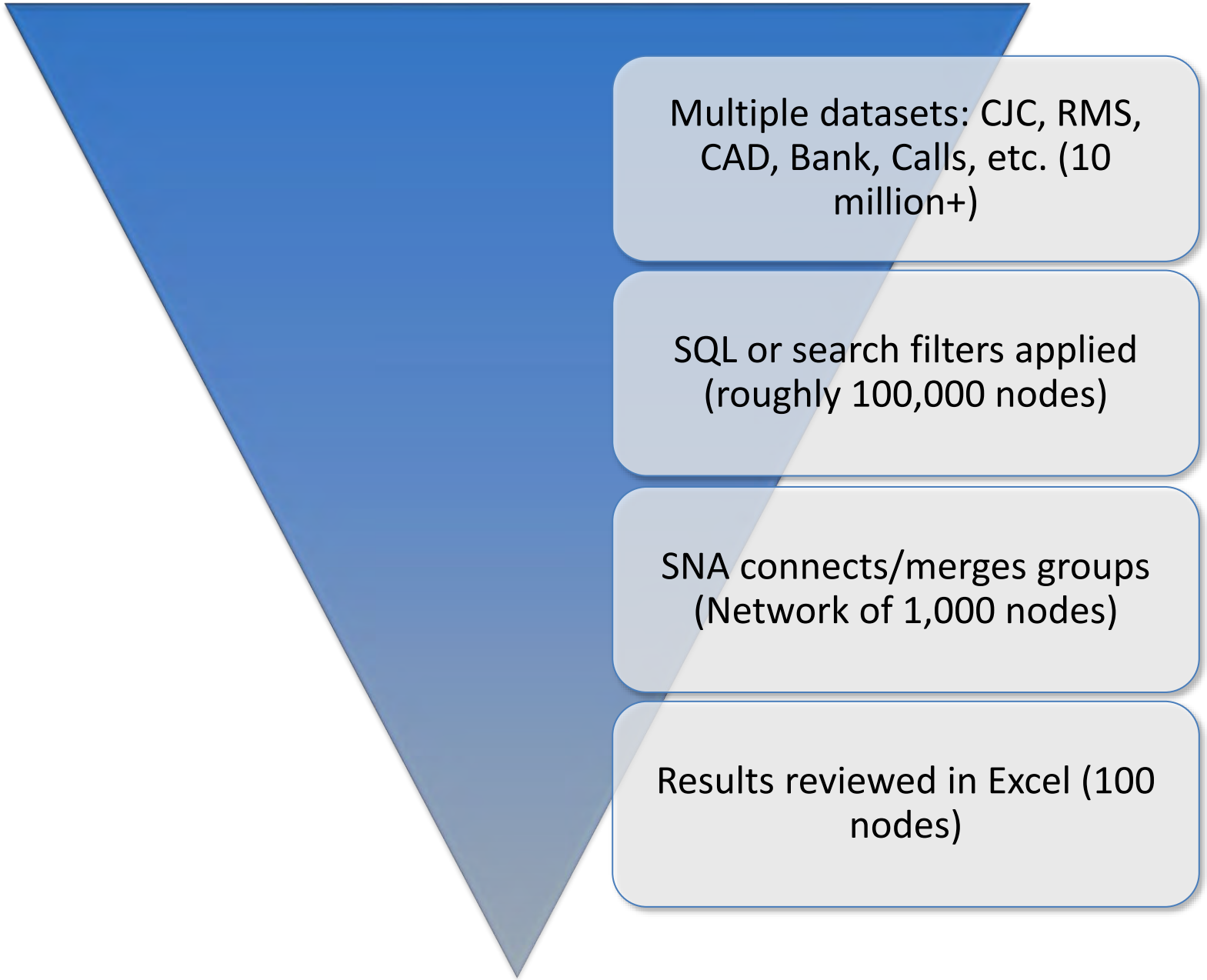
701 N San Jacinto St, Houston, TX 77002

Big Data

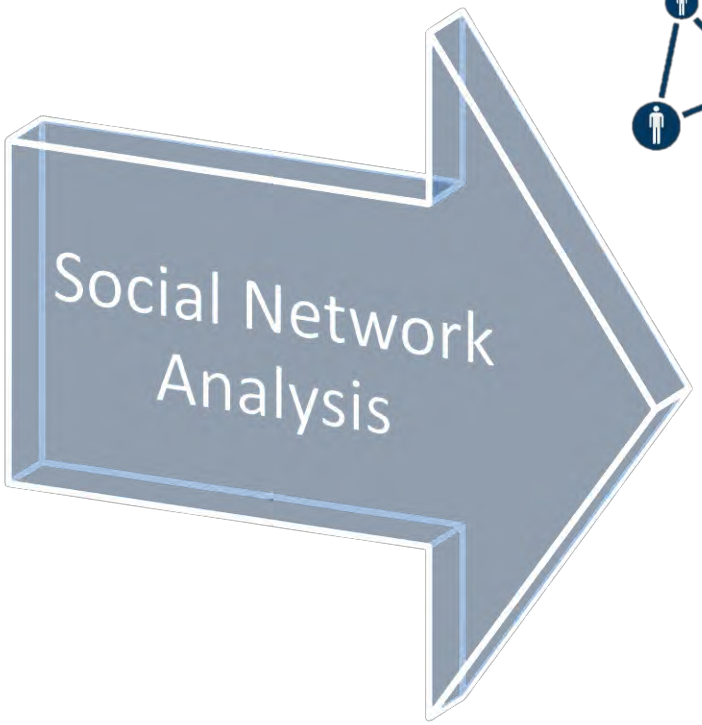
MO' DATA MO' PROBLEMS

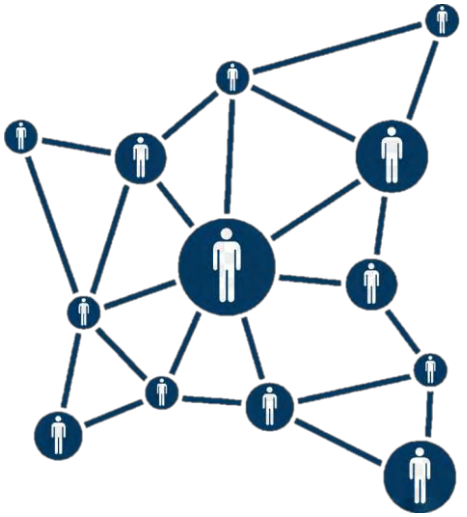
- BIGGIE

Concentrate Data



Social Network Analysis is Not Social Media





What is Social Network Analysis?

Definition

- Social network analysis (SNA) is the process of investigating social structures through the use of networks and graph theory.

- It characterizes networked structures in terms of nodes (individual actors, people, or things within the network) and the ties, edges, or links (relationships or interactions) that connect them.

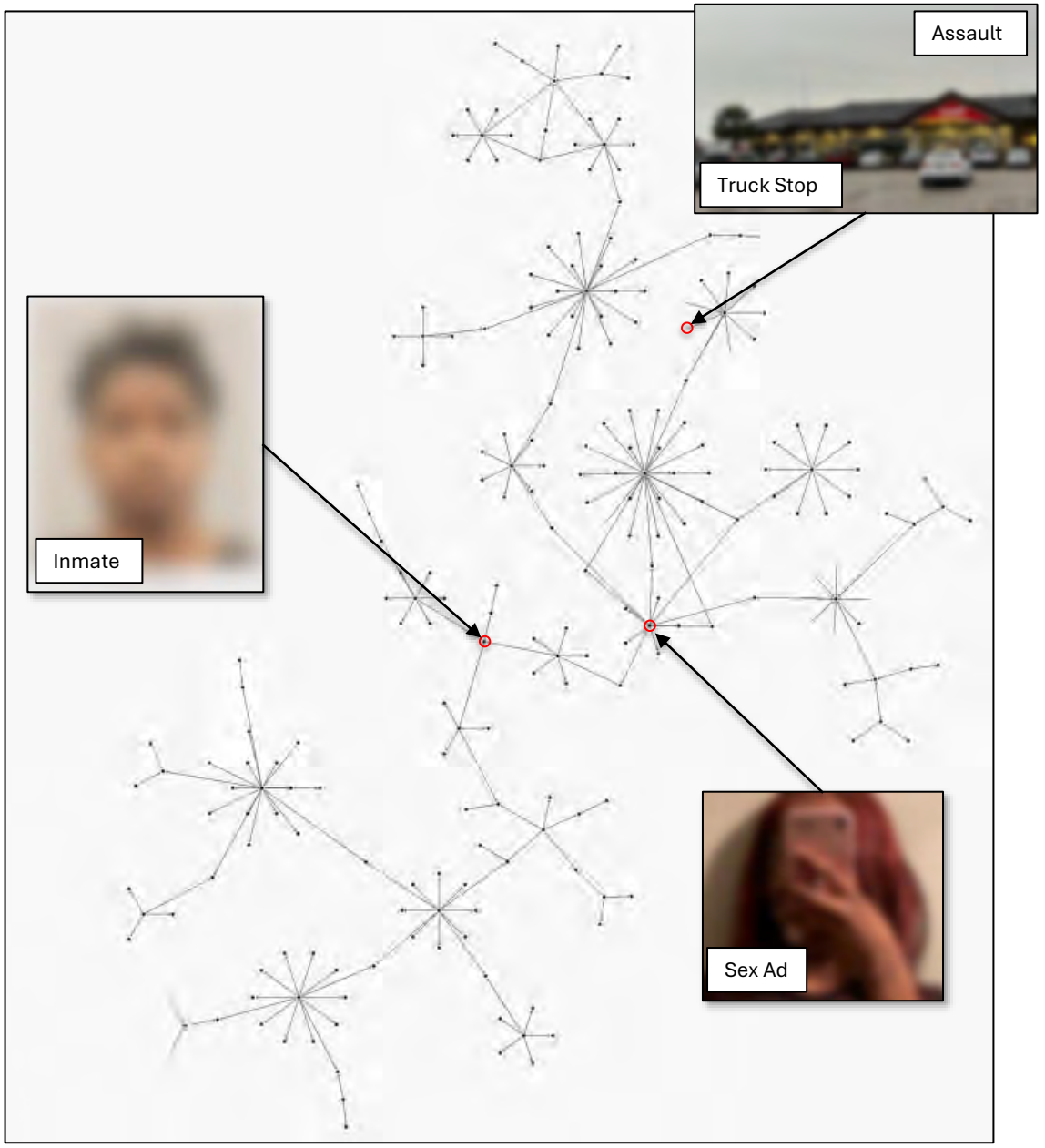
244.6K adult service ads

↓

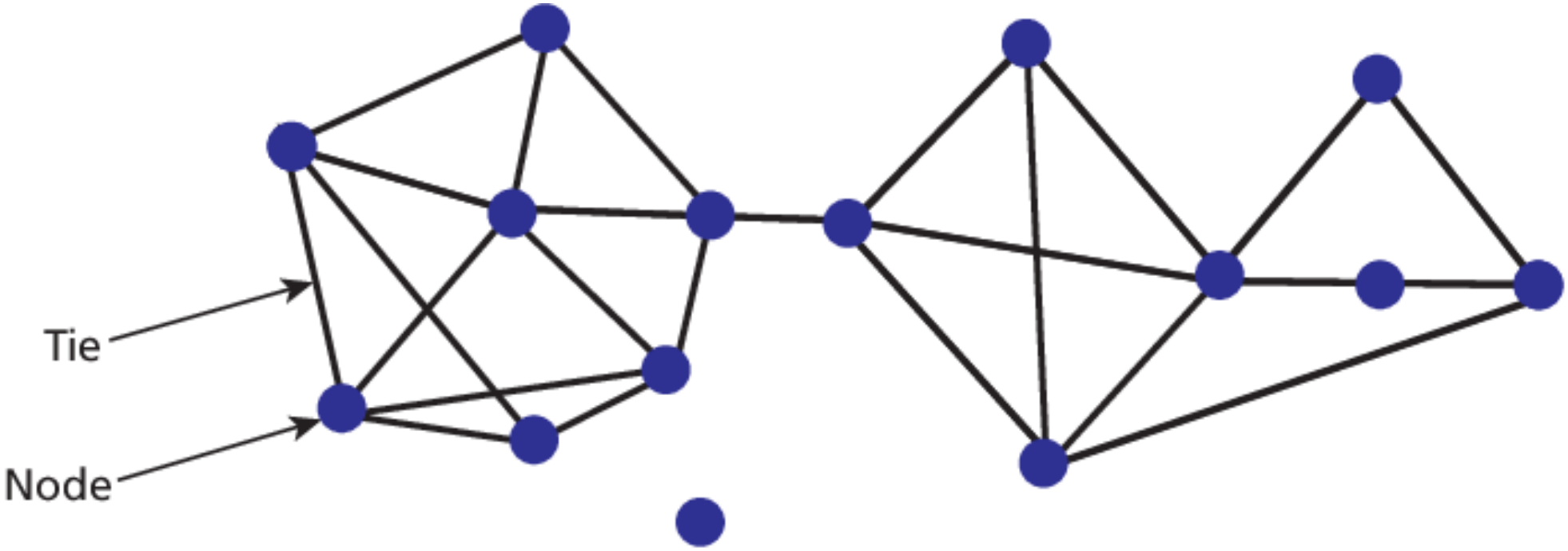
13,336 phone numbers

↓

117 inmates, 22 criminal incidents, several addresses, and 33 phone numbers



What is Social Network Analysis?



Nodes & Ties

Nodes and ties can be anything to include person, place, MO, gang, phone number, deposit, car, or anything and everything under the sun.

Commonly Used Datasets

Human Trafficking Ads

Crime Incidents

Correctional Data

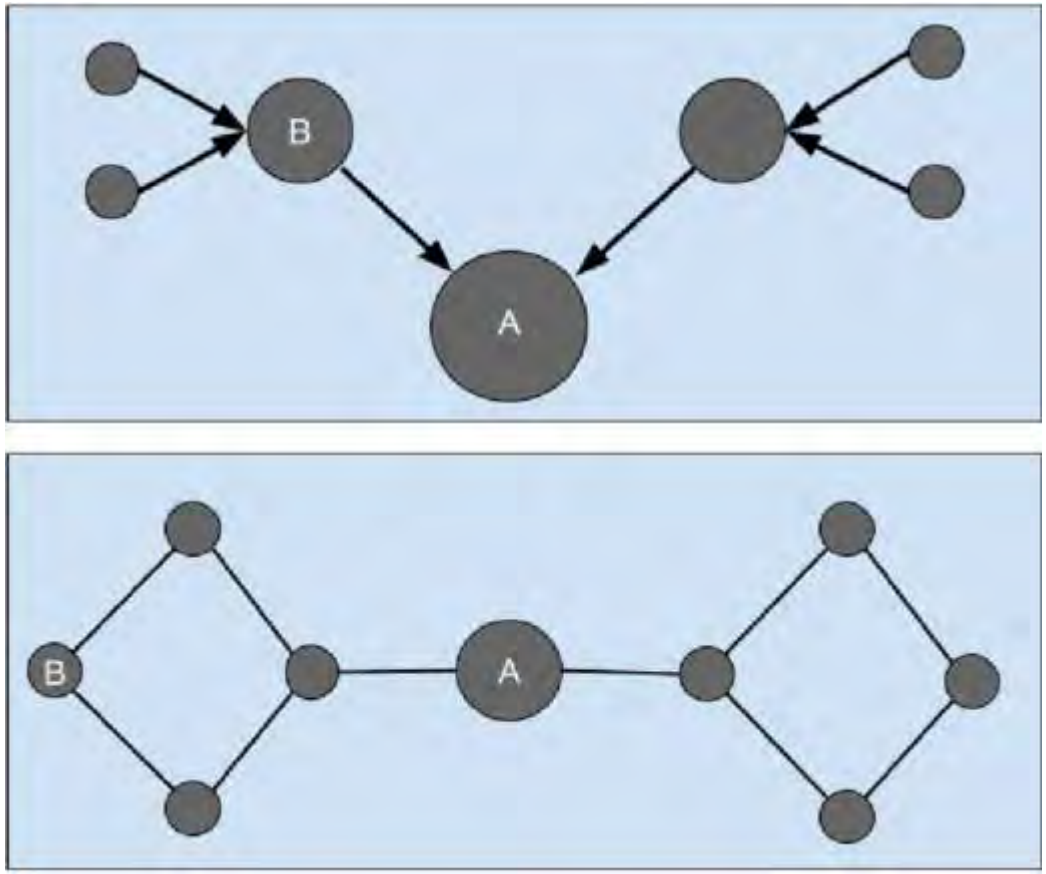
Gang Data

Money Transfers

Crime Network

Cash App

Eigenvector Centrality vs Betweenness Centrality



Eigenvector

This metric would highlights Node A as the most influential due to its connection to other influential nodes. Think of this as a General/Sheriff linked to Majors who carry out their orders.

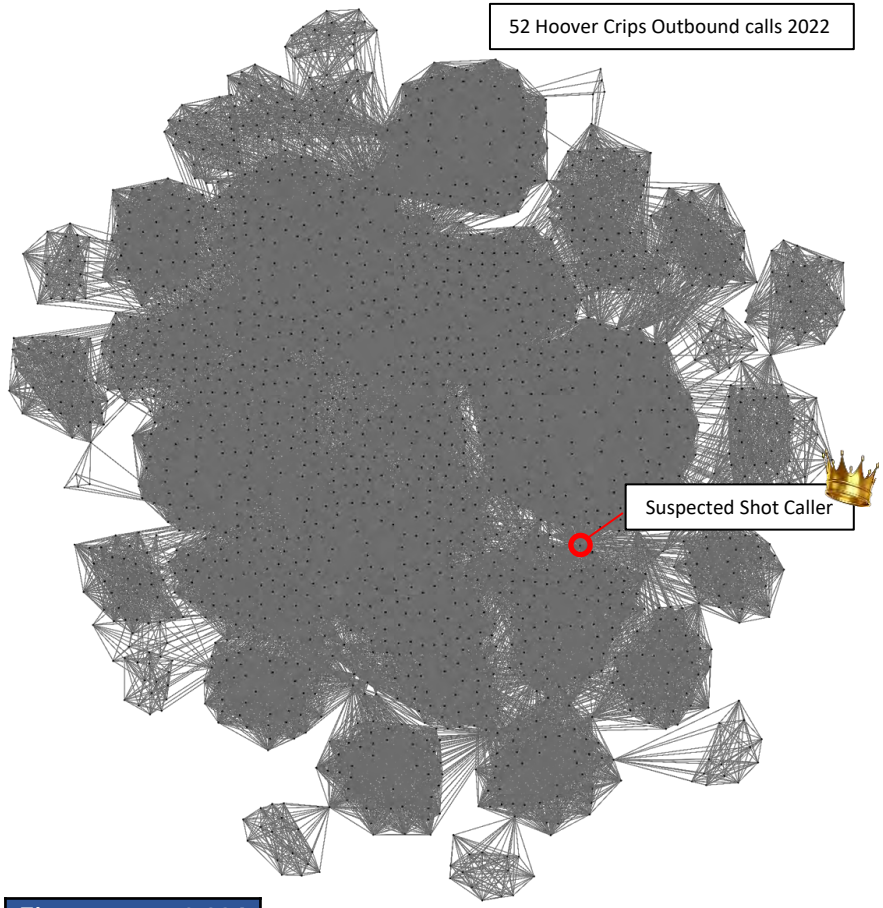
Betweenness

This metric highlights Node A because information from that node will reach many or users in a shorter path.

Sample of Ideal Results for an Analysis

SNA Intelligence Generated

Outbound jail calls of 52 Hoover Crips, the most violent gang, (by murder count) in HCSO jurisdiction was analyzed over a one-year period (600K nodes). The second highest Eigenvector Centrality score along with several other nodes belonged to phone numbers of documented members of the Crips. The most connected phone number was contacted by over 12 different gang members in 2022.



Key Takeaway

Overall SNA principals applied to documented gang members calls uncovers key players in gangs. Moreover, the calls can be listened to in order to provide context to the node.

Number of Gangs of Members Contacting 111-111-1114 in 2022:

1. 52 HOOVER GANGSTER CRIPS x 7 members
2. BLACK DISCIPLES x 1 member
3. MANDINGO WARRIOR x 1 member
4. YOUNG MOB GORILLAS x 1 member
5. INSANE CRIPS/INSANE GANGSTER CRIPS x 1 member
6. HUNCHO GANG CRIPS x 1 member

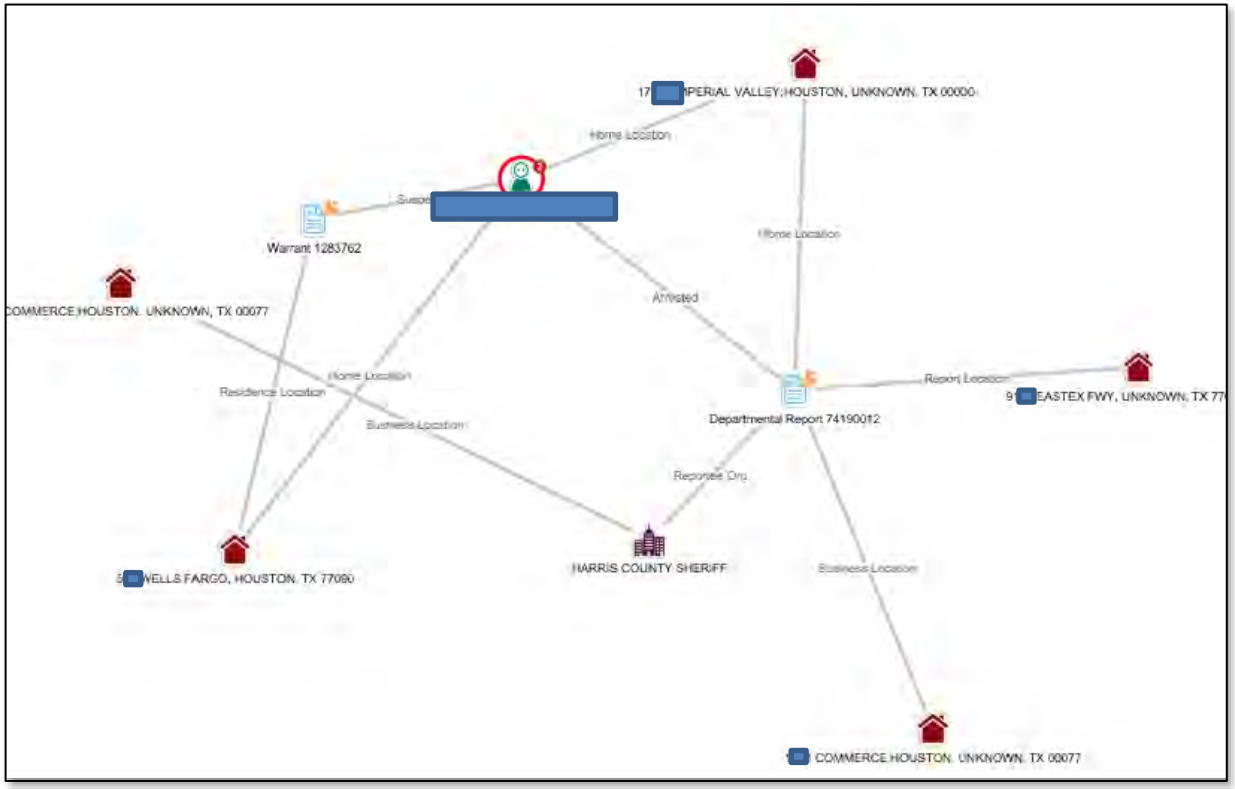
Eigenvector ≥0.934	
Node Label	Score
111111111	1
111111112	0.99144
111111113	0.99144
111111114	**0.99144**
111111115	0.99144
111111116	**0.94063**
111111111	0.93919
111111112	0.93643
111111113	0.934

Integrated SNA Software Limits

Built in SNA Tool Shortfalls

- RMS systems, local District Attorney defendant charts, and correctional data systems offer built in SNA tools.

- The problem with this is lack of integration to other datasets. You see two nodes are linked but they are all weighted the same. You cannot group them up by crime-type, region, or gang.

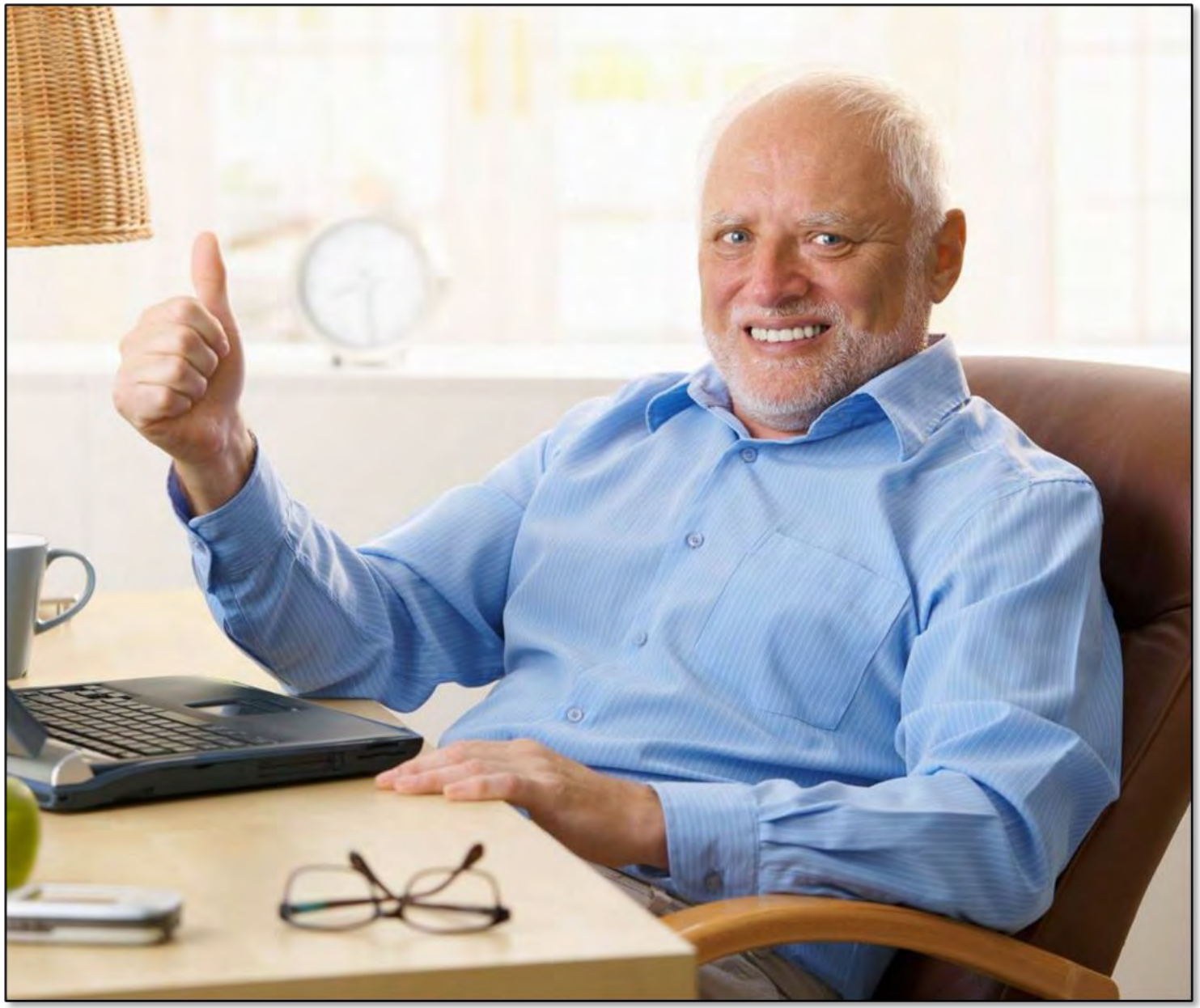


Struggles of Social Network Analysis

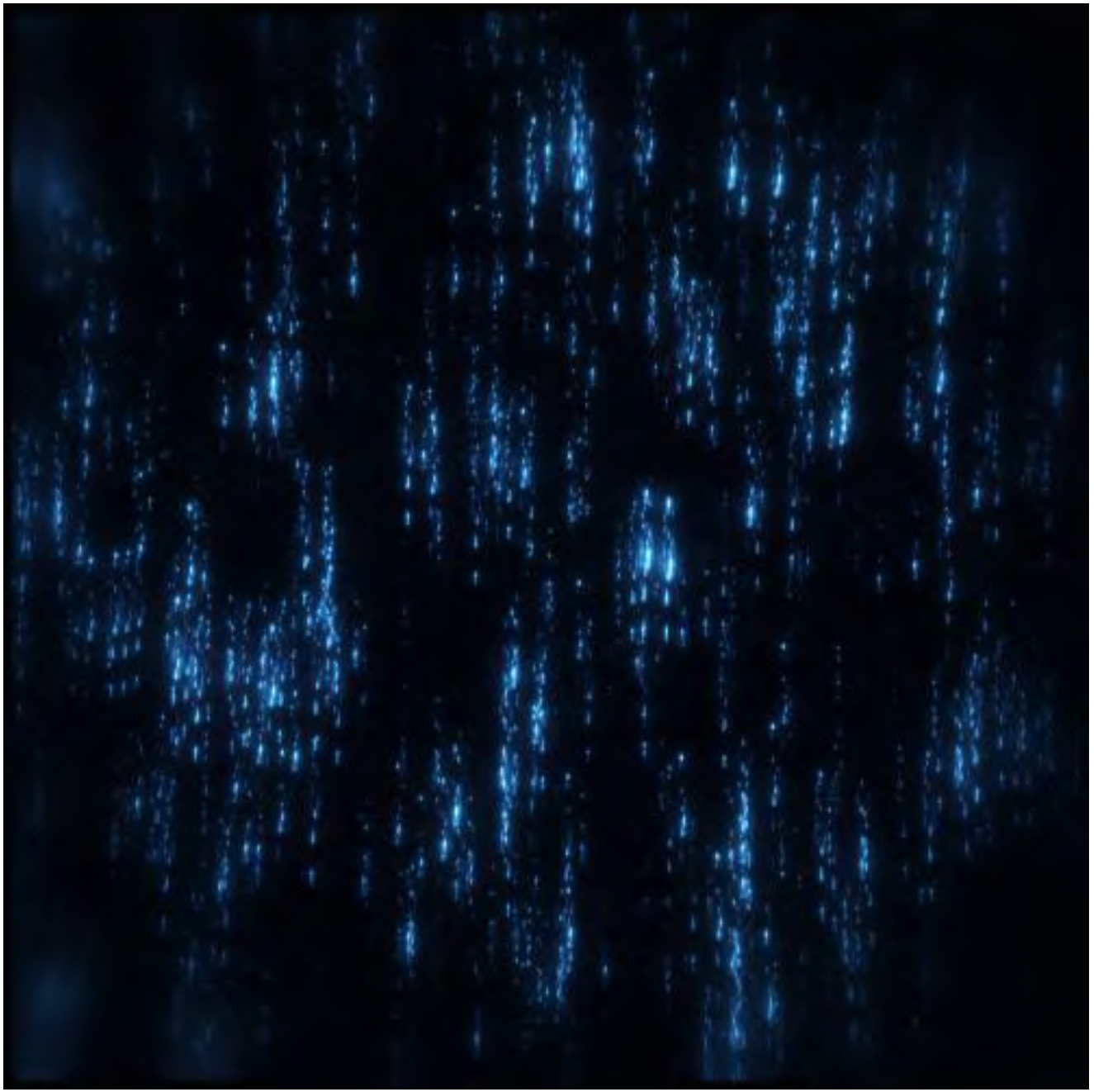
Starting Out

- Overall, as time progresses, the analyst gets better, and thus more successful outcomes become more common.

- At the start it can be frustrating and difficult. Also sometimes the analysis goes nowhere



SNA Walkthrough



Access to Data

The first step to analysis is obtaining data in a CSV/Excel format. This can be from an ODBC connection with your agency data using Microsoft SQL Server, SSRS Reports, Subpoena, and exports from front facing websites.

Data Literacy

Once you have the data you need to know how to interpret it, what data is even documented, and what is the primary key that can link it to other data sets.

Microsoft® SQL Server®

Notable Dataset Elements

Geographical Location

- District
- Beat
- Address

Offense Type

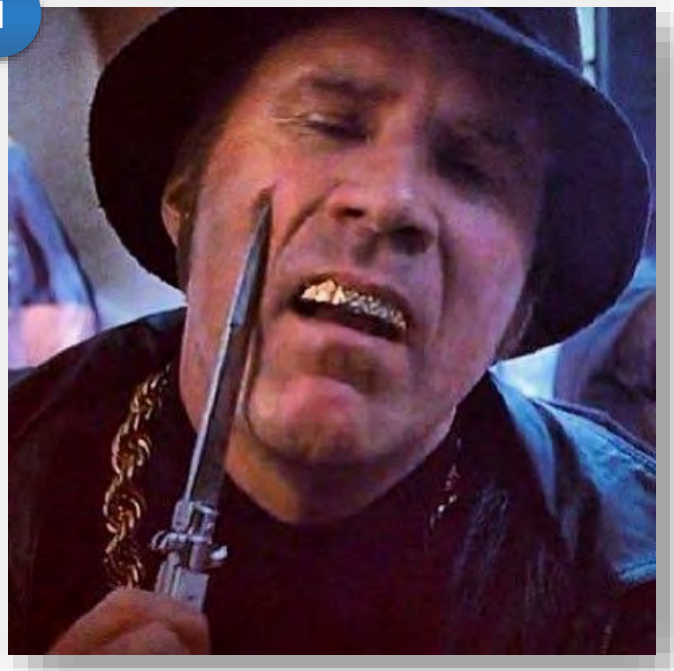
- Violent Crime
- Glock Switches
- Catalytic Converters
- Human Trafficking
- Juggings
- Fentanyl

Gang Affiliation

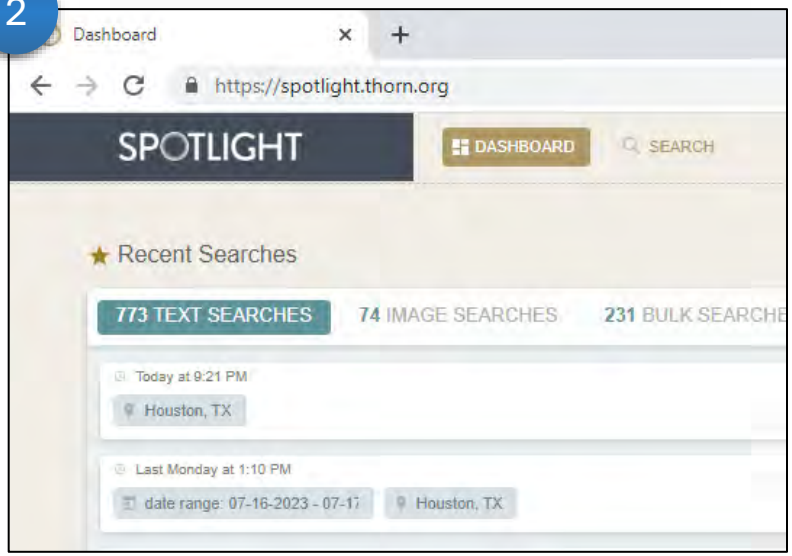
- Bloods
- Crips
- Tango Blast
- Aryan Brotherhood

Acquiring Dataset (Human Trafficking Ads)

1



2



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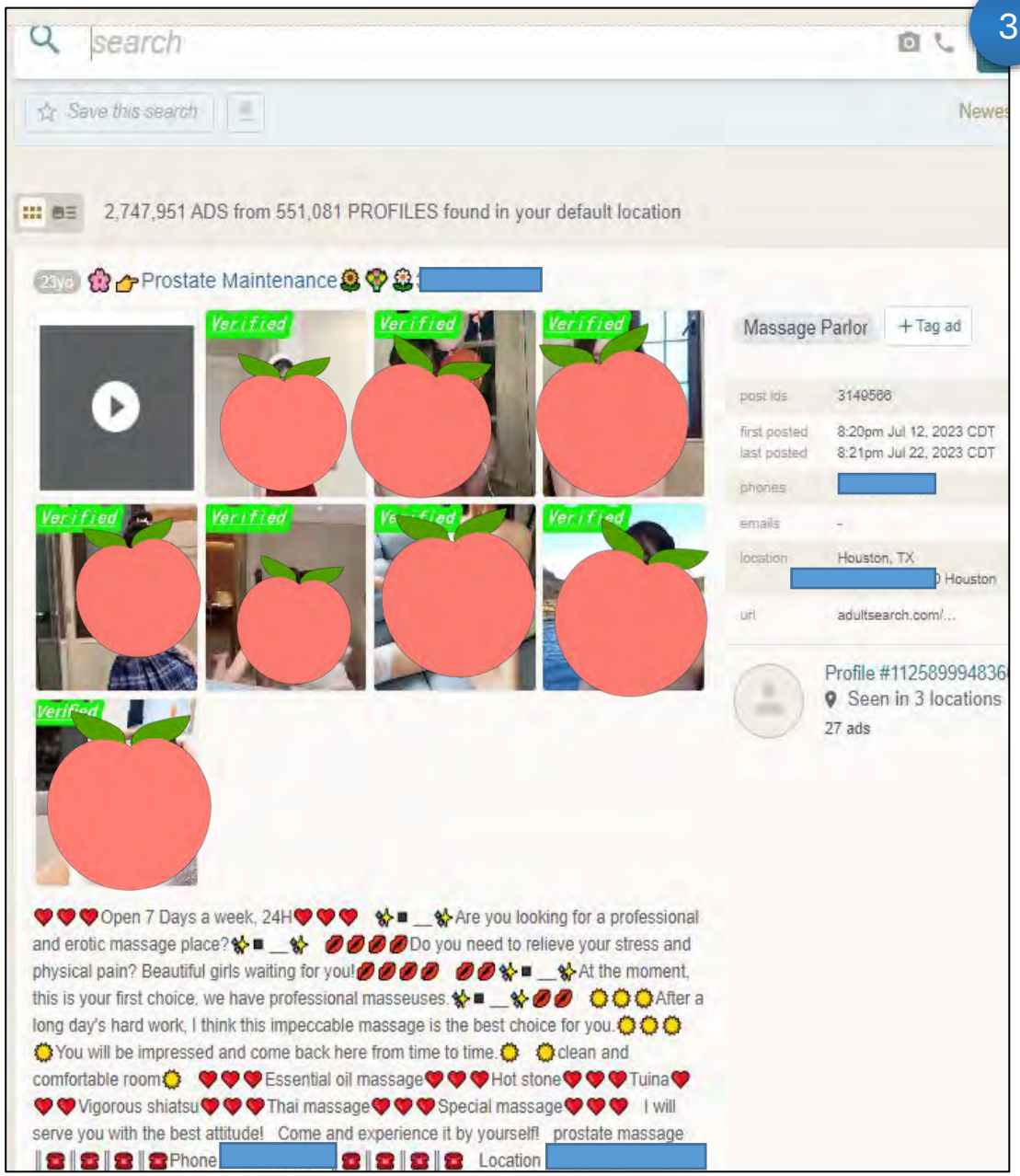


Acquiring Dataset (Phone Communication)

1

2

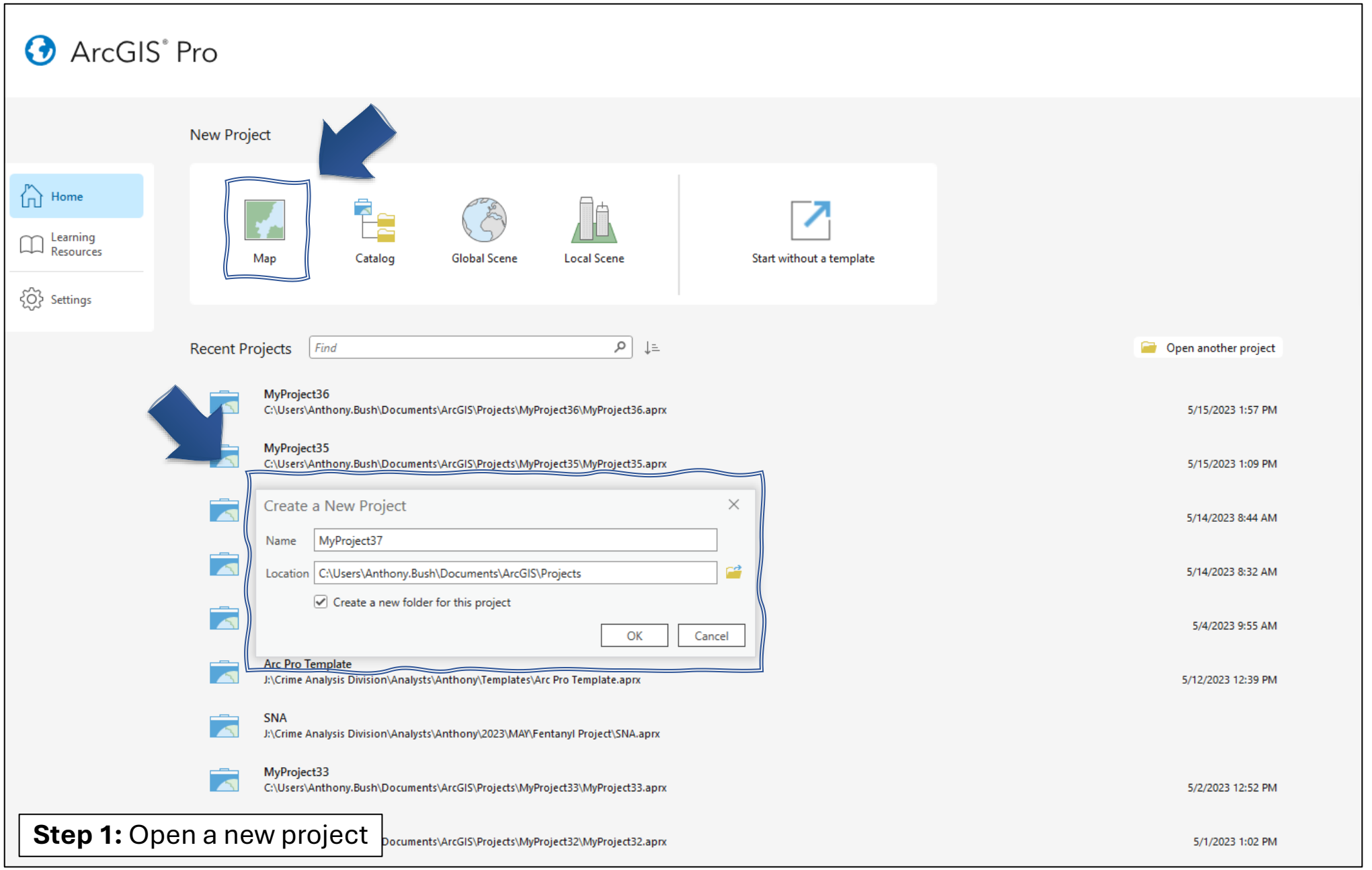
SECURUS Technologies
connecting what matters®

3

M1 | First Name

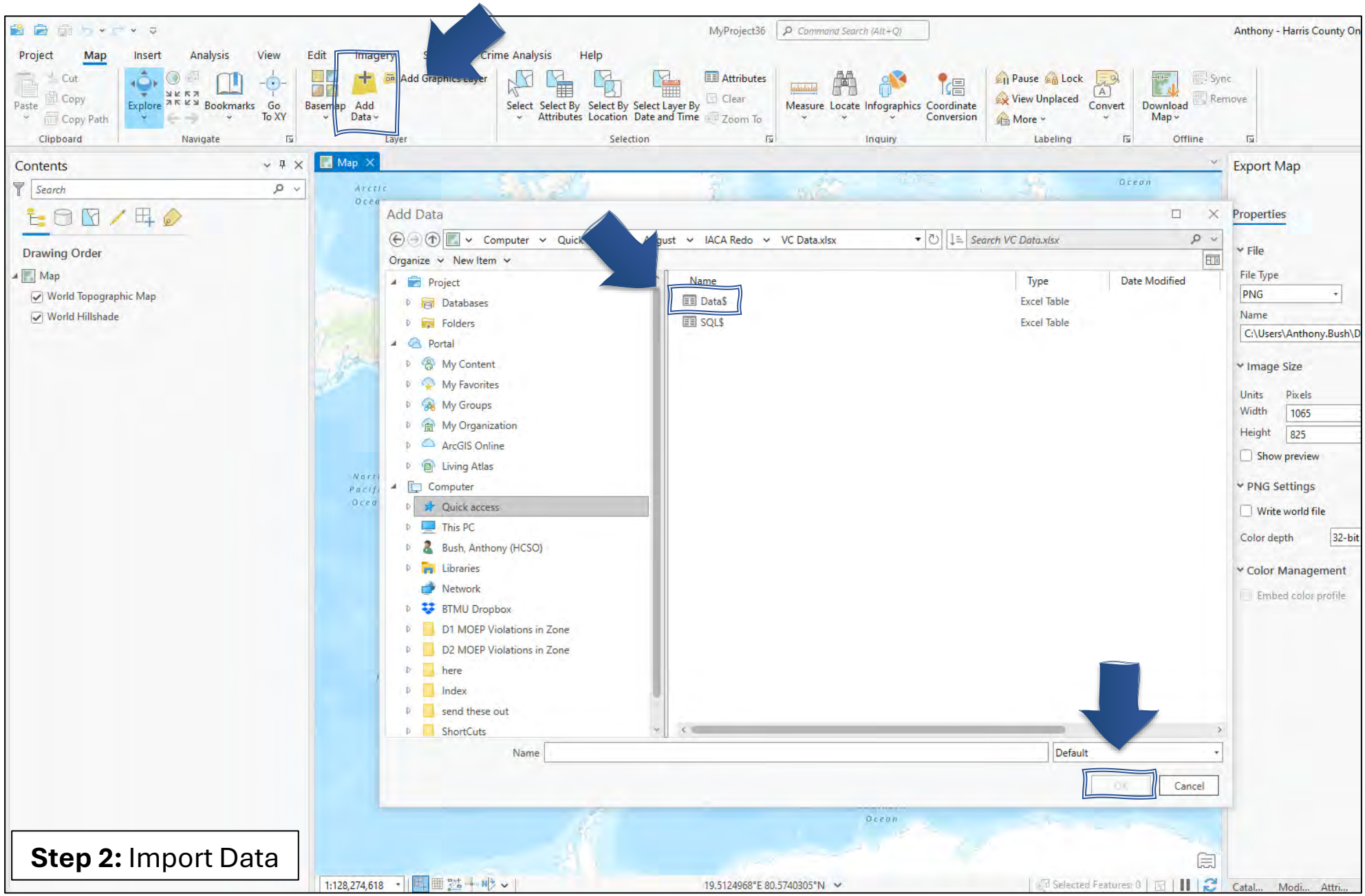
	A	B	C	D	E	F	G
1	Site	PortLoc	Ctry	Wireless	Dialed#	Dest Zon	Start Tim
2	Harris Cou	Pod 3-HH	1	Y	346	Local	01/01/2023
3	JA14 701 I	7B1-1	1	Y	979	Interlata/In	01/01/2023
4	JA14 701 I	7B1-1	1	Y	979	Interlata/In	01/01/2023
5	JA14 701 I	7B1-1	1	Y	979	Interlata/In	01/01/2023
6	JA14 701 I	7B1-1	1	Y	979	Interlata/In	01/01/2023
7	Harris Cou	Pod 3-HH	1	Y	346	Local	01/01/2023
8	Harris Cou	Pod 3-HH	1	Y	346	Local	01/01/2023
9	JA14 701 I	2D3-2	1	Y	832	Local	01/01/2023
10	JA14 701 I	2D3-2	1	Y	832	Local	01/01/2023
11	JA14 701 I	2D3-2	1	Y	832	Local	01/01/2023
12	Harris Cou	Pod 3-HH	1	Y	346	Local	01/01/2023
13	Harris Cou	Pod 3-HH	1	Y	346	Local	01/01/2023
14	Harris Cou	Pod 3-HH	1	Y	346	Local	01/01/2023
15	JA14 701 I	7B1-1	1	Y	979	Interlata/In	01/02/2023
16	JA14 701 I	7B1-1	1	Y	979	Interlata/In	01/02/2023
17	JA14 701 I	7B1-1	1	Y	979	Interlata/In	01/02/2023
18	JA14 701 I	2D3-2	1	Y	832	Local	01/02/2023
19	Harris Cou	Pod 3-HH	1	Y	346	Local	01/02/2023
20	Harris Cou	Pod 3-HH	1	Y	346	Local	01/02/2023
21	JA14 701 I	2D3-1	1	Y	832	Local	01/02/2023
22	JA14 701 I	2D3-1	1	Y	832	Local	01/02/2023
23	Harris Cou	Pod 3-HH	1	Y	346	Local	01/02/2023
24	JA14 701 I	2D3-1	1	Y	832	Local	01/02/2023
25	Harris Cou	Pod 3-HH	1	Y	346	Local	01/02/2023

Open ESRI Arc Pro Map



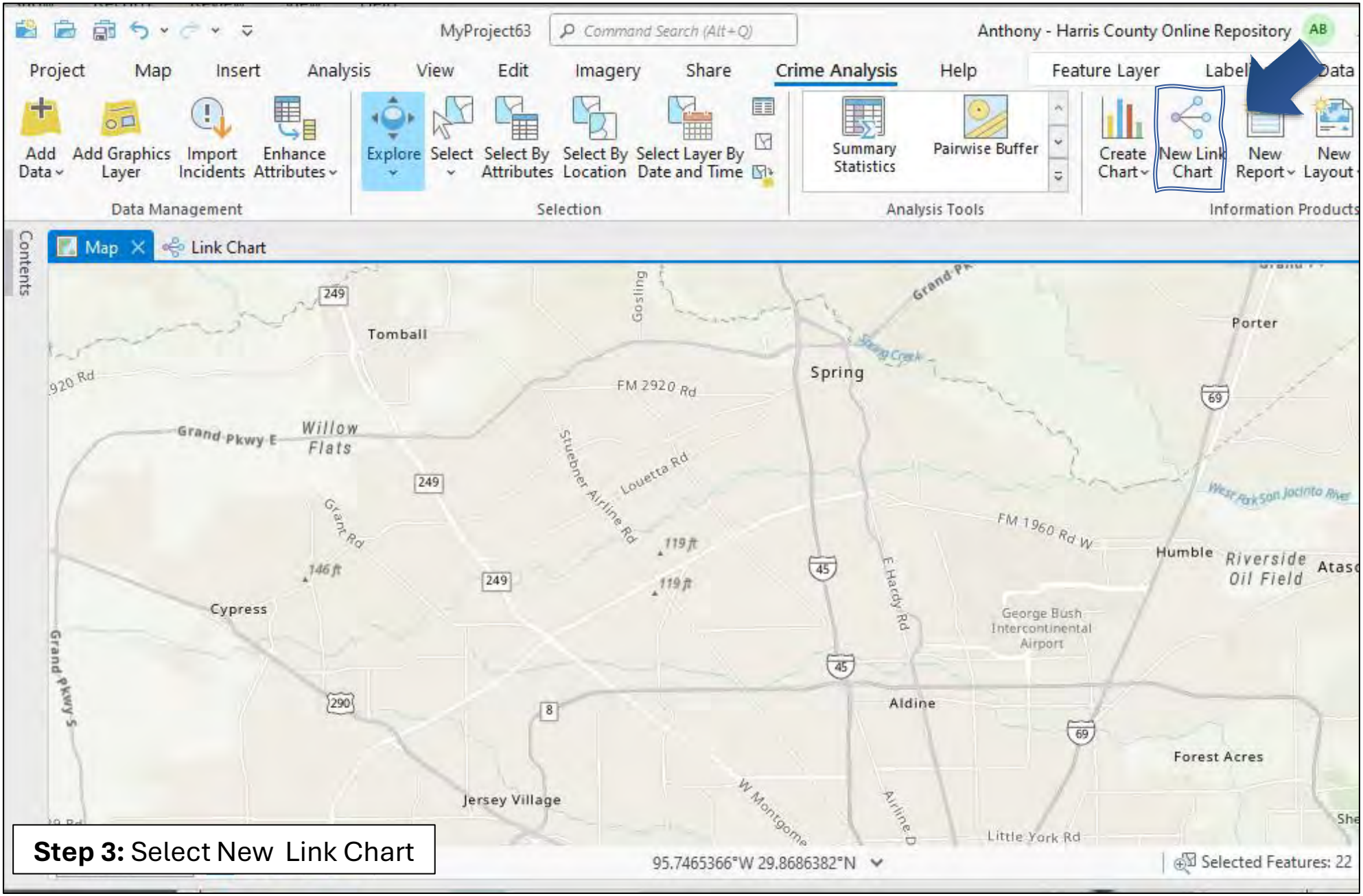
Step 1: Open a new project

Add Data to Project



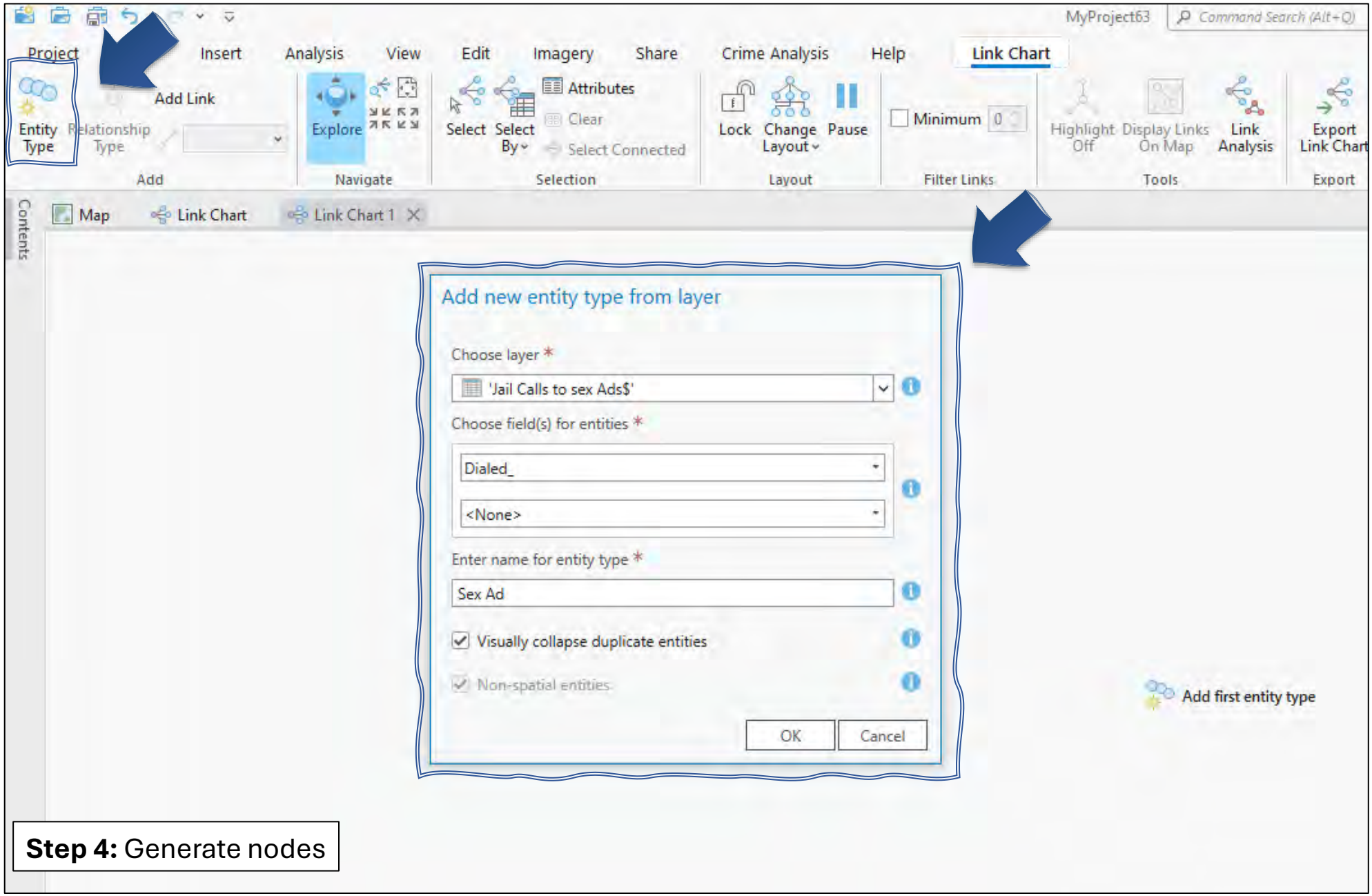
Step 2: Import Data

Add Link Chart to Project



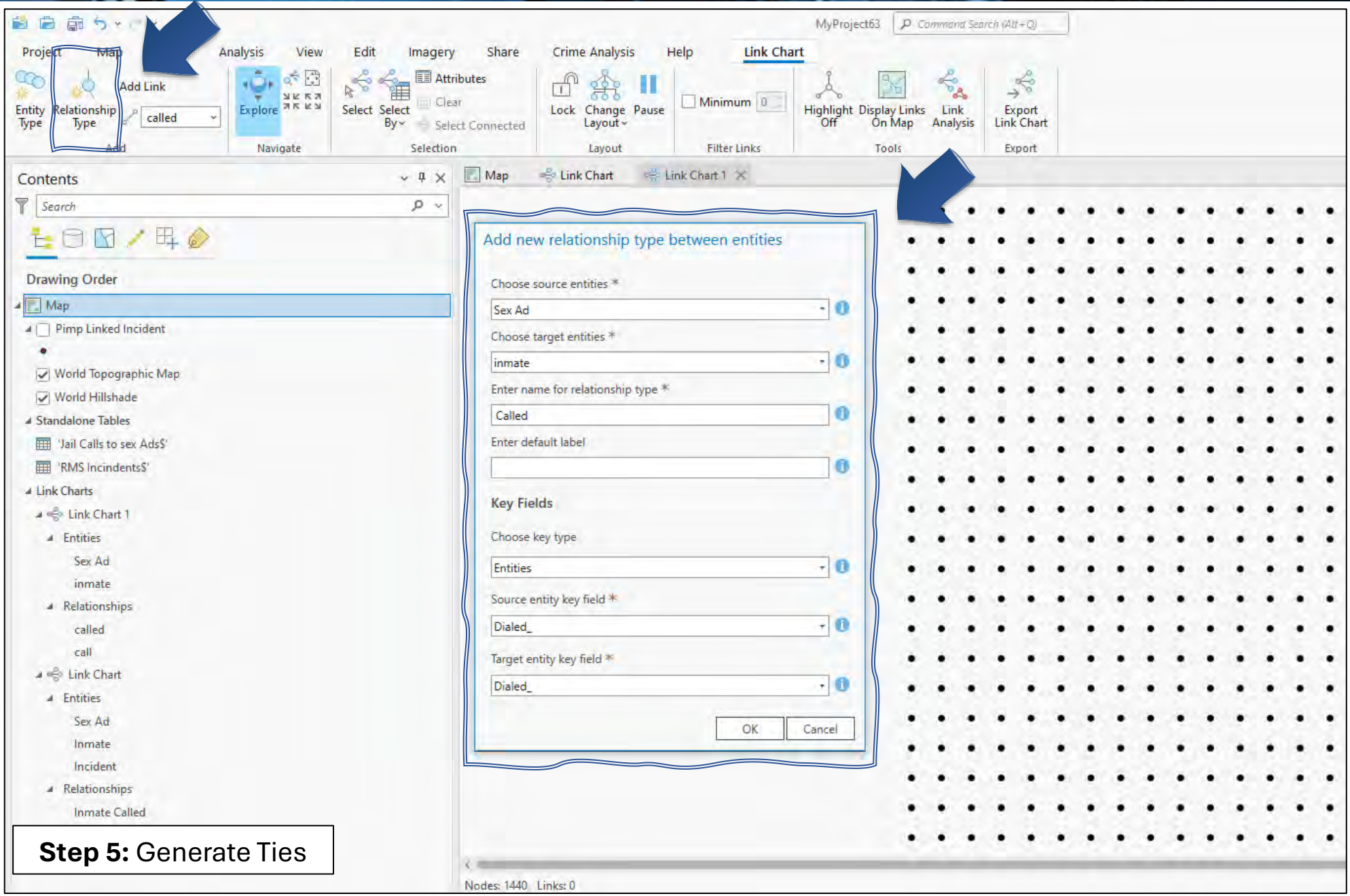
Step 3: Select New Link Chart

Add Nodes to Chart



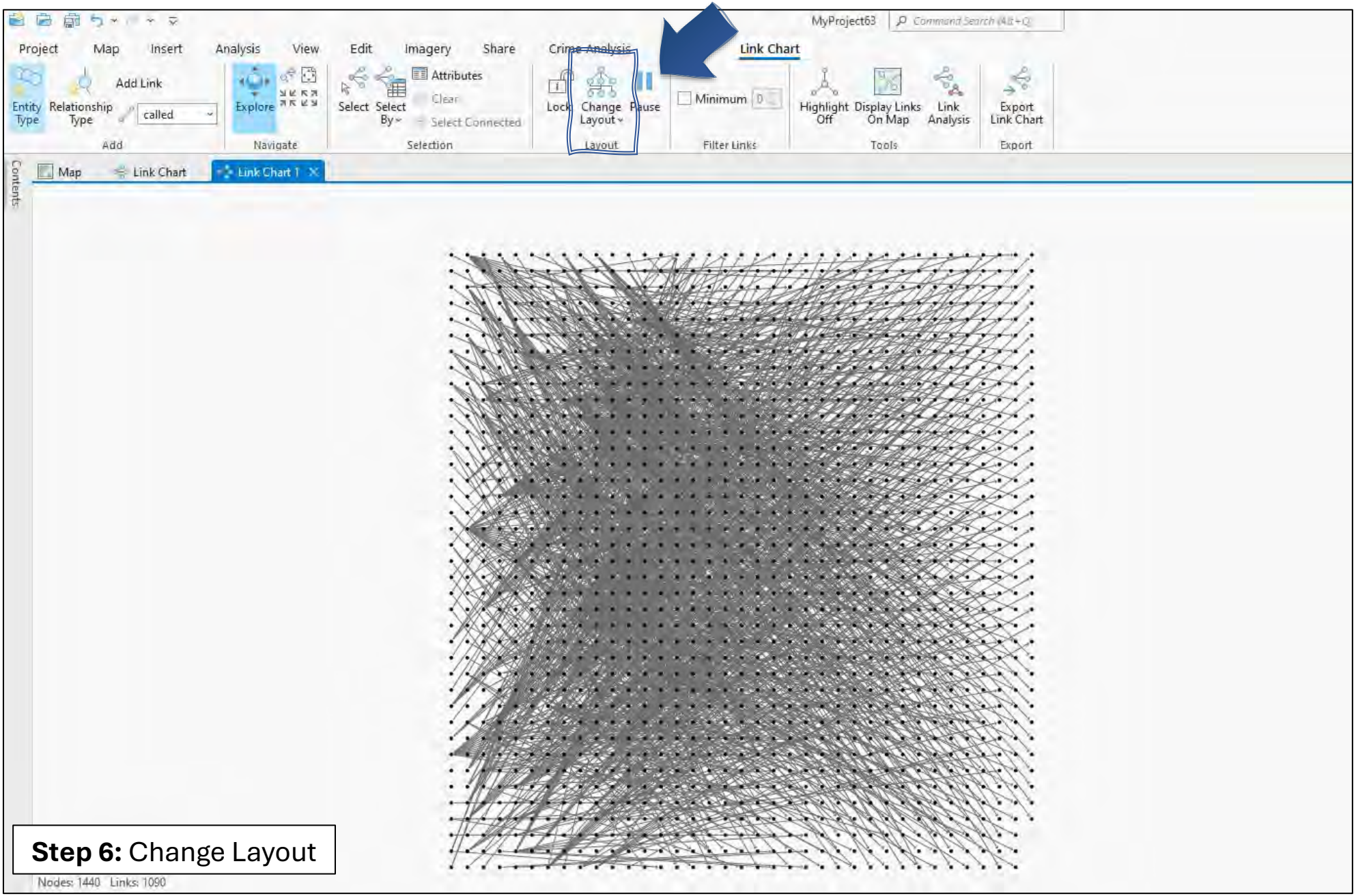
Step 4: Generate nodes

Add Links to Chart



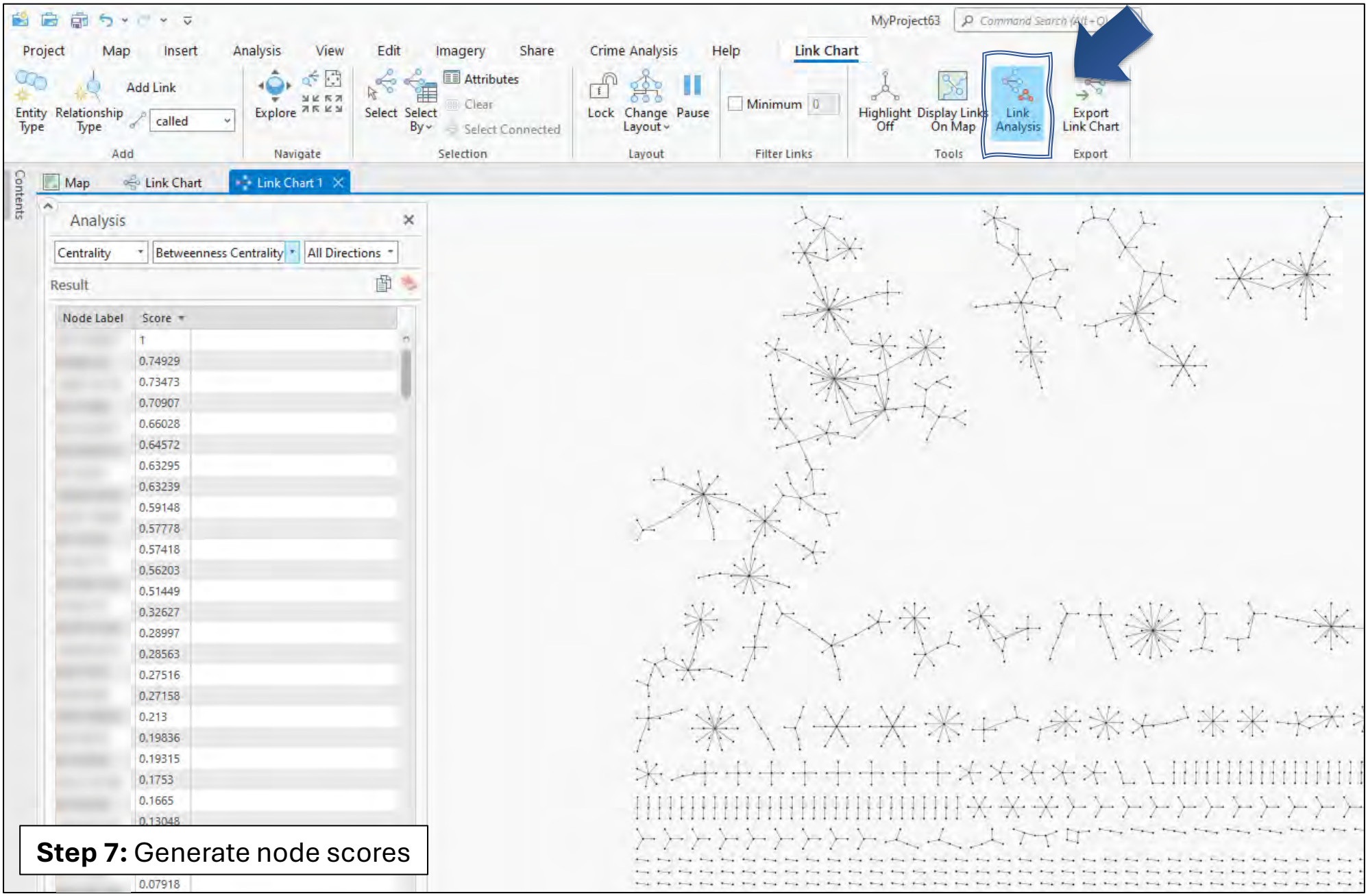
Step 5: Generate Ties

Change Chart Layout



Step 6: Change Layout

Find Significant Nodes for Analysis

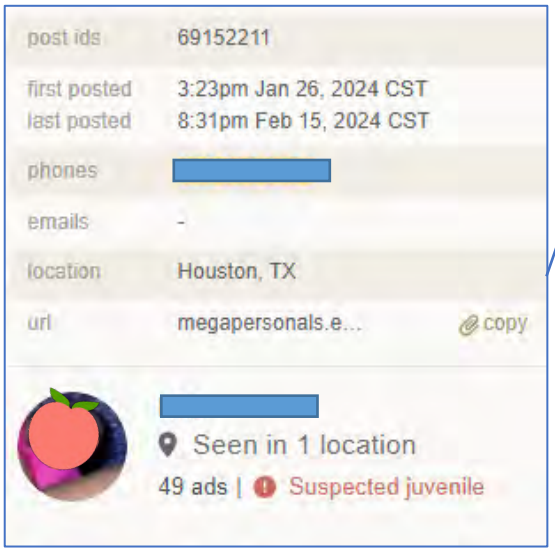


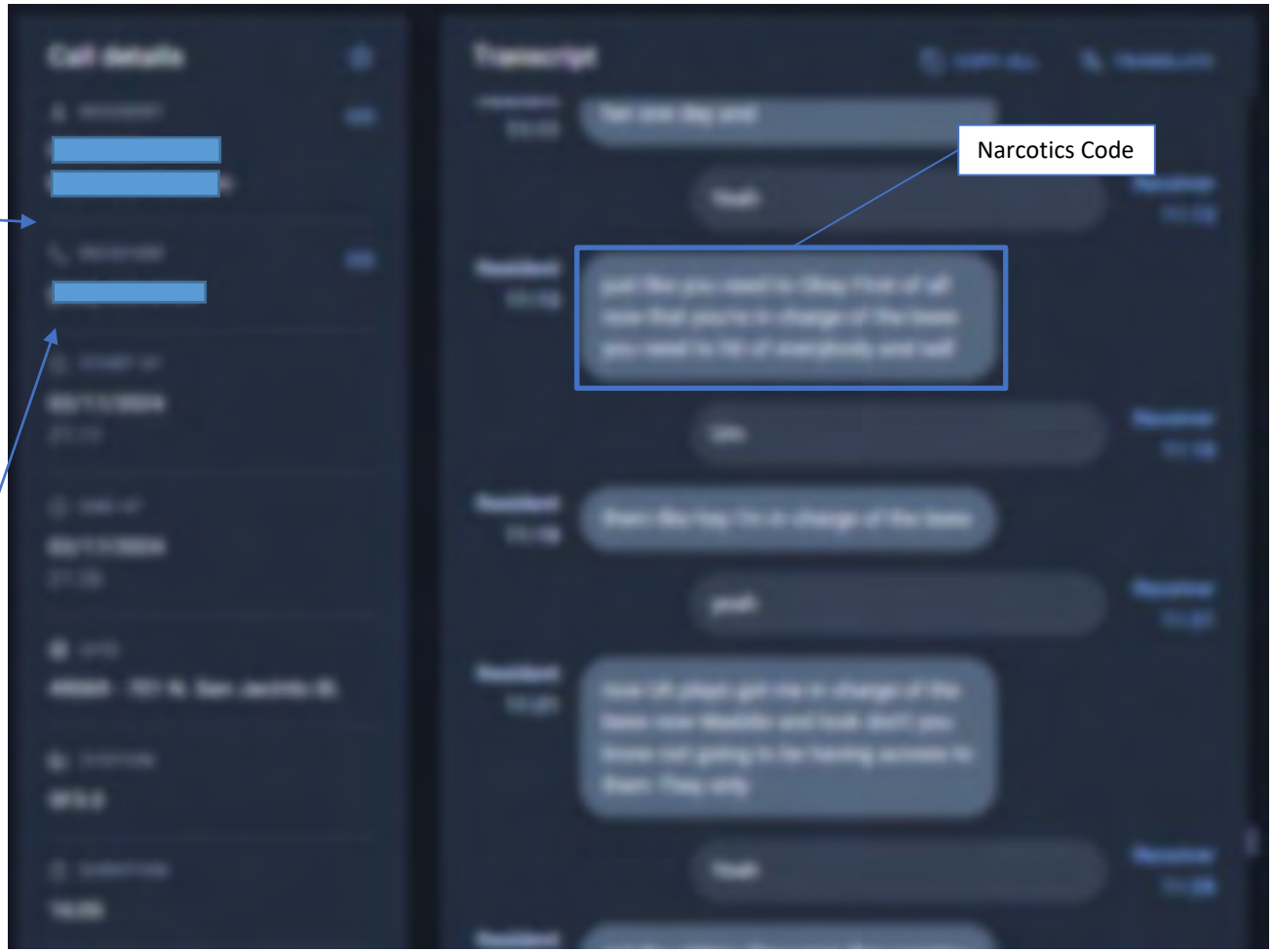
Step 7: Generate node scores

Search Calls to Key Nodes

Targeting Inmate Nodes

Statistically significant inmate nodes or phone numbers, that talk about Human Trafficking, can be keyword searched for actionable intelligence. Additionally, inmates that speak with linked phone numbers about Human Trafficking can be considered as possible informants in the Human Trafficking scene in Houston. See below example for an inmate talking a woman linked to Human Trafficking about selling suspected narcotics.





Bonus Links

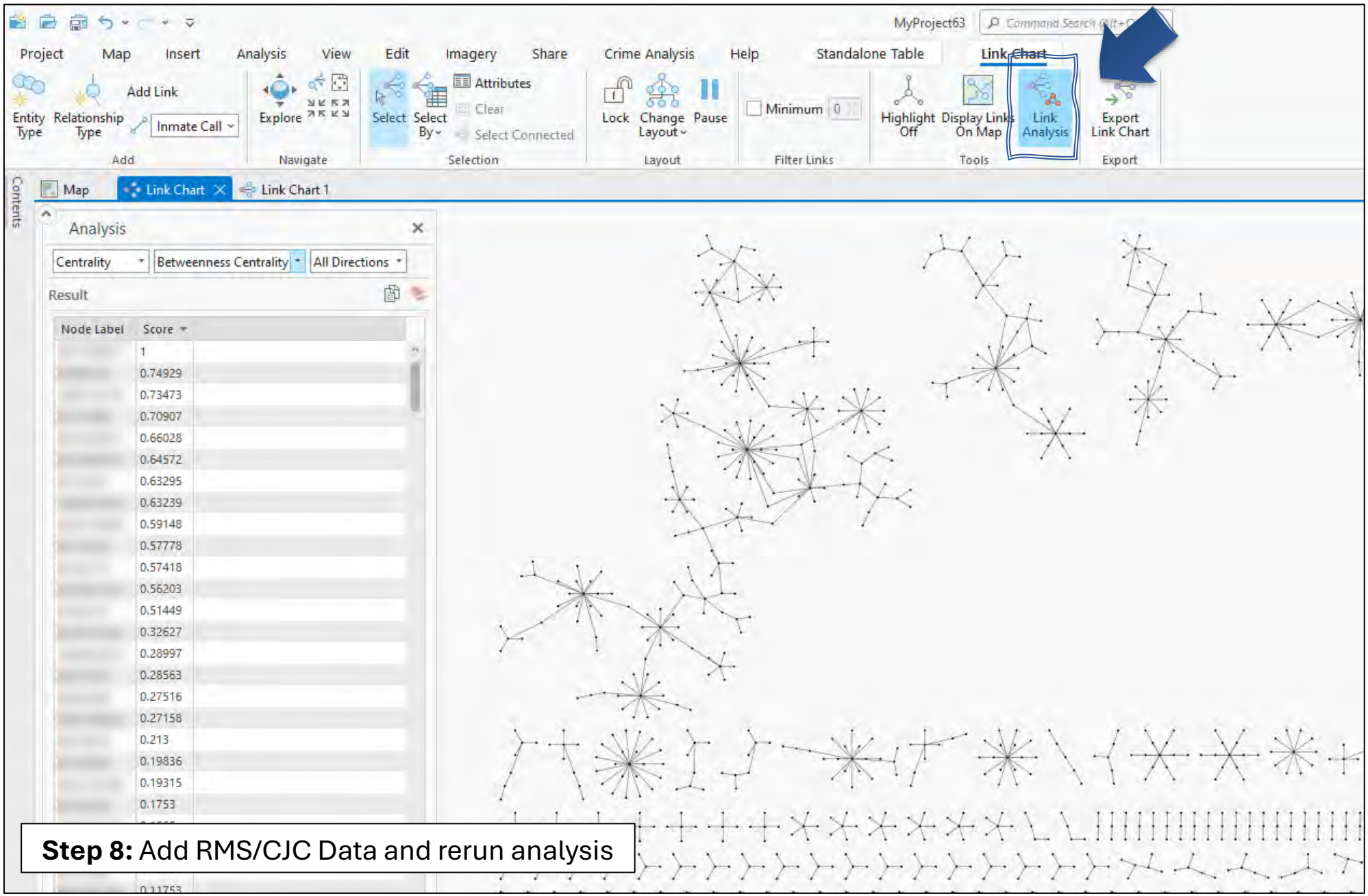
YO DAWG, I HEARD YOU LIKE LINKS
SO I PUT MORE LINKS SO
YOU CAN LINK WHILE YOU LINK

So Much Data!!

MISC CJC Data Gathered

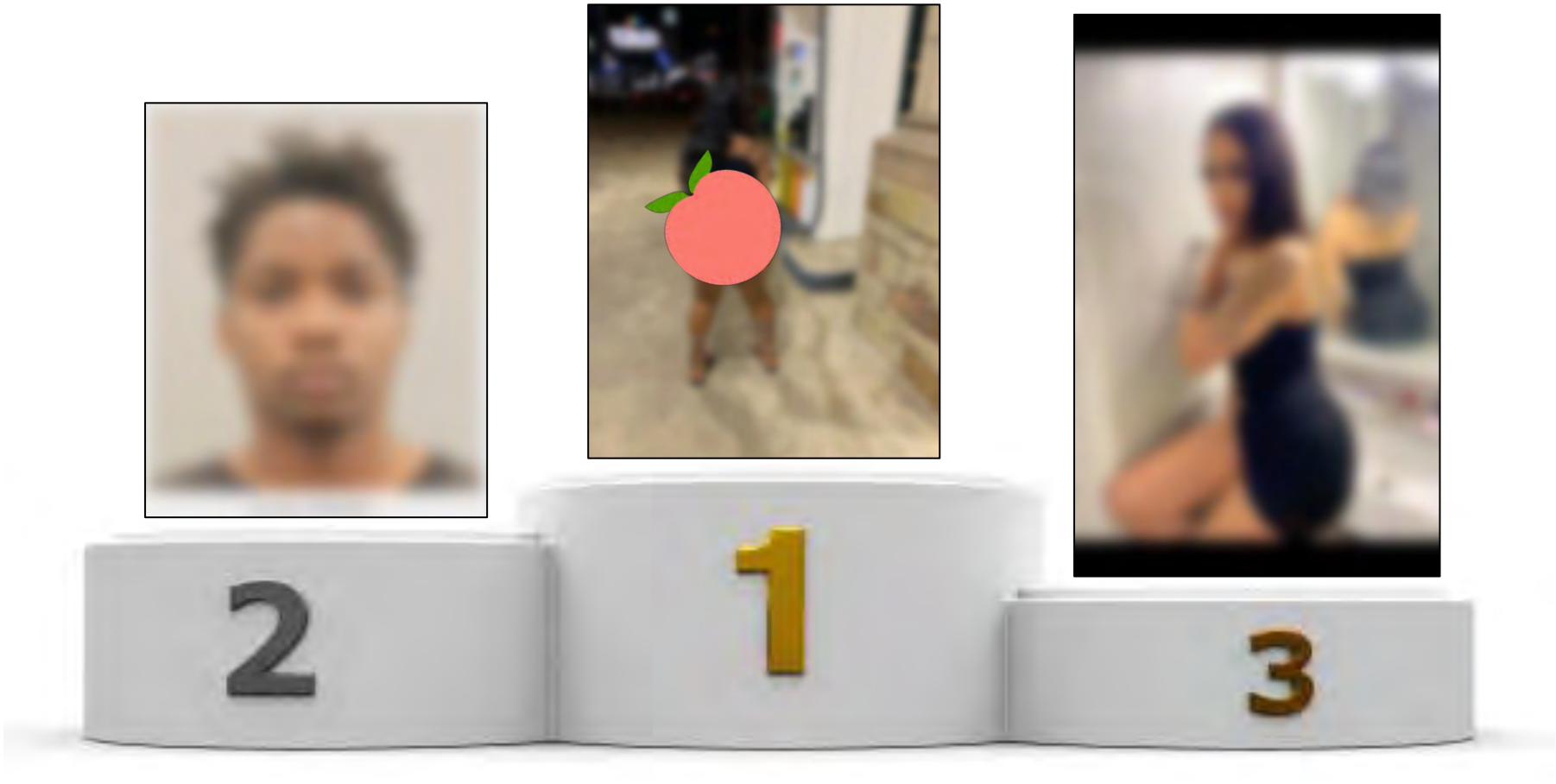
RMS Criminal Incidents

RMS Incidents Added for Analysis



Step 8: Add RMS/CJC Data and rerun analysis

Key Nodes

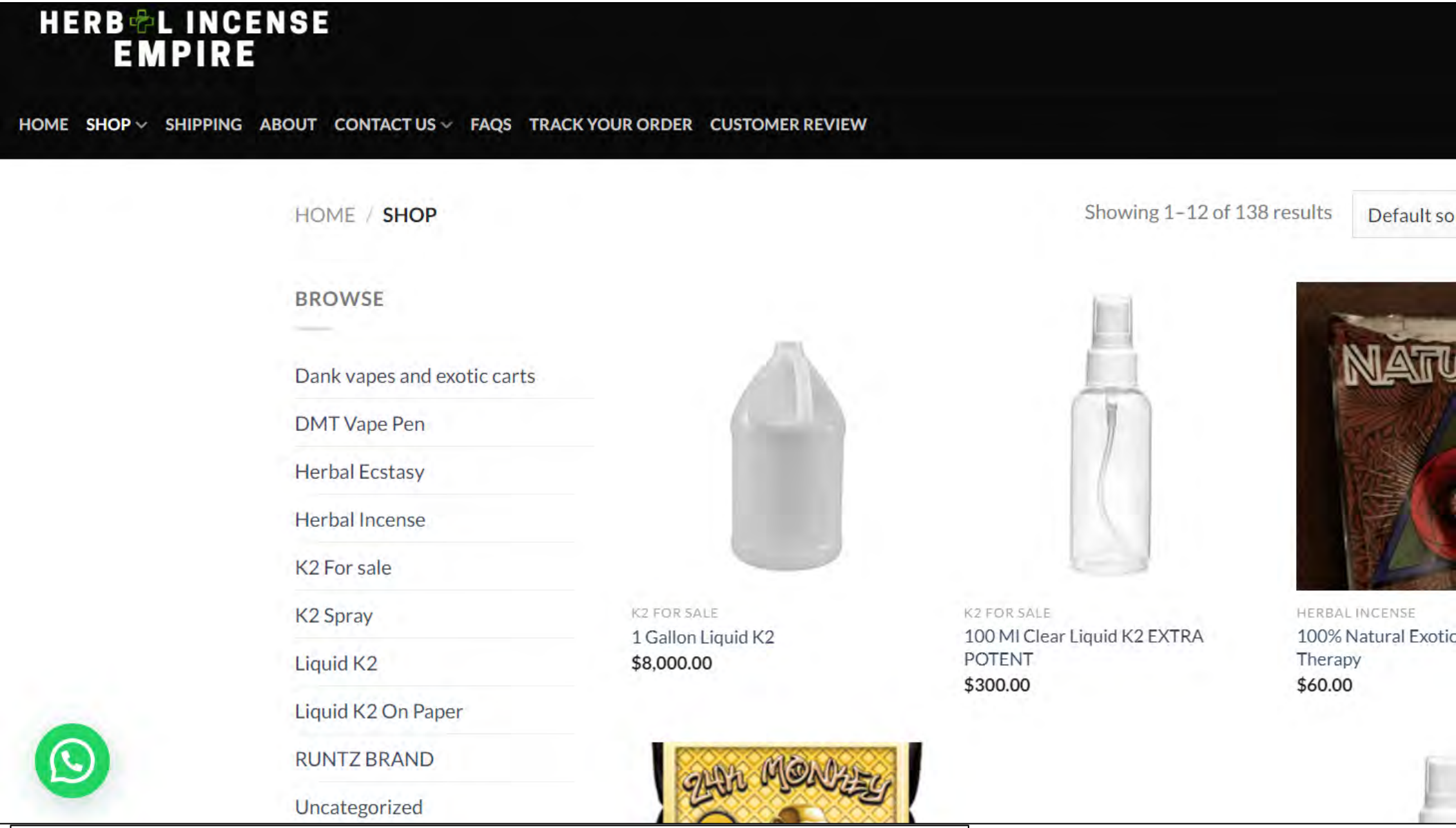


Subject #2: Young Adult
Background: Inmate is charged with Murder of a female whom he was in an intermittent relationship with for several months.

Subject #1: Sex Ad Phone #
Background: Over the past three years the phone number linked to the ad has been called by 18 different inmates.

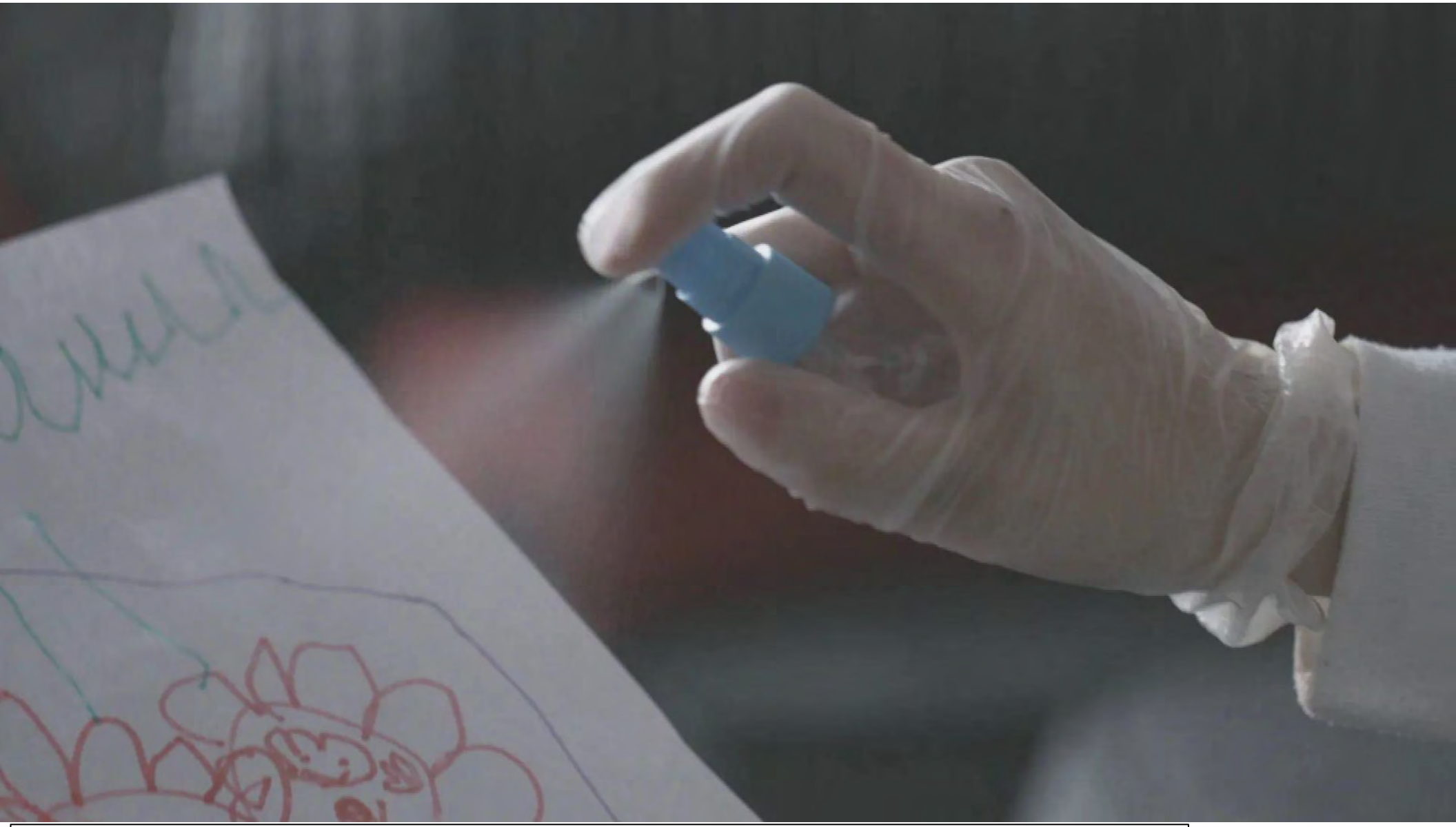
Subject #3: Sex Ad Phone #
Background: In 2024 alone seven different inmates have contacted the phone number linked to several sex adds.

Understanding the Problem



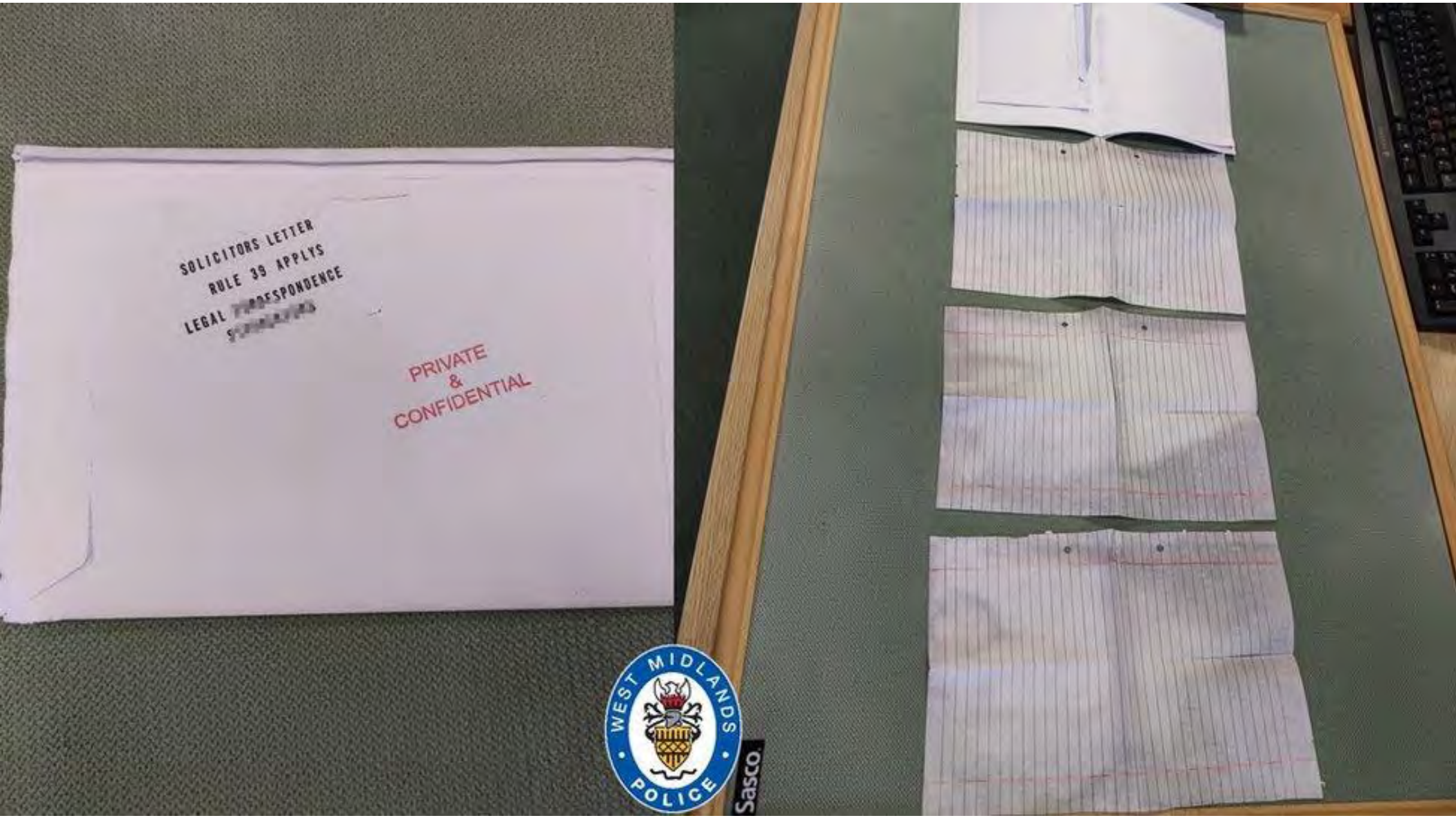
Step 1: Narcotics can be obtained online or the streets by outside parties

Understanding the Problem



Step 2: Ne'er-do-well soak paper in narcotics and mark it as confidential mail for an inmate.

Understanding the Problem



Step 3: Sheets are then smuggled into jail via the mail or third party.

Understanding the Problem

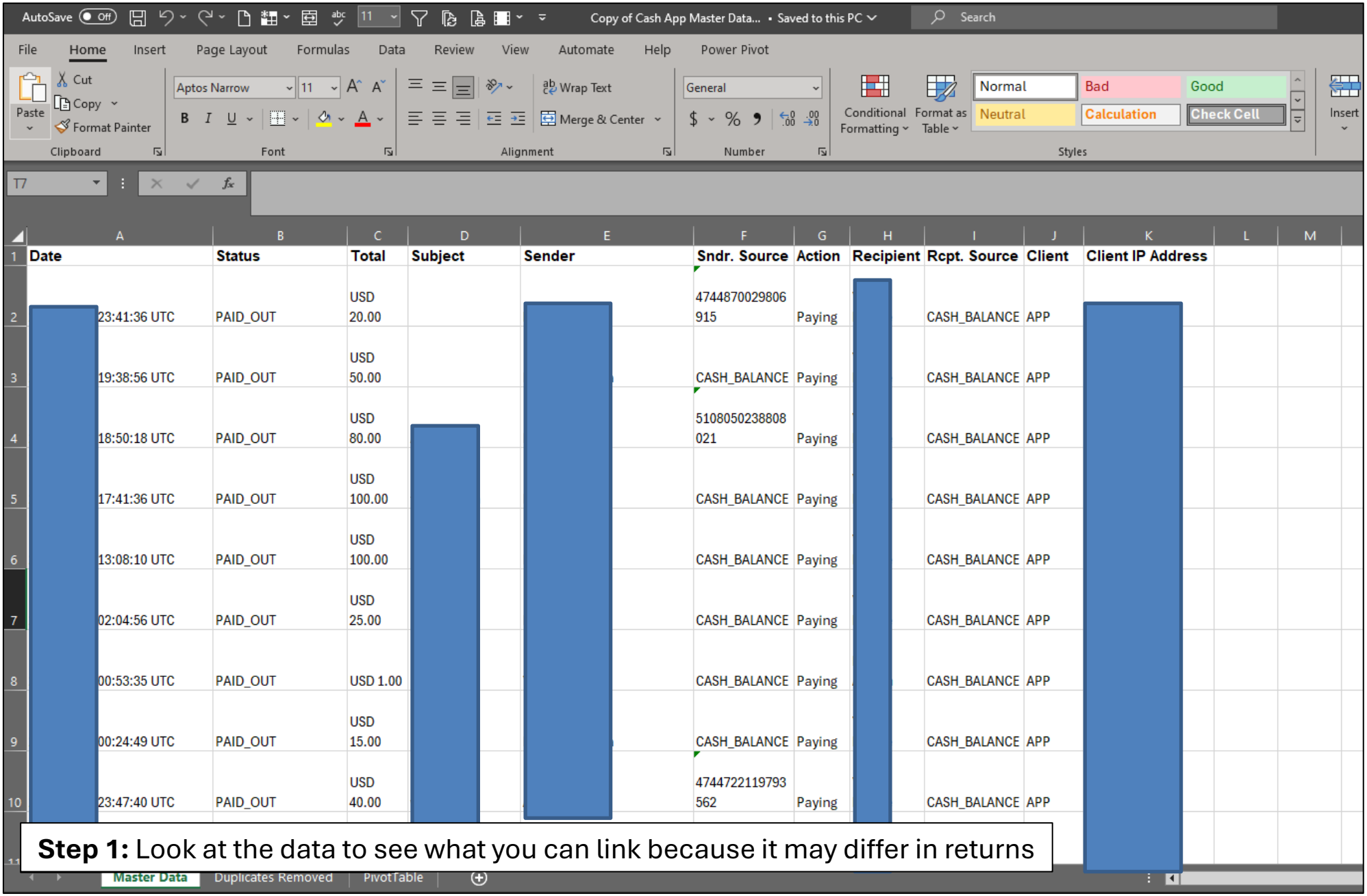
Step 4: Due to poor quality control inmates' overdose on potent drugs.

Follow the Money

Drug Transactions

- Domino size sheets of laced paper can sell for an average of $50. They pay the supplier using money transfer apps like Cash App
- Inmates smoke the paper to obtain a high. Sometimes the paper is laced with fentanyl.
- Using keyword searches on transcribed calls or searching phone numbers of callers, Cash App accounts are rapidly identified.
- Cash App/Zelle transactions of drug traffickers are subpoenaed by investigators and the data is exploited by Crime Analysts.

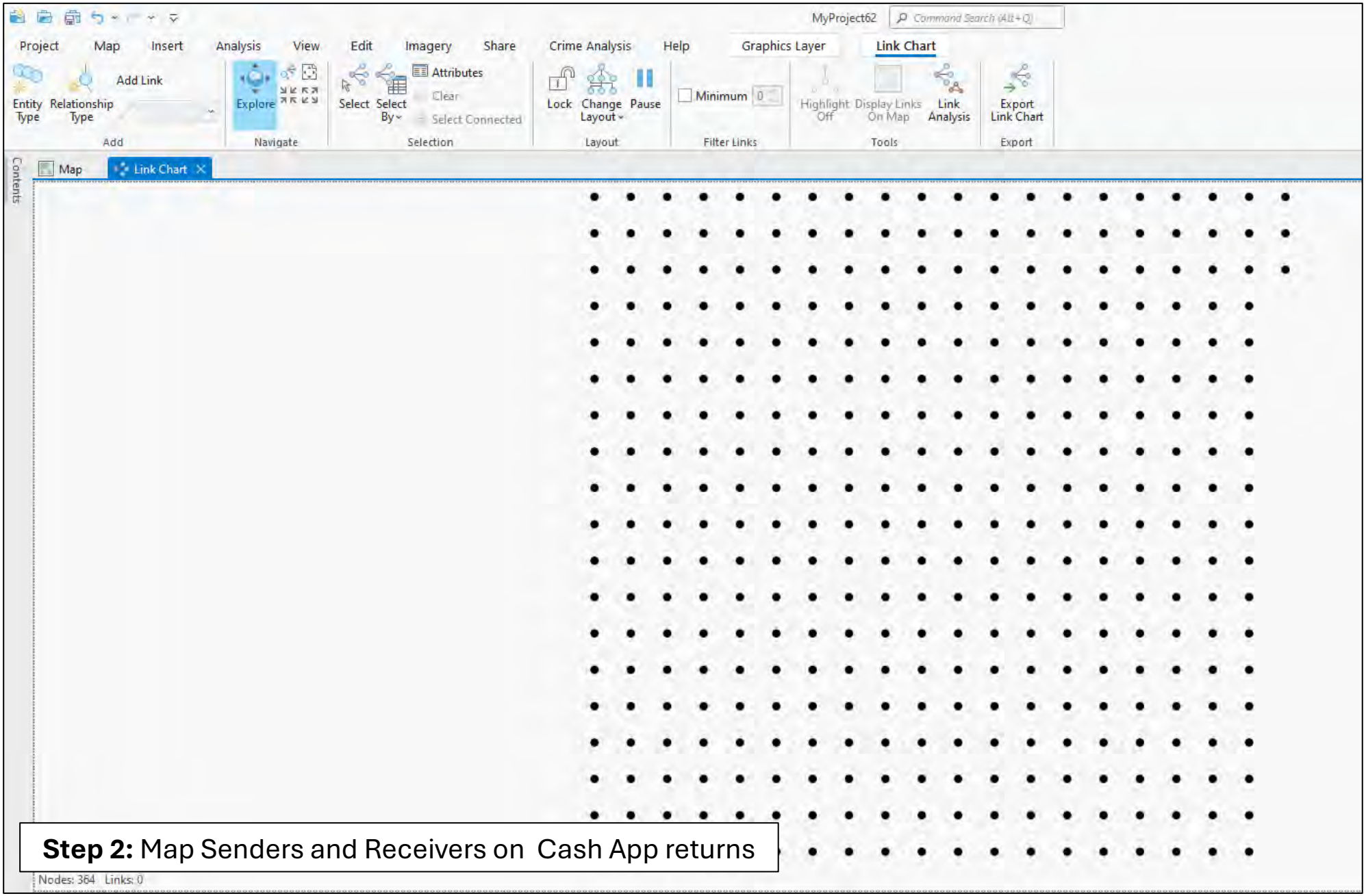
Examine the Data



Date	Status	Total	Subject	Sender	Sndr. Source	Action	Recipient	Rcpt. Source	Client	Client IP Address
23:41:36 UTC	PAID_OUT	USD 20.00			4744870029806915	Paying		CASH_BALANCE	APP	
19:38:56 UTC	PAID_OUT	USD 50.00			CASH_BALANCE	Paying		CASH_BALANCE	APP	
18:50:18 UTC	PAID_OUT	USD 80.00			5108050238808021	Paying		CASH_BALANCE	APP	
17:41:36 UTC	PAID_OUT	USD 100.00			CASH_BALANCE	Paying		CASH_BALANCE	APP	
13:08:10 UTC	PAID_OUT	USD 100.00			CASH_BALANCE	Paying		CASH_BALANCE	APP	
02:04:56 UTC	PAID_OUT	USD 25.00			CASH_BALANCE	Paying		CASH_BALANCE	APP	
00:53:35 UTC	PAID_OUT	USD 1.00			CASH_BALANCE	Paying		CASH_BALANCE	APP	
00:24:49 UTC	PAID_OUT	USD 15.00			CASH_BALANCE	Paying		CASH_BALANCE	APP	
23:47:40 UTC	PAID_OUT	USD 40.00			4744722119793562	Paying		CASH_BALANCE	APP	

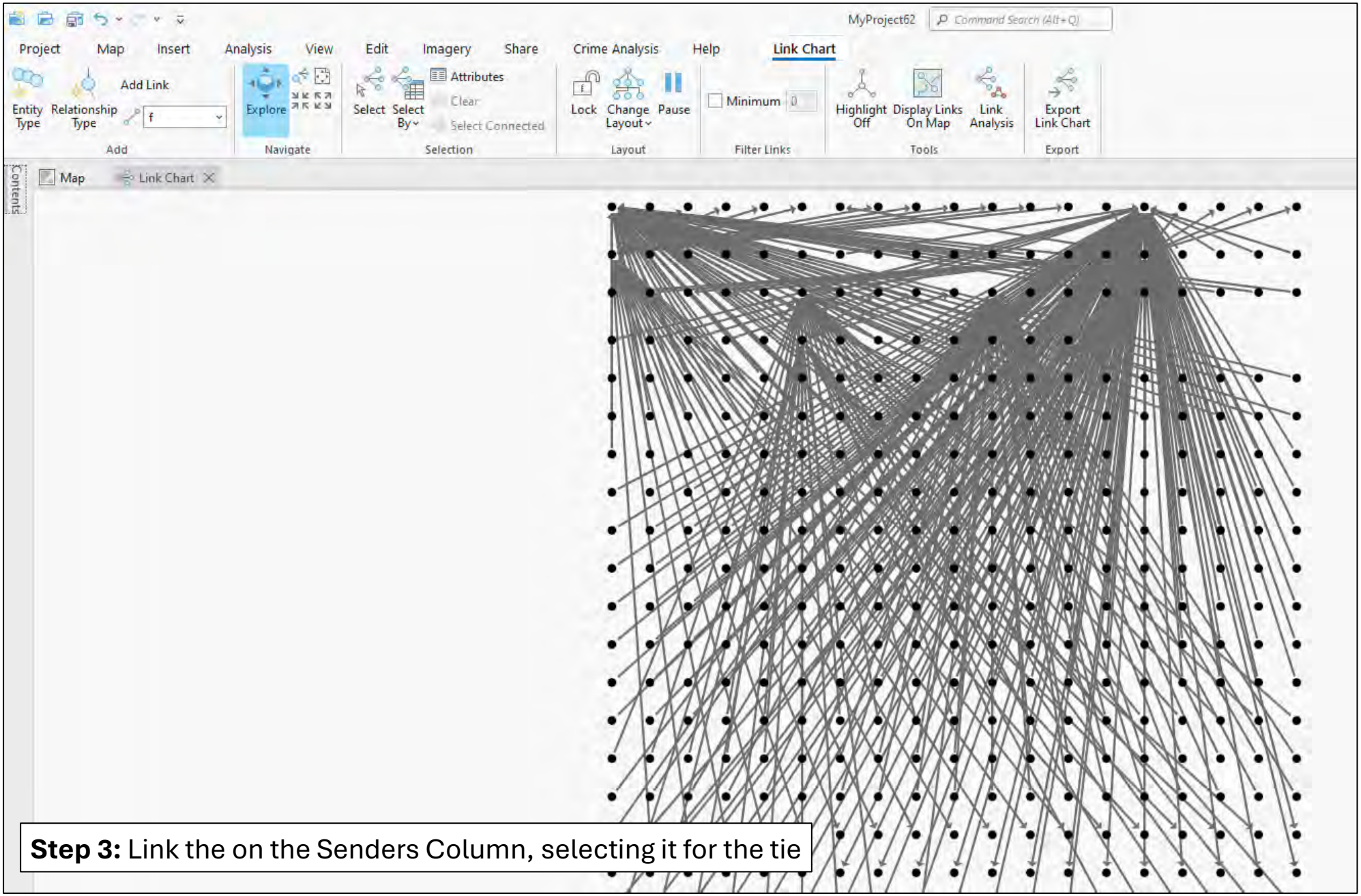
Step 1: Look at the data to see what you can link because it may differ in returns

Generate Nodes Warrant Returns



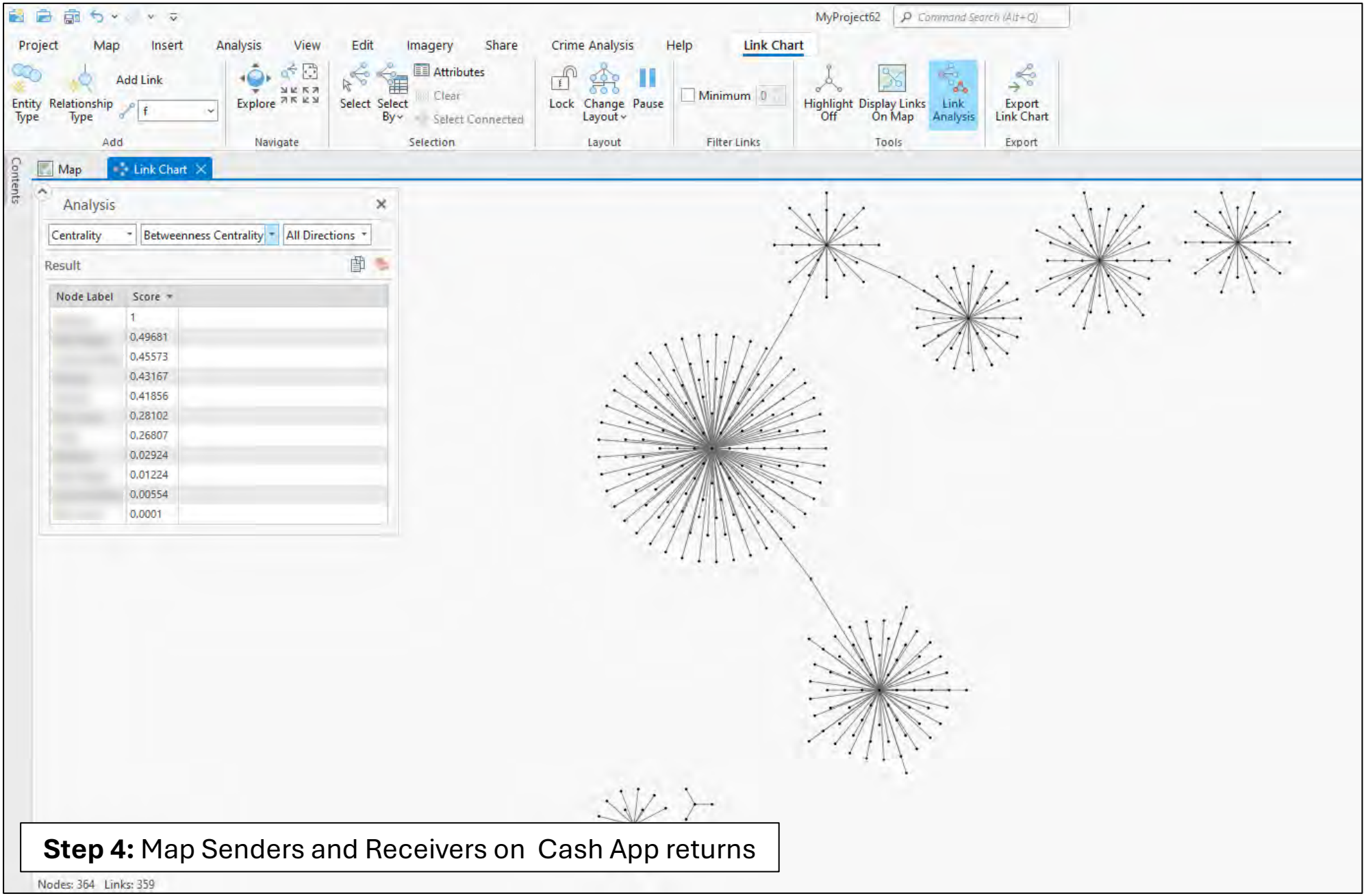
Step 2: Map Senders and Receivers on Cash App returns

Link Nodes Warrant Returns



Step 3: Link the on the Senders Column, selecting it for the tie

Analyze Nodes Warrant Returns

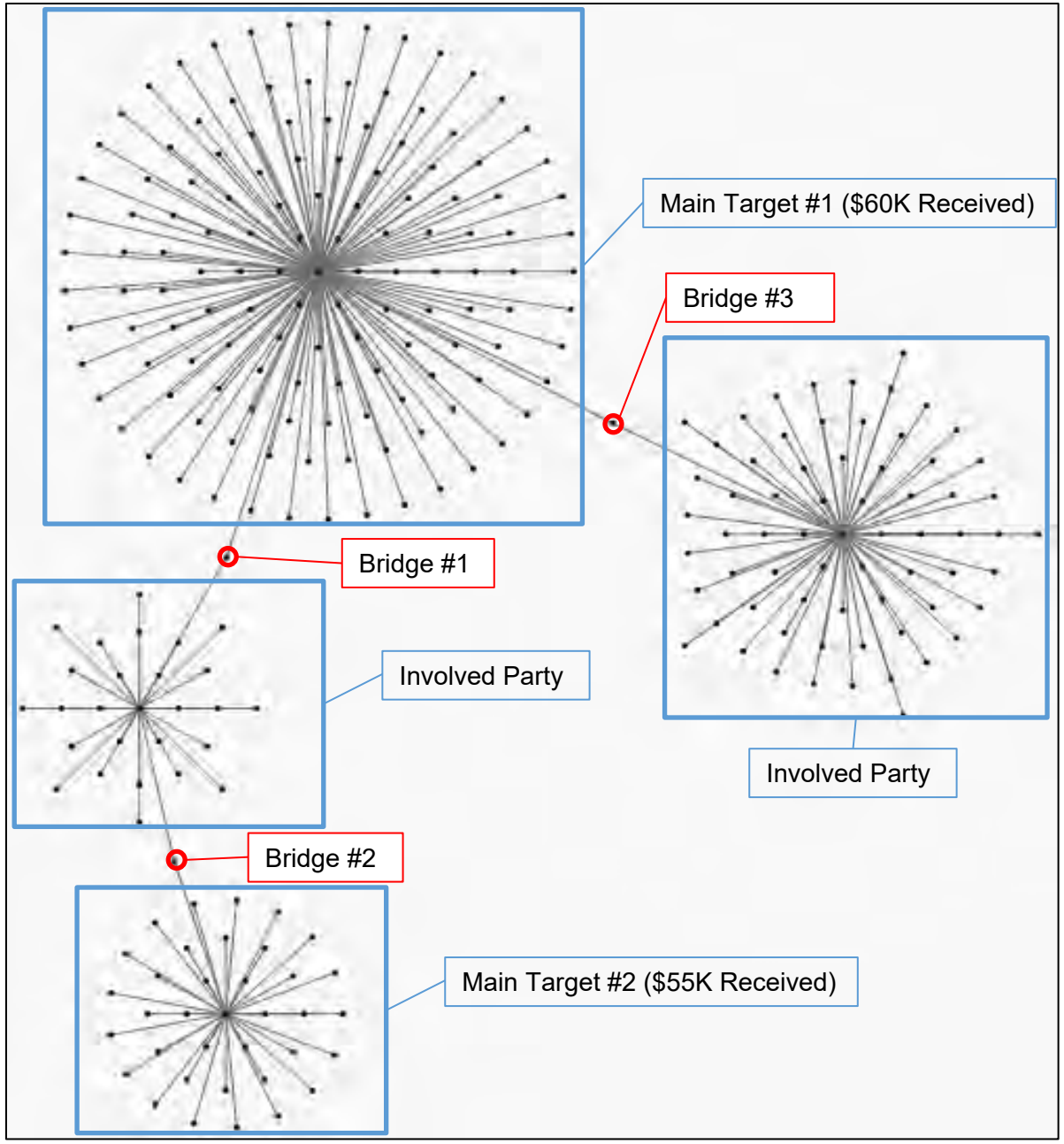


Step 4: Map Senders and Receivers on Cash App returns

Translate the Data

Drug Cash App Targets

- Cash app bridges were discovered from two primary target accounts.
- These bridge accounts can be subpoenaed and expand the network.
- Ideally the information gathered will aid investigators in disrupting the network of drug traffickers in the jail and save lives.



Determining Gang Leadership

Gang Leadership

In this final example shows how SNA can uncover gang leadership structure by merging gang membership with Jailhouse call logs.

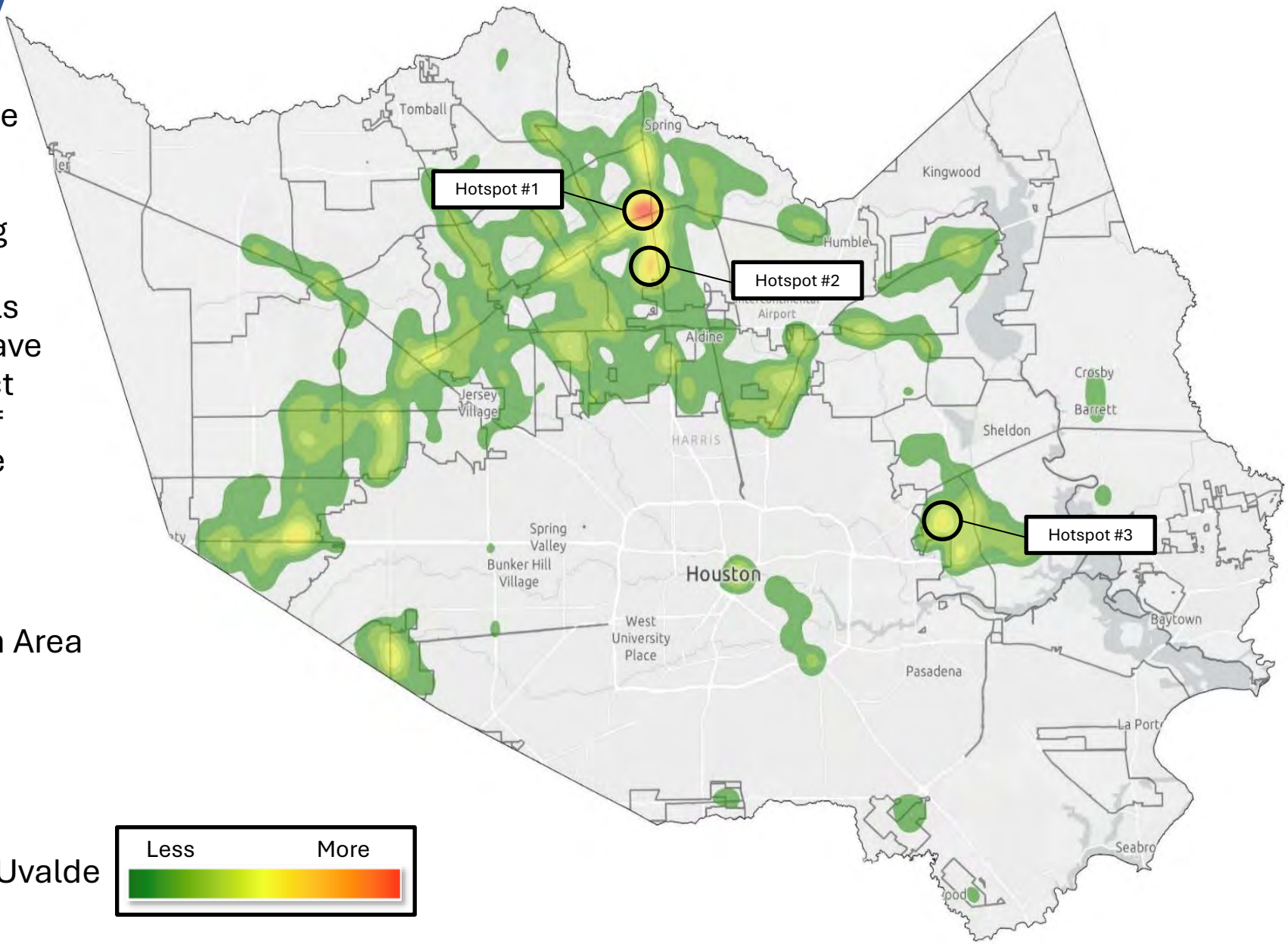
Consult Geographical Data

Kernel Density

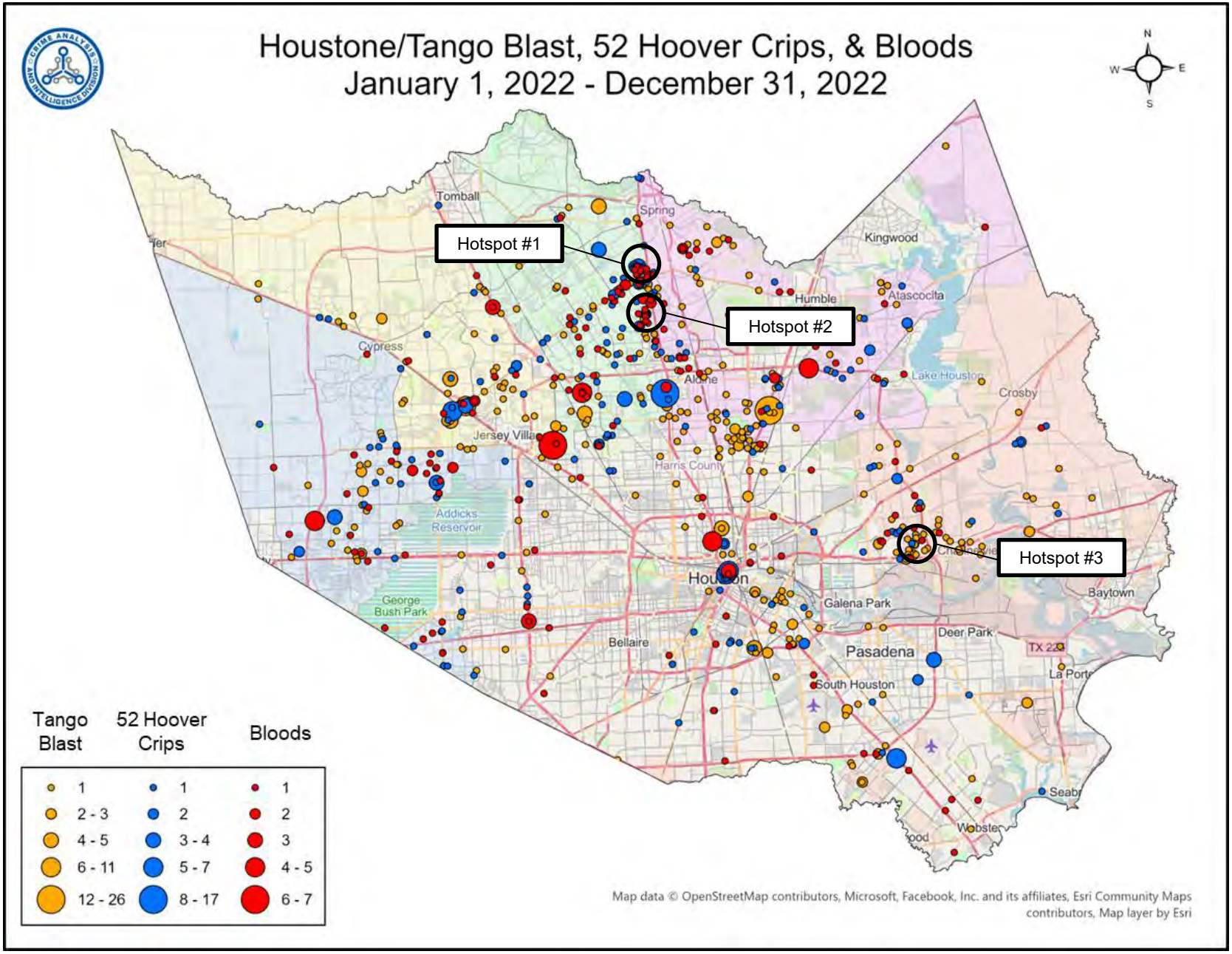
The Kernel Density map to the right shows violent crime incidents in HCSO jurisdiction in one month. By focusing on SNA on violent gangs and criminals in the area it will have a significant impact on the reduction of violent crime in the County.

Hot Spots

- Cypress Station Area (District 1)
- Ella Blvd Area (District 1)
- Cloverleaf and Uvalde (District 3)



Consult Geographical Data

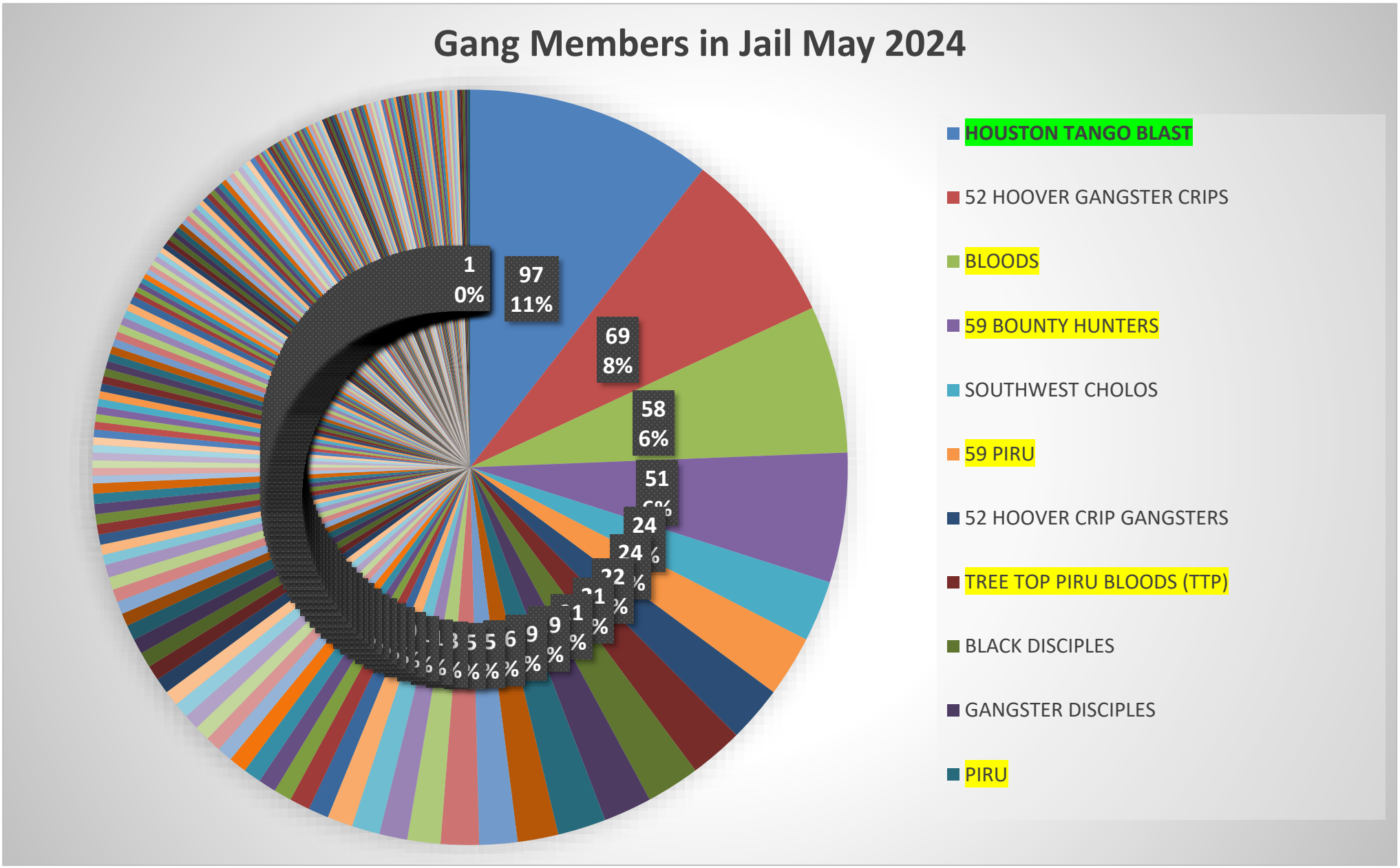


Gang Analysis

The top three gangs by volume were mapped and aggregated on combined X and Y values to show intensity of activity.

Spatial visualization allows for another method of showing the impact of a gang in an area.

Consult Inmate Population



HCSO Violent Crime Visualized

1

2

Microsoft® SQL Server®

3

(HCSO\Anthony.Bush (123)) - Microsoft SQL Server Management Studio

release

OMS Current Gang...nthony.Bush (123))

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (10000) [ID]
      ,[SYSID]
      ,[BOOKINGNUM]
      ,[SPN]
      ,[FIRSTNAM]
      ,[LASTNAME]
      ,[DOB]
      ,[GENDER]
      ,[GANG]
      ,[CODE]
      ,[HOUSING_LOCATION]
      ,[FACILITY]
      ,[SECTION]
      ,[BLOCK]
      ,[CELL]
  FROM [EvoOMS].[dbo].[RPT_GANG_AFFILIATION]
  where GANG is not null
```

80 %

Results | Messages

	ID	SYSID	BOOKINGNUM	SPN	FIRSTNAM	LASTNAME
1	21119480677030	21094825645229				
2	21119607130913	21094825356586				
3	21183043596065	21043818971946				

HCSO Violent Crime Visualized

1

2

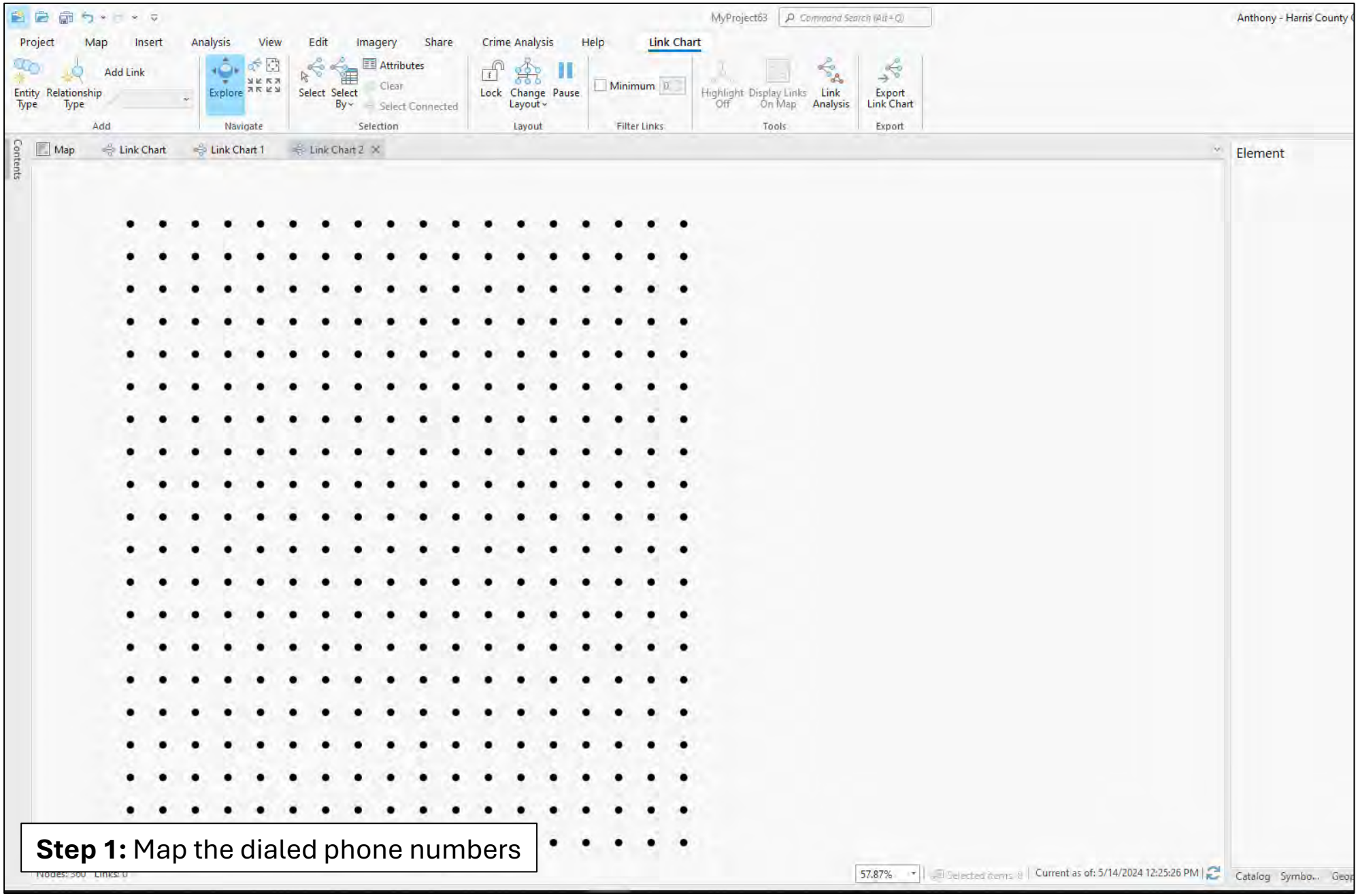
SECURUS Technologies
connecting what matters®

3

M1 | First Name

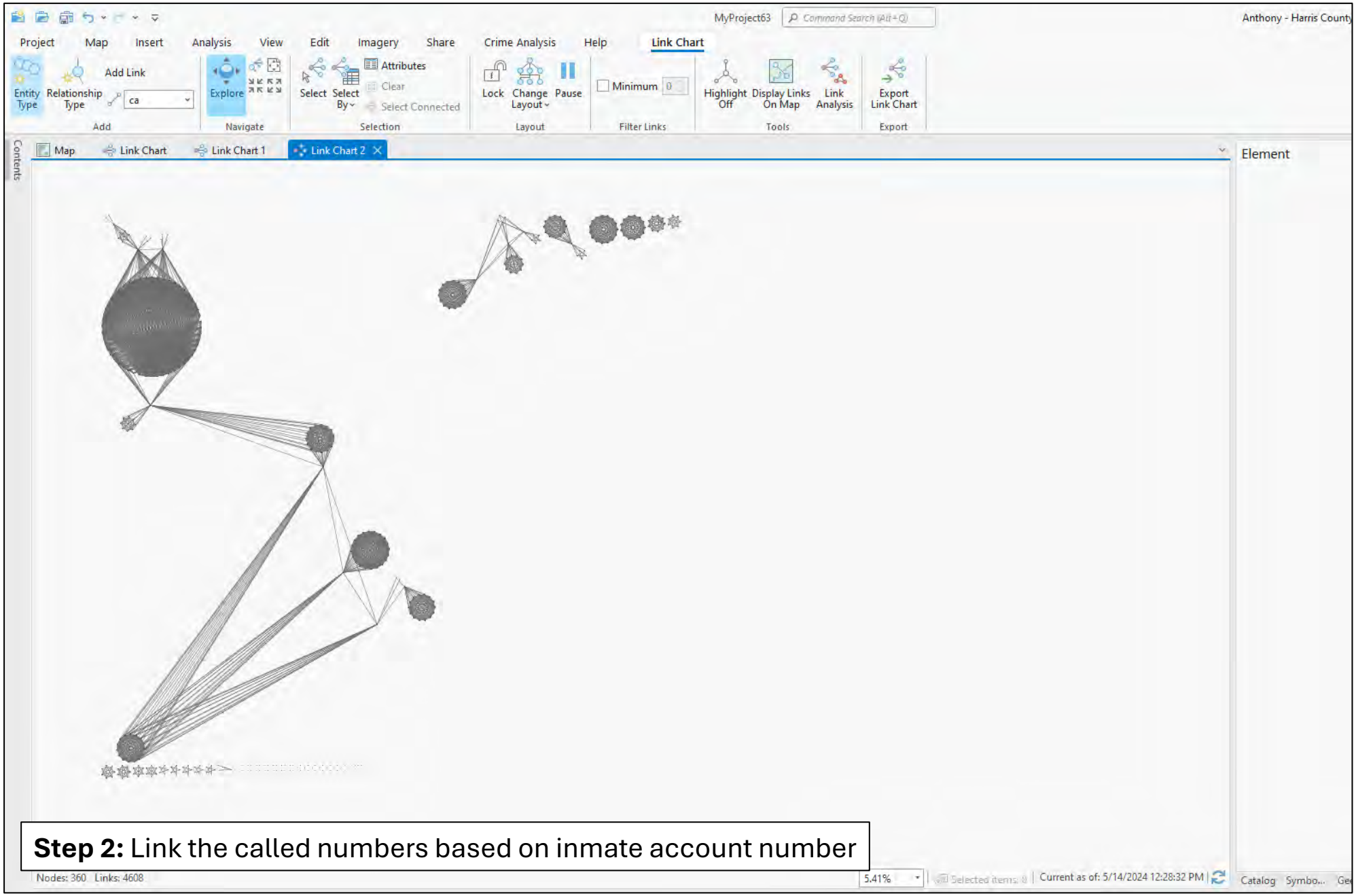
	A	B	C	D	E	F	G
1	Site	PortLoc	Ctry	Wireless	Dialed#	)est Zon	tart Tim
2	Harris Cou	Pod 3-HH	1	Y		1Local	01/01/2023
3	JA14 701 I	7B1-1	1	Y		Interlata/In	01/01/2023
4	JA14 701 I	7B1-1	1	Y		Interlata/In	01/01/2023
5	JA14 701 I	7B1-1	1	Y		Interlata/In	01/01/2023
6	JA14 701 I	7B1-1	1	Y		Interlata/In	01/01/2023
7	Harris Cou	Pod 3-HH	1	Y		1Local	01/01/2023
8	Harris Cou	Pod 3-HH	1	Y		1Local	01/01/2023
9	JA14 701 I	2D3-2	1	Y		Local	01/01/2023
10	JA14 701 I	2D3-2	1	Y		Local	01/01/2023
11	JA14 701 I	2D3-2	1	Y		Local	01/01/2023
12	Harris Cou	Pod 3-HH	1	Y		1Local	01/01/2023
13	Harris Cou	Pod 3-HH	1	Y		1Local	01/01/2023
14	Harris Cou	Pod 3-HH	1	Y		1Local	01/01/2023
15	JA14 701 I	7B1-1	1	Y		Interlata/In	01/02/2023
16	JA14 701 I	7B1-1	1	Y		Interlata/In	01/02/2023
17	JA14 701 I	7B1-1	1	Y		Interlata/In	01/02/2023
18	JA14 701 I	2D3-2	1	Y		Local	01/02/2023
19	Harris Cou	Pod 3-HH	1	Y		1Local	01/02/2023
20	Harris Cou	Pod 3-HH	1	Y		1Local	01/02/2023
21	JA14 701 I	2D3-1	1	Y		Local	01/02/2023
22	JA14 701 I	2D3-1	1	Y		Local	01/02/2023
23	Harris Cou	Pod 3-HH	1	Y		1Local	01/02/2023
24	JA14 701 I	2D3-1	1	Y		Local	01/02/2023

Generate Nodes Jail Calls



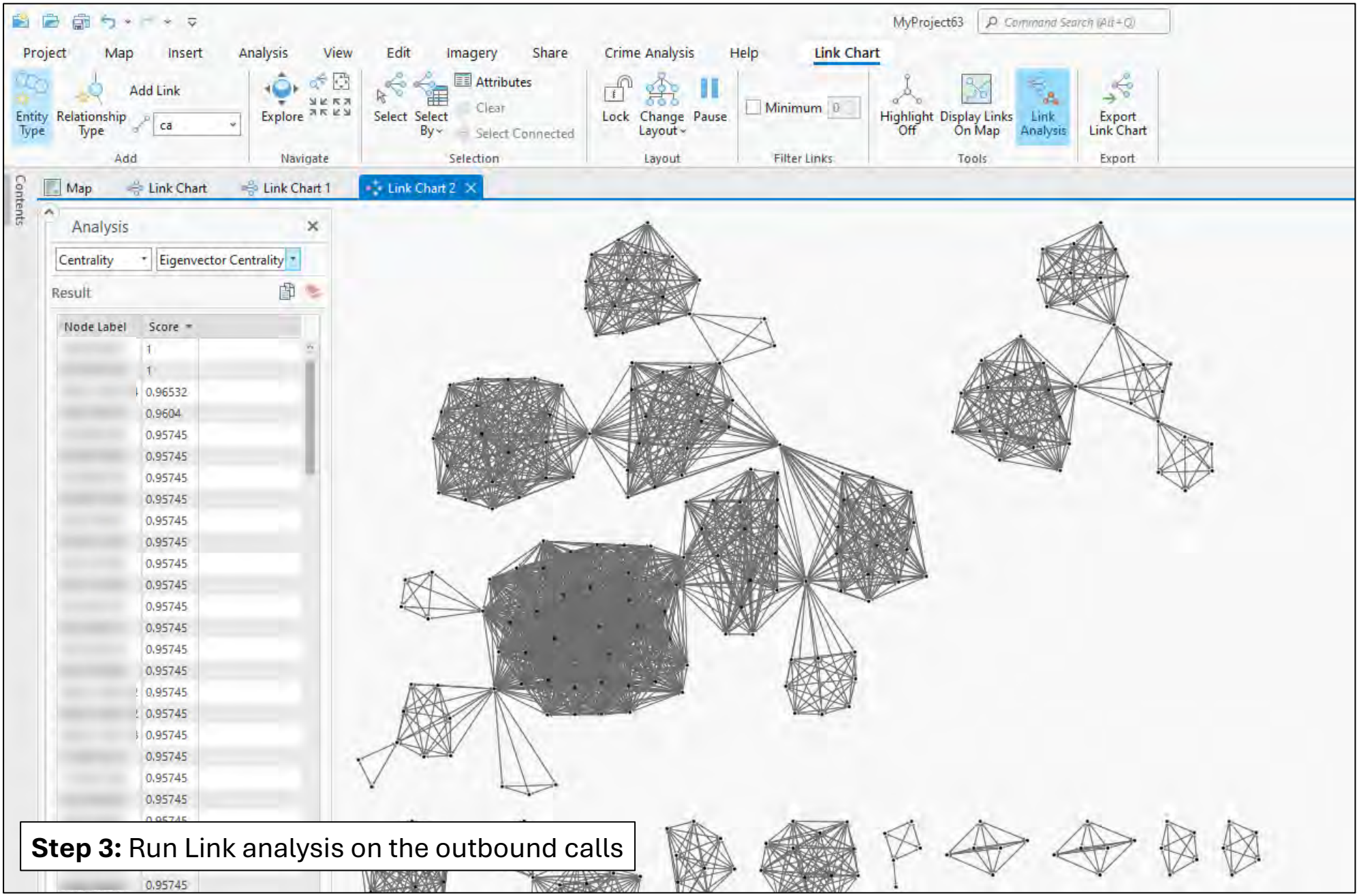
Step 1: Map the dialed phone numbers

Generate Connections



Step 2: Link the called numbers based on inmate account number

Run Analysis



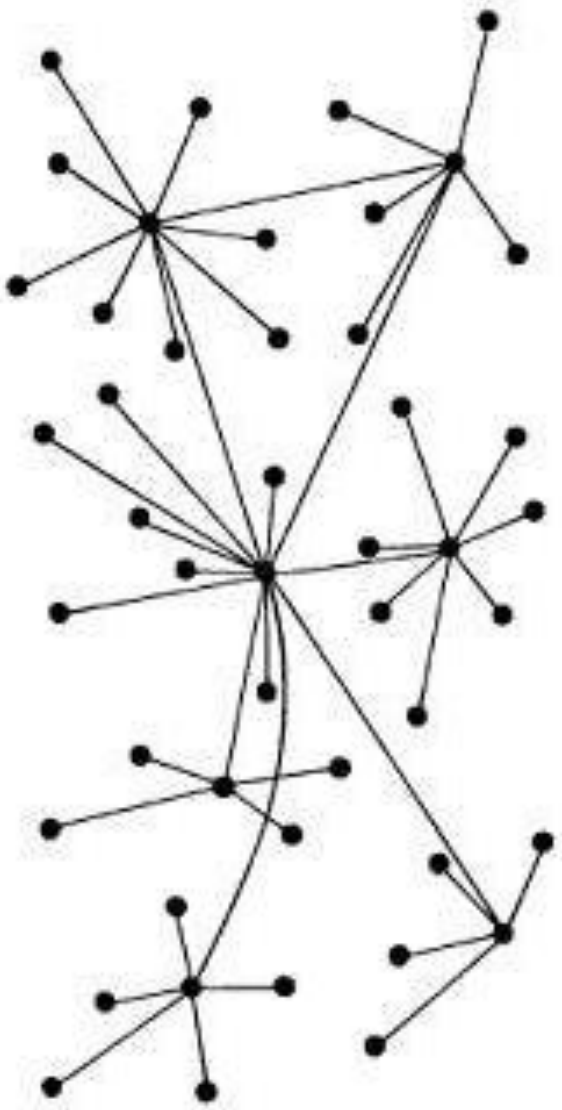
Step 3: Run Link analysis on the outbound calls

Most Contacted Nodes

Network Summary

Comparing the last six months of jail calls of the roughly 120 nodes shows three numbers that are called by three or more documented Tango Blast / Houstone set gang members.

Tango Blast Subsets		
Documented in TX Gang	**Phone Numbers**	**Accounts**
N/A	[redacted]	3
Tango Blast / Houstone	[redacted]	3
59 Bounty Hunters	[redacted]	3



DECENTRALIZED
(B)

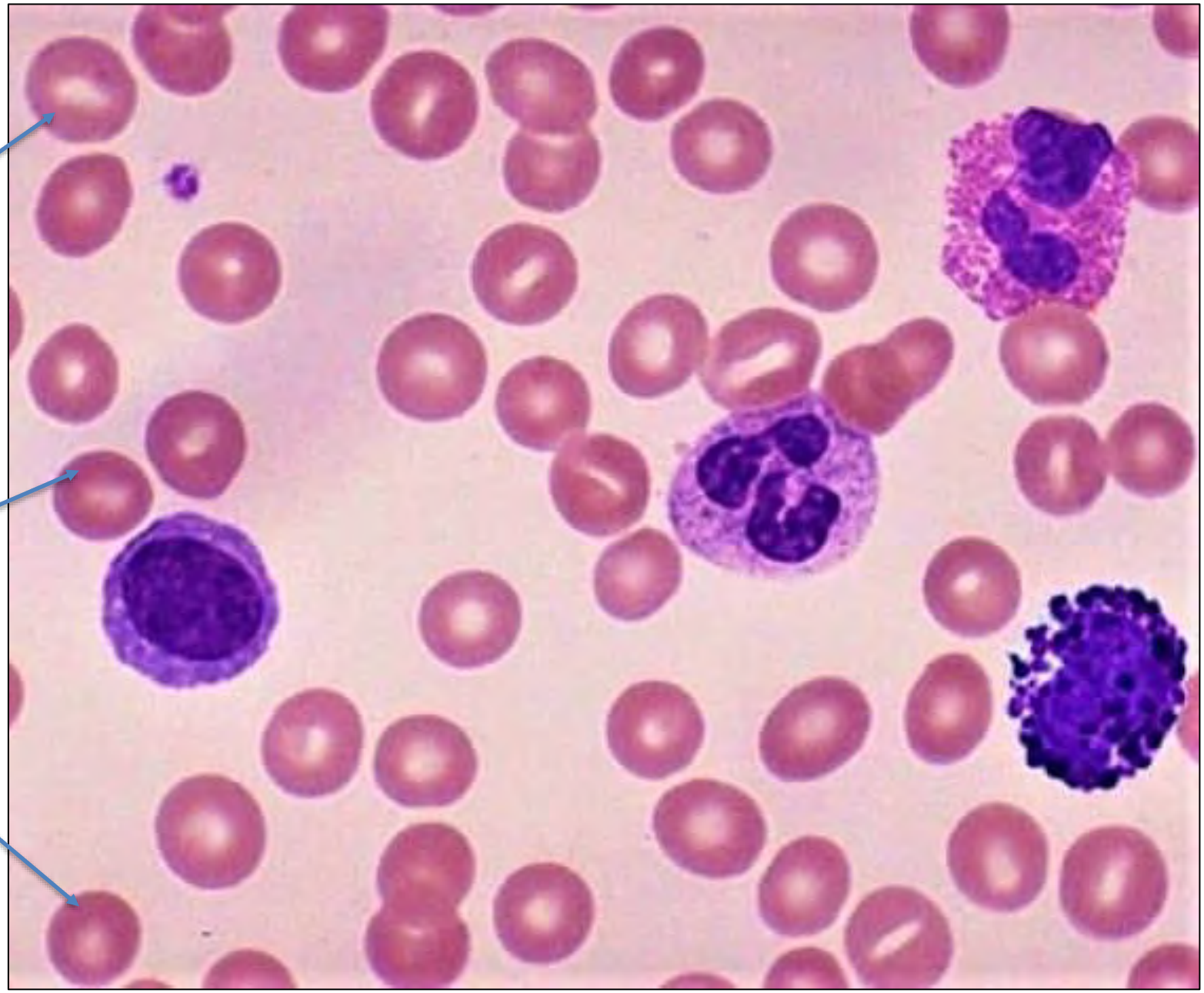
Top Scoring Nodes

Subject #2: [redacted]
Background: 29 YOA Blood gang member with an open warrant for violation of a protective order. Family violence history.

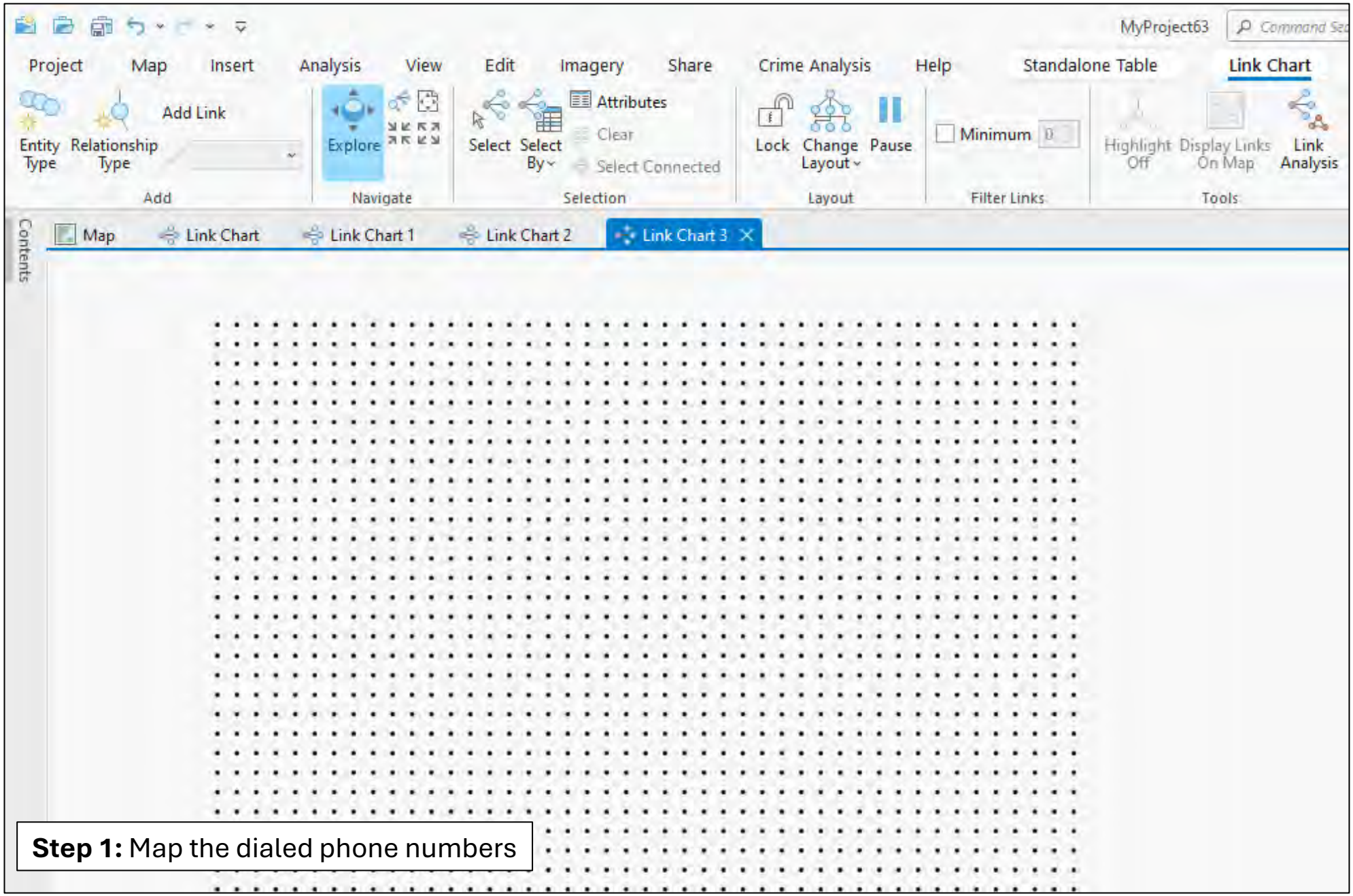
Subject #1: [redacted]
Background: Young female who may be a friend of an inmate in jail for Capital Murder.

Subject #3: [redacted]
Background: 48 YOA Houstone/Tango Blast gang member who recently assaulted someone with a glass bottle.

Bonus Gang

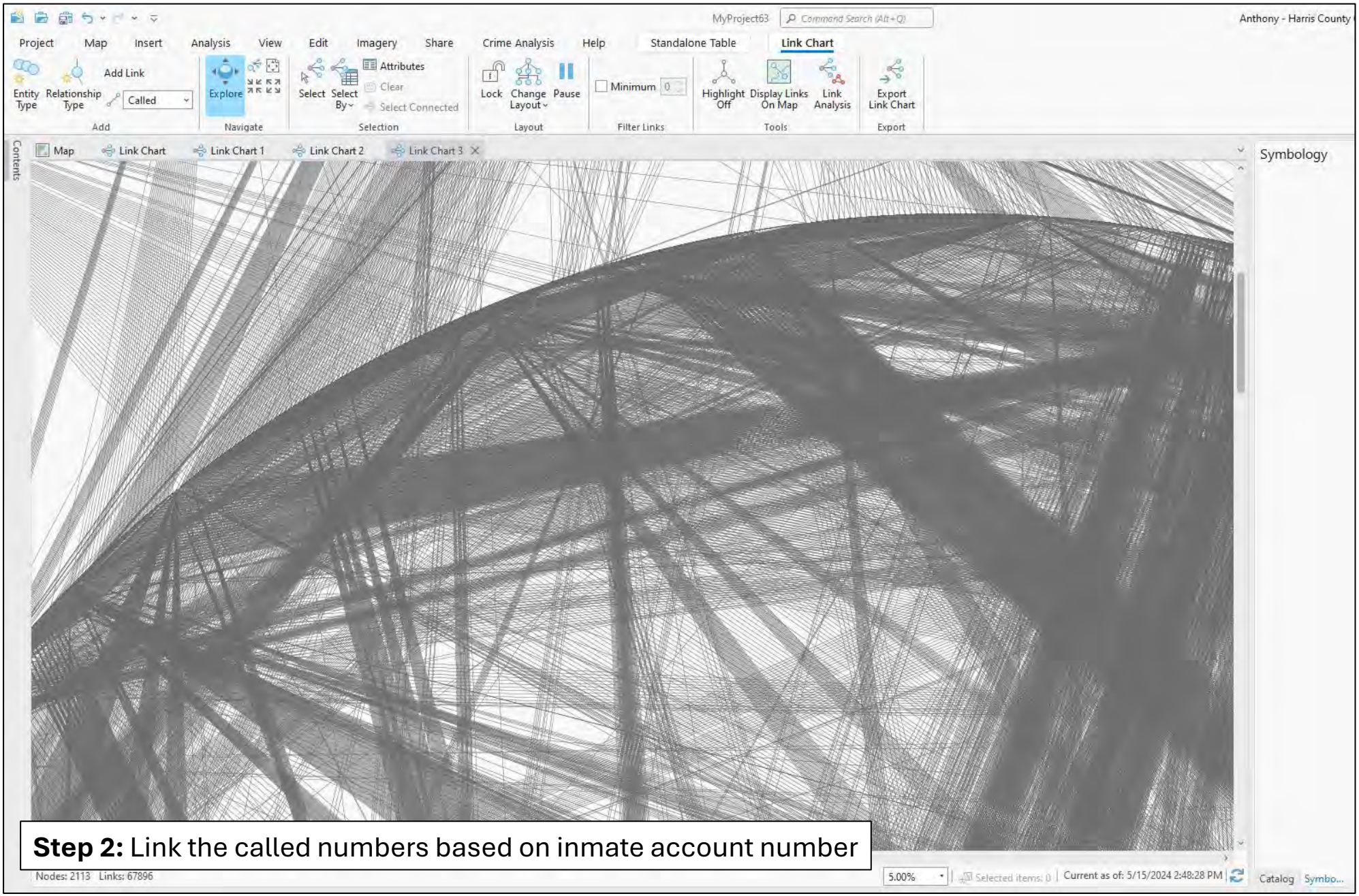


Generate Nodes Jail Calls



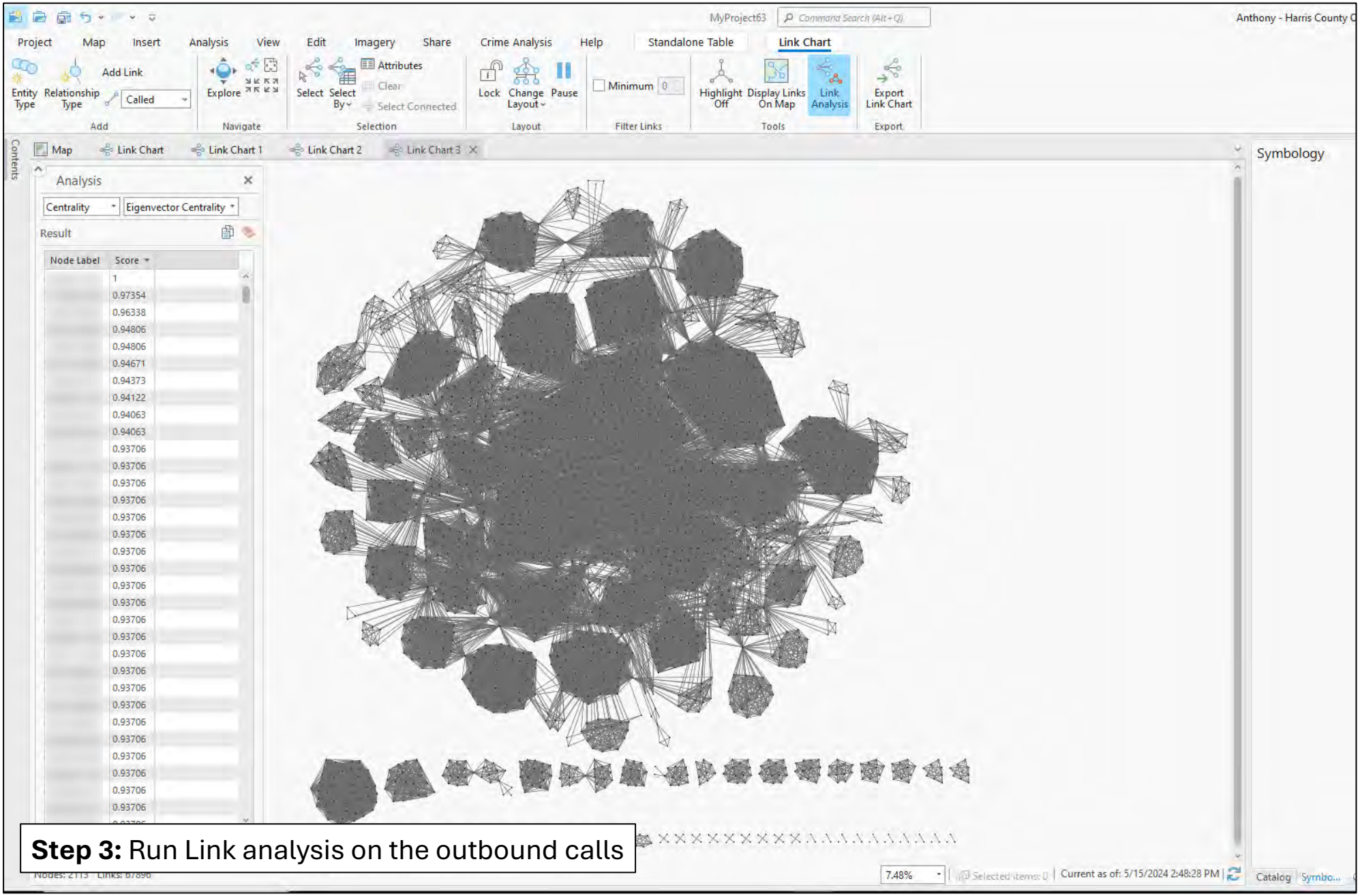
Step 1: Map the dialed phone numbers

Generate Connections



Step 2: Link the called numbers based on inmate account number

Run Analysis



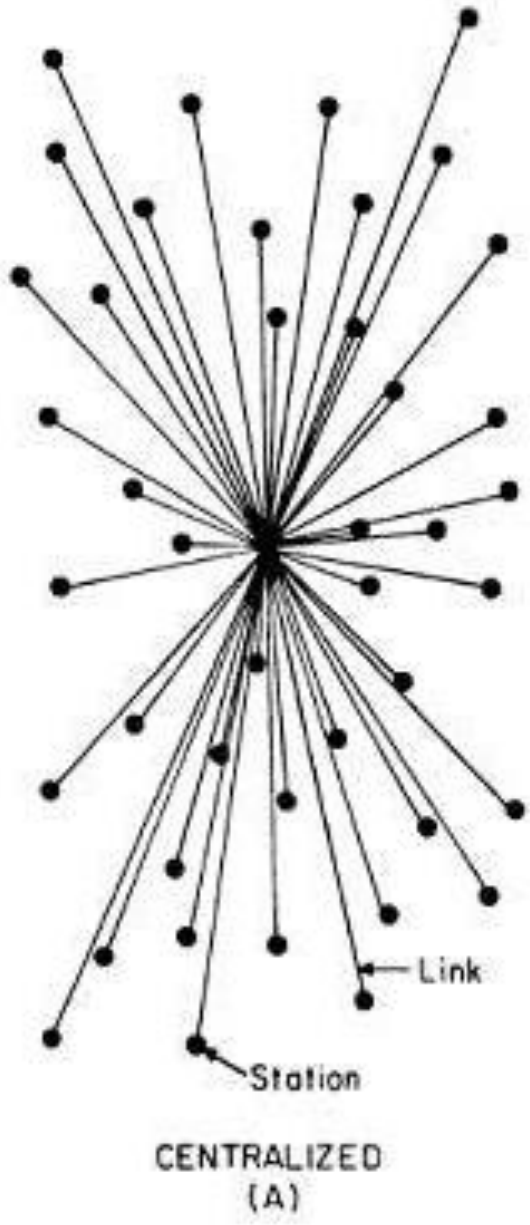
Step 3: Run Link analysis on the outbound calls

Most Contacted Nodes

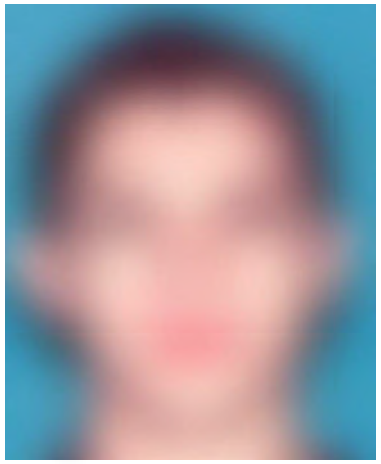
Network Summary

Comparing the last six months of jail calls of the roughly 156 nodes shows nine numbers that are called by three or more documented blood set gang members.

Blood Subsets		
Gang	**Phone Numbers**	**Accounts**
59 Bounty Hunters	[redacted]	11
Tree Top Piru Bloods (TTP)	[redacted]	4
N/A	[redacted]	4
Multi-Gang (Bloods)	[redacted]	3
N/A	[redacted]	3
Multi-Gang (Hispanic)	[redacted]	3
Southwest Cholos	[redacted]	3
Multi-Gang (Hispanic)	[redacted]	3
N/A	[redacted]	3



Top Scoring Nodes



Subject #2: [redacted]
Background: 39 YOA Southwest Cholos male linked to capital murder case from 2004. May have been deported after serving his time.

Subject #1: [redacted]
Background: 41 YOA linked to multiple gang members predominantly Blood set. Committed recent property crimes.

Subject #3: [redacted]
Background: Not linked to a gang member but is a female who talks with a documented member.

Takeaways

Key Takeaways

The key takeaway is that by using SNA you can find structures and significant people in large datasets.

Best Application

The best application I have discovered of this software is combing local jail calls with other datasets. Applying centrality metrics to at least a year of communication uncovers possible leaders in a gang. The top scoring phone numbers/ inmates have been linked to founders of gangs, second in command, and major narcotic traffickers.

Collaboration

Due to the ubiquity of phone numbers results, often the results loop in Federal partners already investigating some highlighted numbers, but they don’t know of the inmates talking to them or other phone numbers linked.

Takeaways

Targeting

By using SNA, Law Enforcement can leverage this untapped data at no additional cost to the agency. This narrowing and filtering of data allows force multiplication. By utilizing targeting-based data to strike only critical elements in organized crime or crime types, command staff can maximize the impact of the limited resources in staffing they have.

1 x B-1 Lancer

=

200 x B-25-Bombers

Questions & Contact Info

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DISCLAIMER

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The Crime Data represents basic/general data of incidents based on the highest offense listed in a particular report and does not reflect the FBI's NIBRS coding system in that lesser included offenses may not be included. As data is submitted, routine data validation are applied to ensure completeness, however, the responsive data contained within this report may have been retrieved from the system prior to being subject to or completing those validation routines, and as such, may contain inaccuracies, be incomplete or not reflect every incident that may have occurred with the specified jurisdiction for the requested timeframe. The data may or may not have been screened through the Harris County Sheriff's Office records department and therefore may reflect:

- Information not yet verified by further investigation and may include mechanical or human error.
- Preliminary crime classifications that may be changed at a later date based upon further investigation.