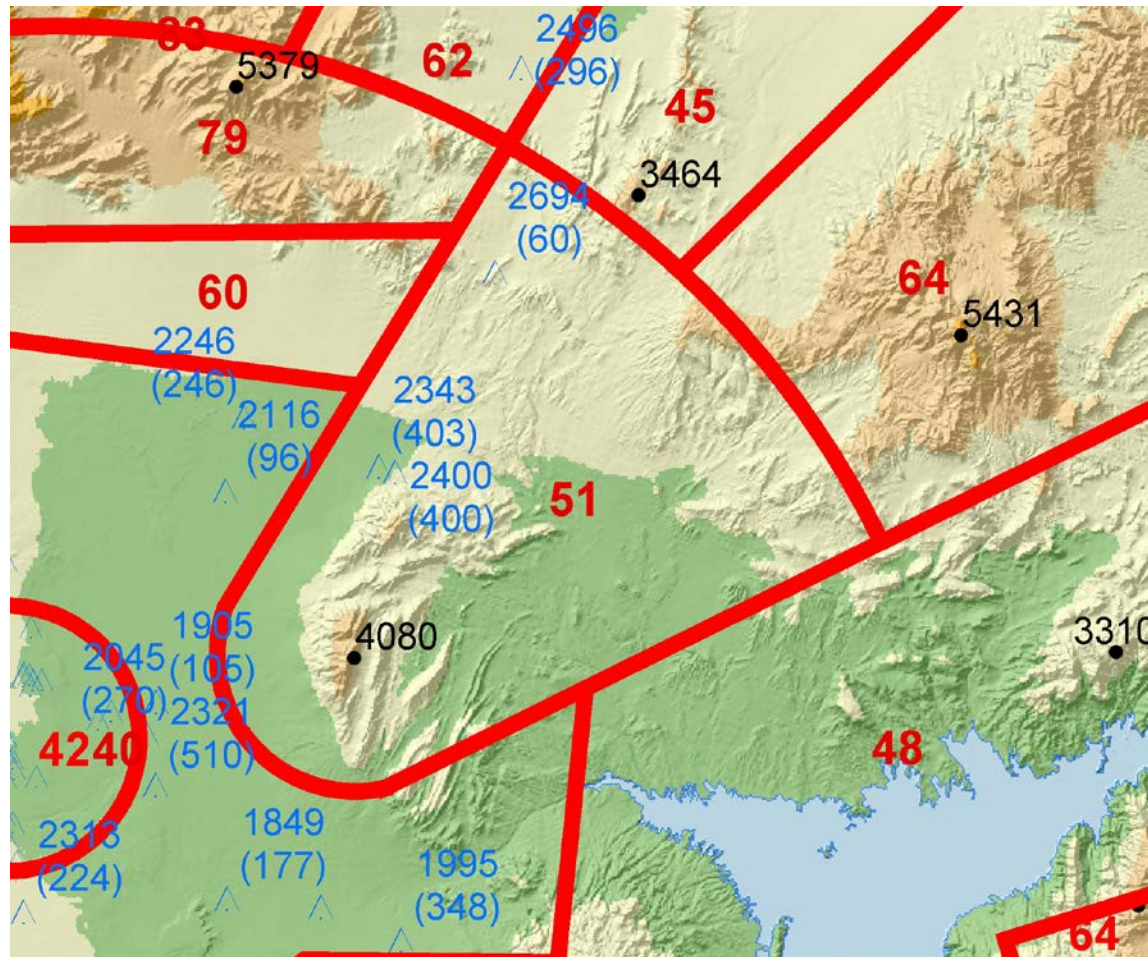


Minimum Vectoring Altitude (MVA) Certification Automation



May 1, 2003

Purpose

- Purpose:
 - Automate the current AVN-100 MVA quality assurance process.
- Concept:
 - Use current technology to certify MVA airspace.
 - Examine existing GIS tools within ARCVIEW using AVN data.
- Benefits:
 - Reduction in time and labor for certification.

Project Research

Inception Phase Activities

- Understand the Problem
- Identify Stakeholders
- Meetings with AVN-100 and NACO
- Inventory Sources and Uses
- Investigate the Tools
- Develop a Vision and Plan
- Define the System

Background

- MVAs and MIAs are drawn by ATC facilities on 2 current VFR Sectionals
- MVA Package is sent to Regional FPO.
- AVN-100 Quality Assurance
 - Review
 - Discuss with ATC facility
 - Approve
- AVN-500 creates the MVA Radar Video Maps.

MVA Package

VFR Sectional Chart



FAA Form 7210-9

MINIMUM IFR ALTITUDE/MINIMUM VECTORING ALTITUDE OBSTRUCTION DOCUMENTATION

1 Area	2 Controlling Obstruction	3 Location	4 Elevation MSL	5 ROC	6 Roundoff	7 Mt. Terrain Reduction	8 Increase For Airspace	9 Other	10 MVA MIA	11 Remarks
A	Terrain	130/63	4802	2000					8000	
B	Terrain	043/39	2336	2000	-36	1000	300		3600	Airspace Obs 2080 8260.3 Par 1041b(3)
C	Terrain	032/12	1460	2000	+40	1000	N/A		2500	8260.3 Par 1041b(3)
D	Terrain	089/15.5	4393	2000	+7	1000	N/A		5400	8260.3 Par 1041b(3)
E	Terrain	115/11.5	2519	2000	-19	1000	N/A		3500	8260.3 Par 1041b(3)
F	Terrain	145/14	3500	2000	N/A	1000	N/A		4500	8260.3 Par 1041b(3)
	Terrain	General	1000-1600	2000	N/A	1000	N/A		2600	8260.3 Par 1041b(3)
I	Terrain	General	1000	2000	N/A	1000	500		2500	8260.3 Par 1041b(3)
J	Terrain	236/19	1014	2000	-14	1000	N/A		2000	8260.3 Par 1041b(3)
K	Terrain	234/29	2000	2000	N/A	1000	500		3500	8260.3 Par 1041b(3)
L	Terrain	189/32	2630	2000	-30	1000	500		4100	8260.3 Par 1041b(3)
M	Terrain	253/40	5344	2000	-44	1000	500		6800	8260.3 Par 1041b(3)
N	Terrain	257/28	3678	2000	+22	1000	500		5200	8260.3 Par 1041b(3)
O	Terrain	265/22.5	2956	2000	+44	1000	N/A		4000	8260.3 Par 1041b(3)
P	Terrain	273/17	2246	2000	-46	1000	N/A		3200	8260.3 Par 1041b(3)
Q	Terrain	282/14	1644	2000	-44	1000	N/A		2600	8260.3 Par 1041b(3)
R	Antenna	301/24	3002	2000	-2	1000	500		4500	8260.3 Par 1041b(3)
	Antenna	301/34.5	4095	2000	+5	1000	500		5600	8260.3 Par 1041b(3)



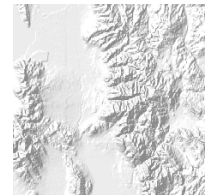
Applicable Documents

- FAA Order 8260.19, Flight Procedures and Airspace (Section 7: Radar Vectoring Altitude Charts) , [MVA Purpose, Chart Review and Approval](#)
- FAA Order 7210.3, Facility Operations and Administration (Section 9: Other Displays), [MVA Preparation, Background info on Buffers, Submission of form 7210-9](#)
- FAA Order 7210.27B, Enroute Minimum IFR Altitude (MIA) Sector Charts
- FAA Form 7210-9, Minimum IFR Altitude/Minimum Vectoring Altitude Obstruction Documentation, [Form sent to AVN-100](#)
- FAR Part 95 Subpart B, [Designated Mountainous Areas](#)



Current Data

- NACO maintains a database of all obstacles over 200 ft.
- AVN-41 maintains a database of VFR spot elevations for IAPA.
- NACO does terrain modeling for MSAW (GTMs, DTMs), OROCA, ASMD.
- VFR Sectional Chart (GeoTiff Images) (Available February 2003)
- NACO maintains all RVMs as MicroStation Design Files.



Requirements

(Subject to further study)

- Obstruction Repository
- COTS ARCGIS ArcView
- ARCSDE (Spatial Data Engine)
- Oracle (ESRI Geodatabase Model)
- ARC Spatial Analyst, ARC 3D Analyst
- Scaleable System

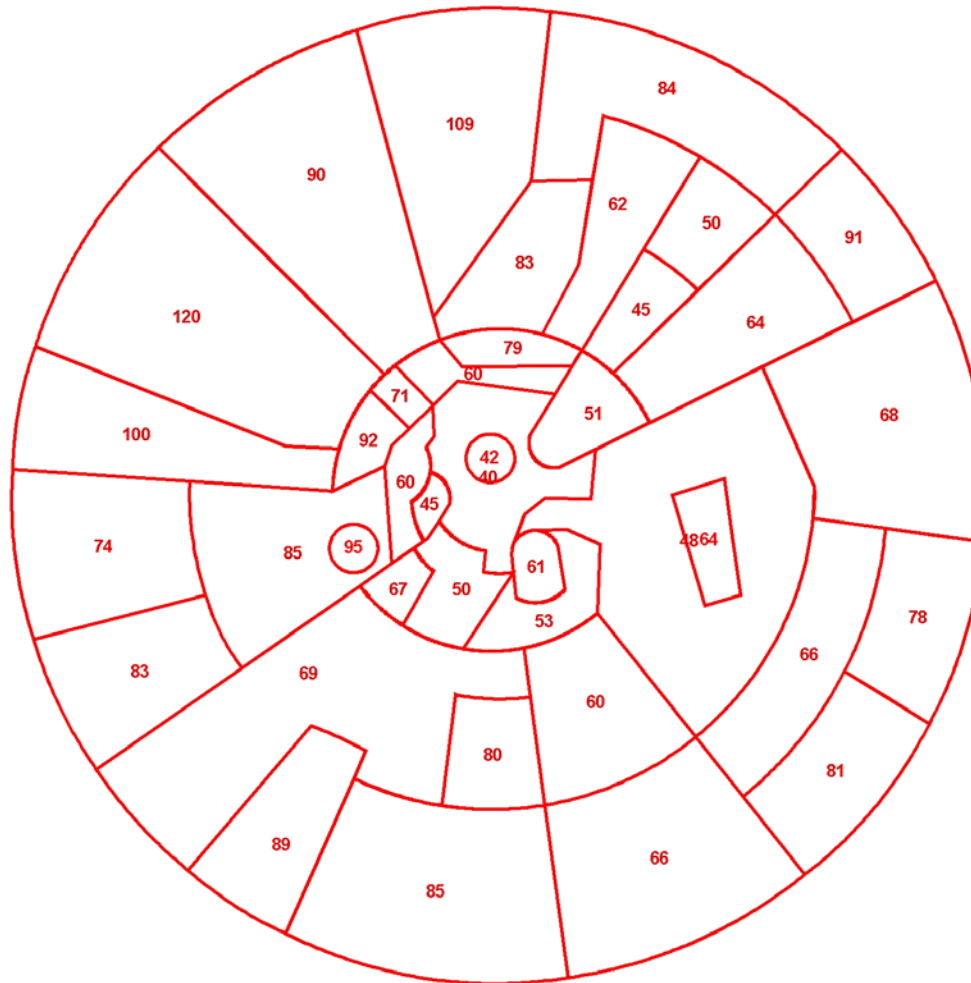
Obstruction Repository

- AVN is developing a FAA Obstruction Repository that will support all obstacle and terrain NAS requirements.
- Source data will include data from DOT/FAA(AVN,ATA), DOC/NOAA/NGS, DoD/NIMA, FCC, NASA and USGS.
- Goal is to retrieve the selected area from the obstruction repository.

Assumptions

- Analysis and Certification of Business Rules
- Includes Buffers
 - 3NM within 40 NMs of Radar Antenna
 - 5NM outside of 40 NMs of Radar Antenna
- Add Required Obstacle Clearance (ROC), 1000 feet in non-mountainous or 2000 feet in designated mountainous areas.
- ATC can modify the resulting value with justification (Reduction)
- Assumed Adverse Obstruction (AAO), 200 ft
- Test and Evaluation by AVN

Las Vegas MVA



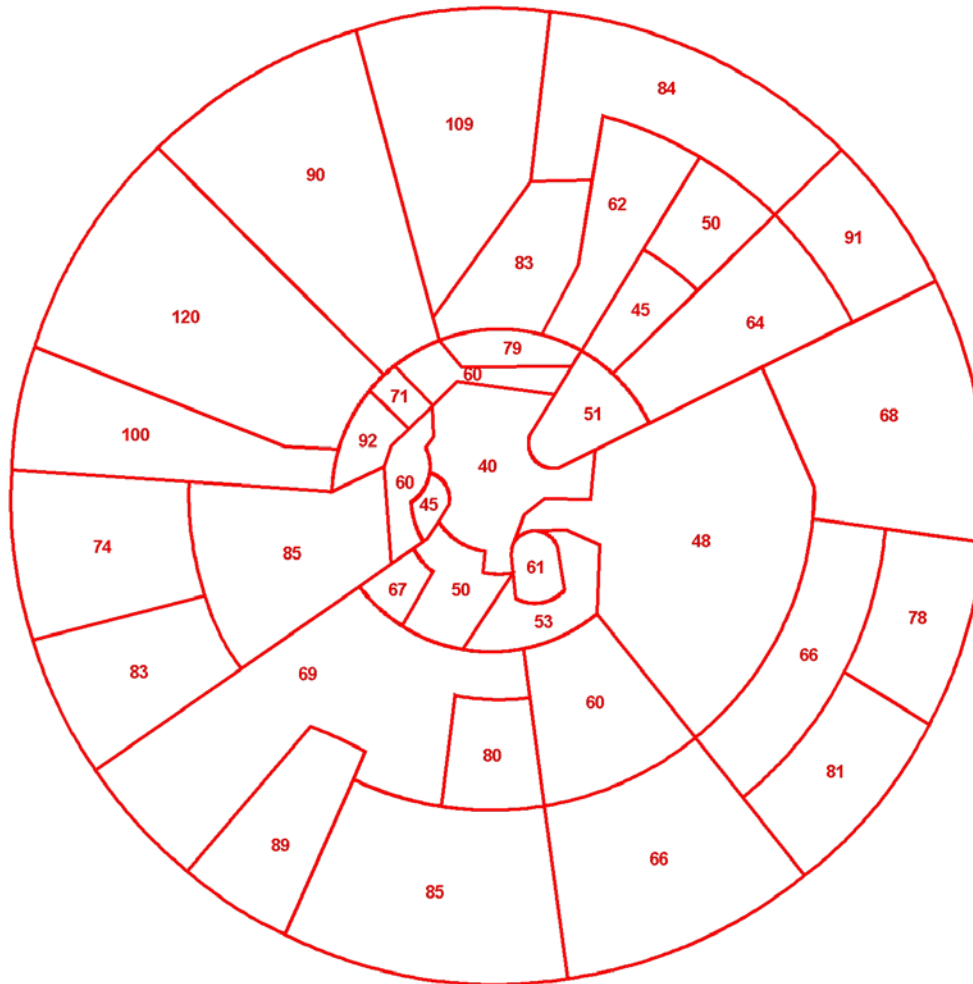
Isolated Prominent Obstructions

Las Vegas MVA



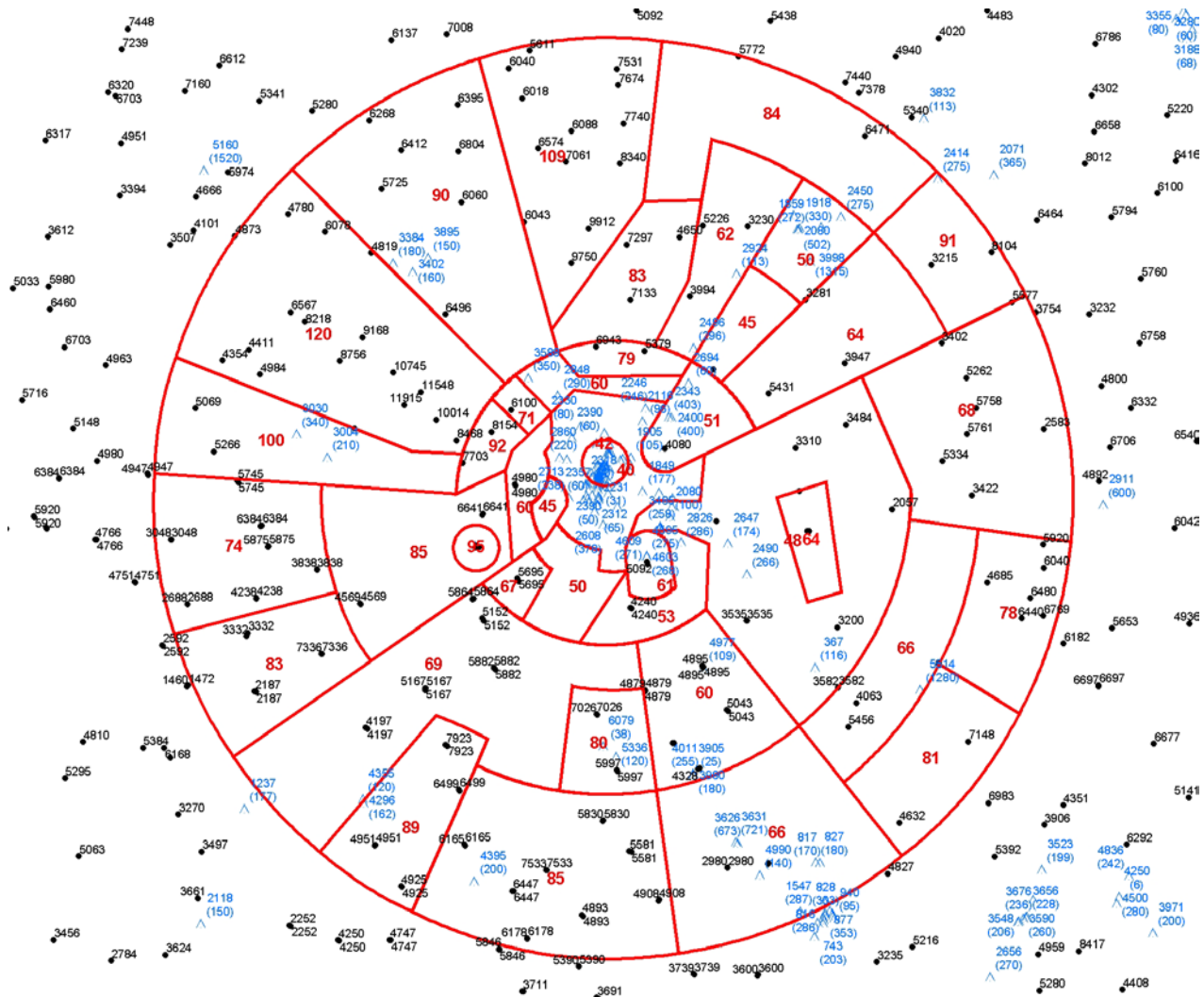
Sector Boundaries

Las Vegas MVA



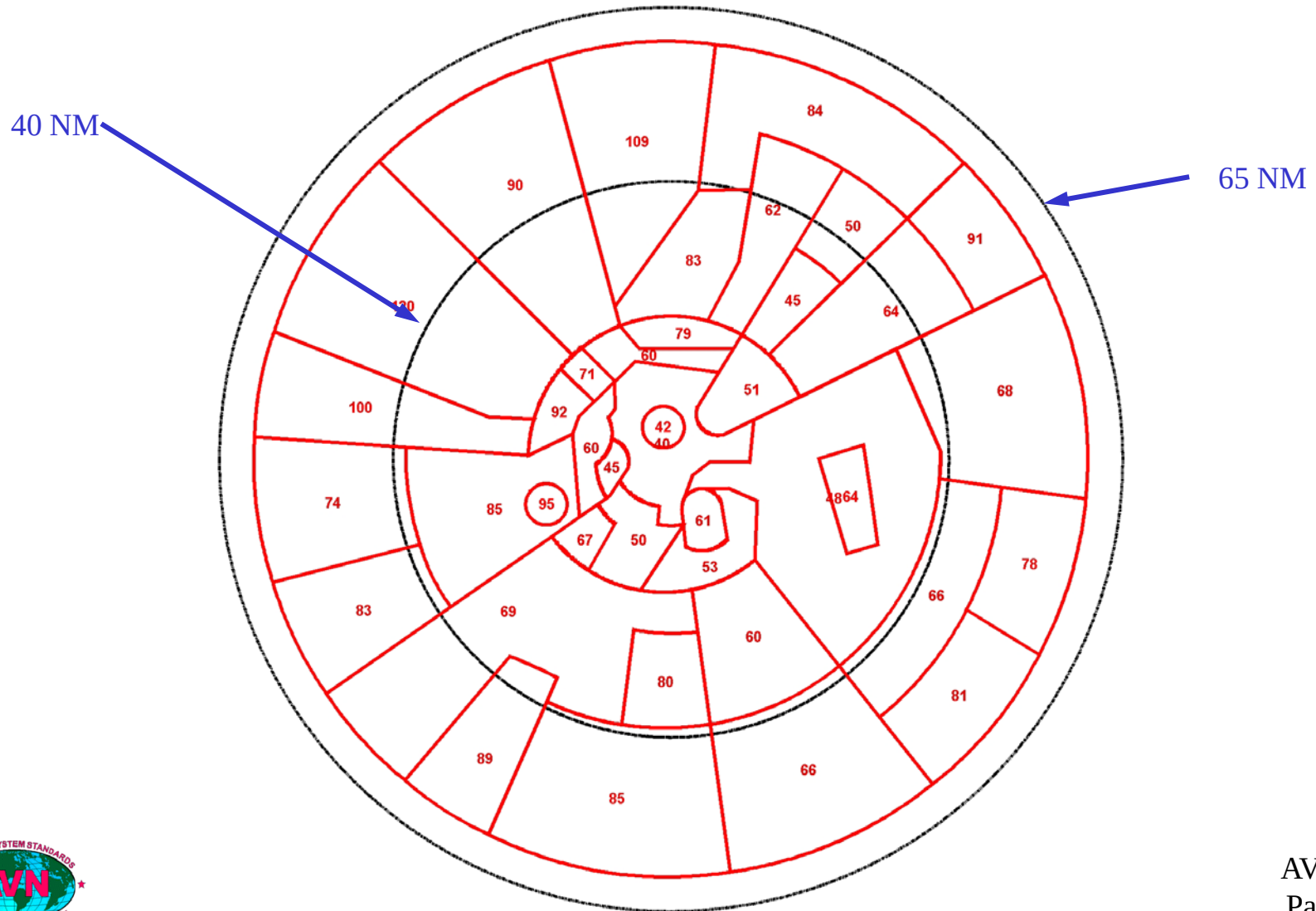
Obstructions

Obstacles/Spot Elevations



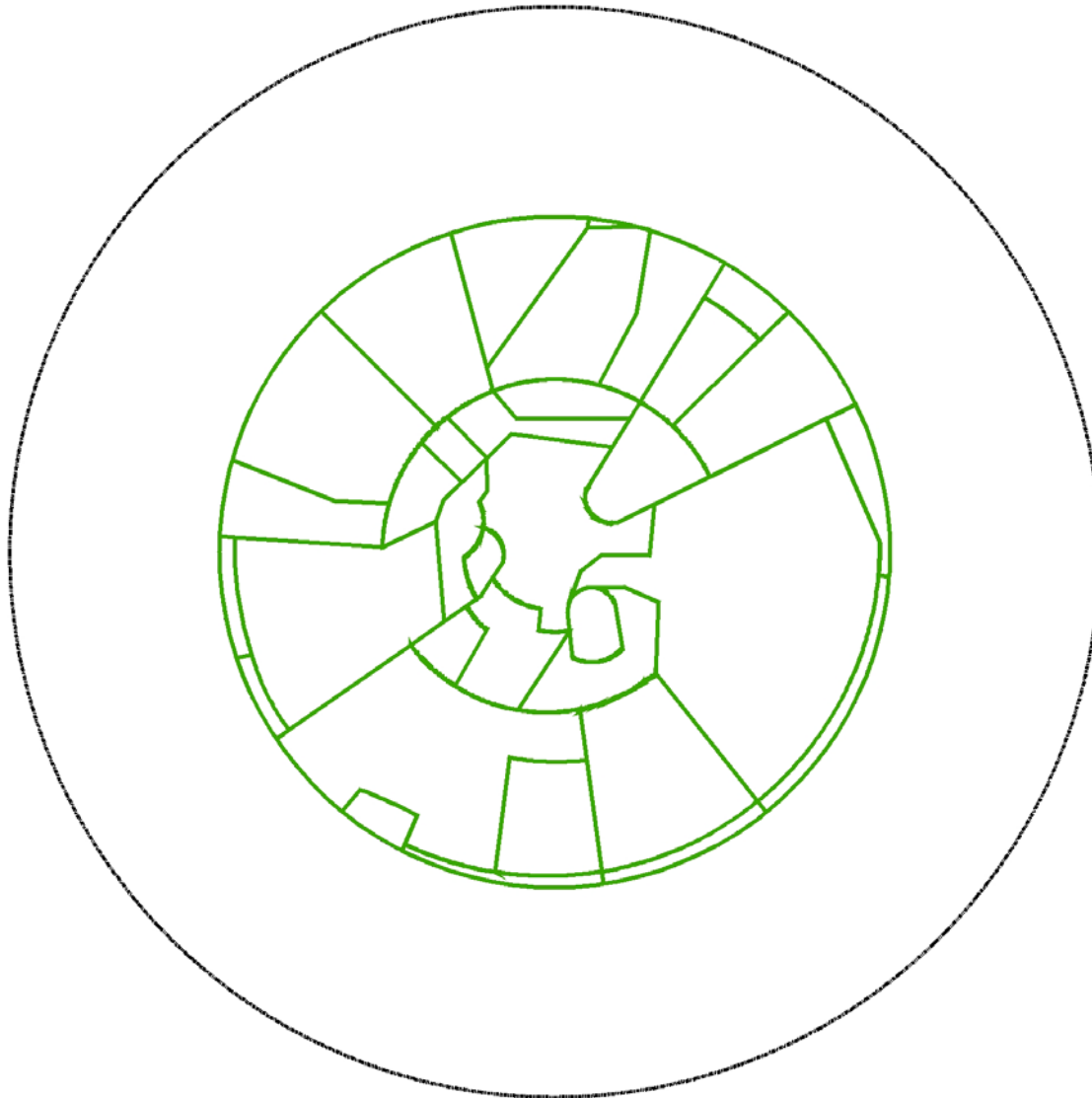
Antenna Range

40 NM/65 NM



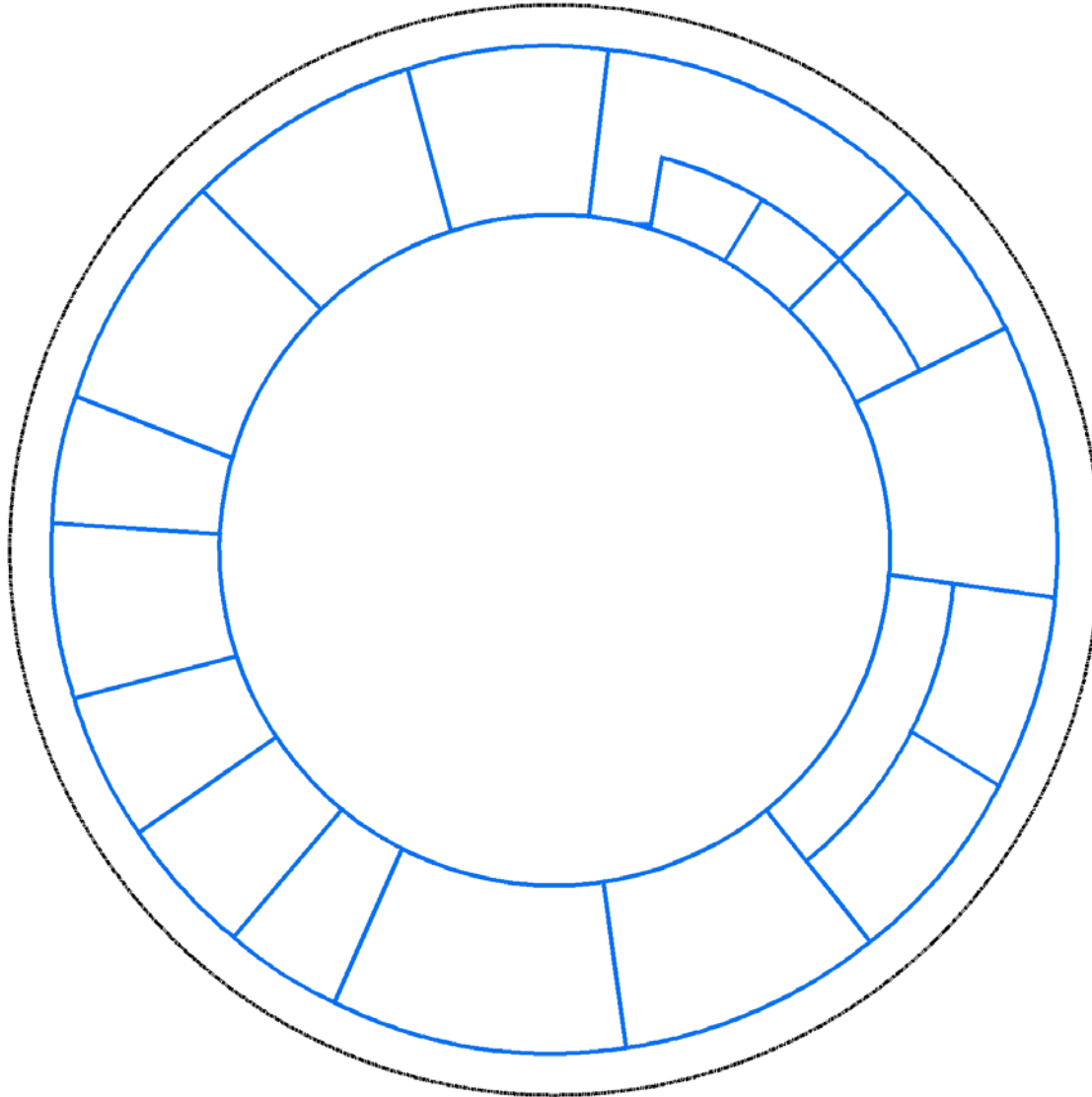
Clip Sectors

Within 40 Nautical Miles



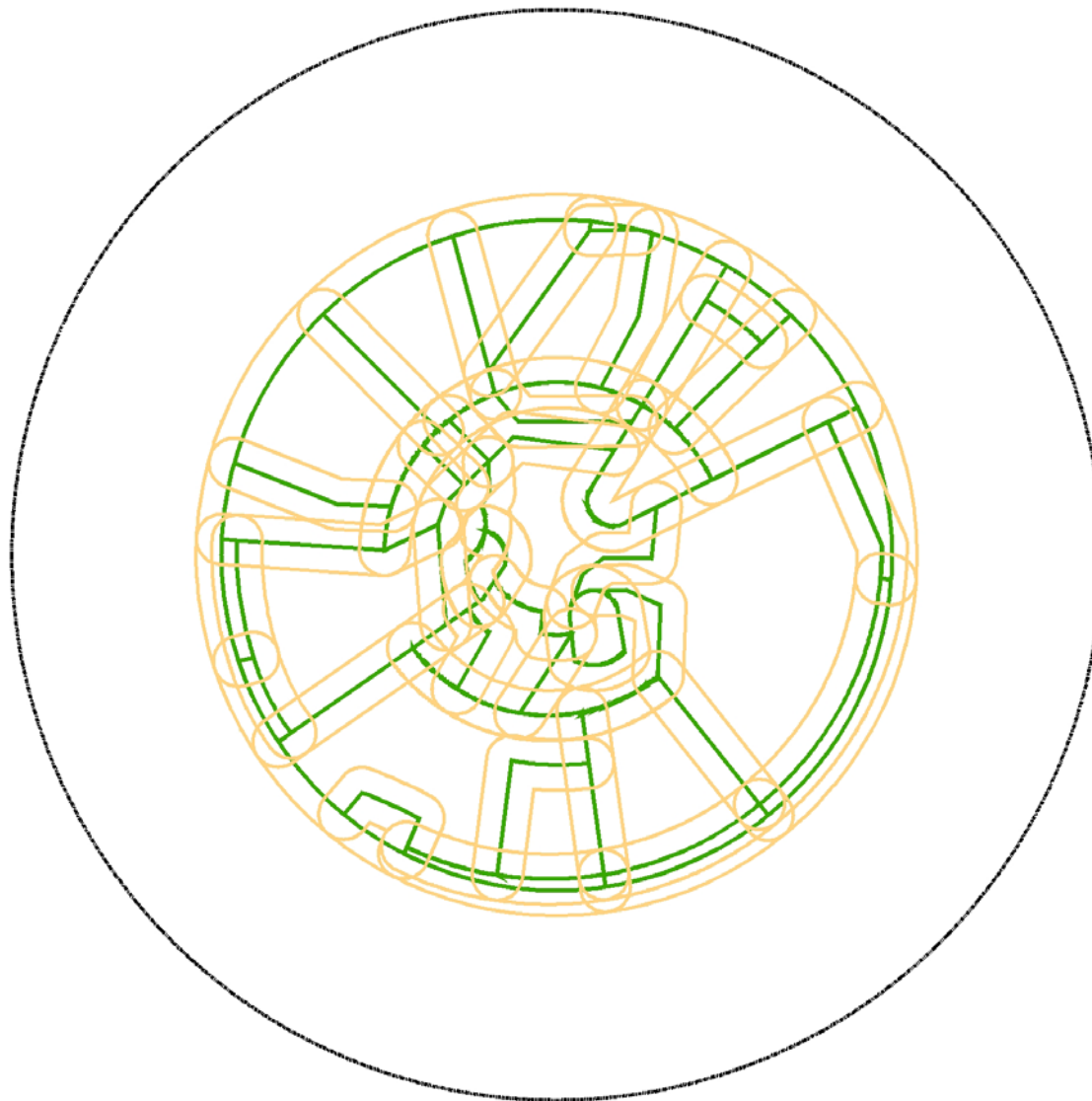
Clip Sectors

Outside of 40 Nautical Miles

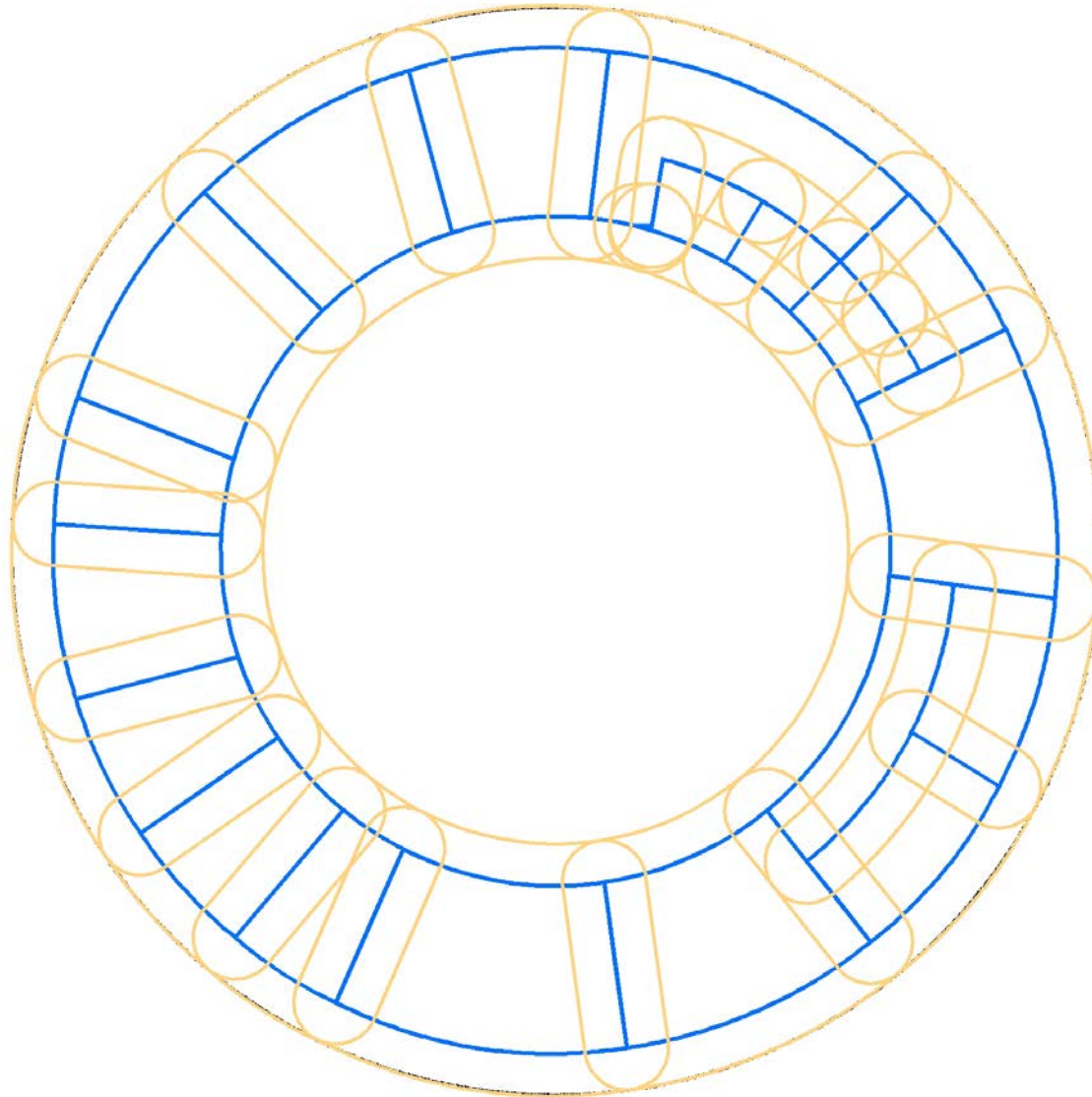


3NM Buffer

Within 40 NM

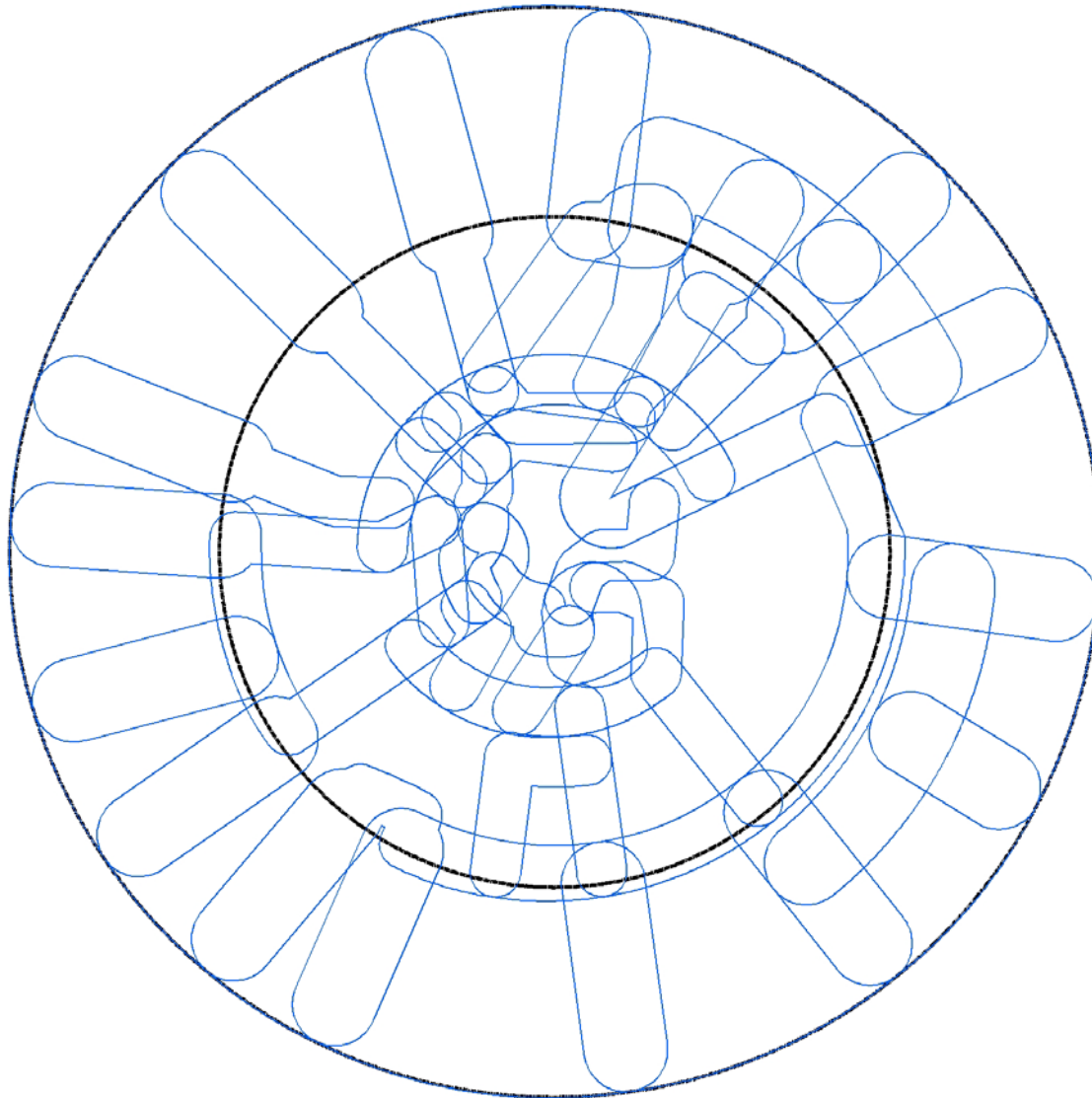


5 NM Buffer Outside of 40 NM

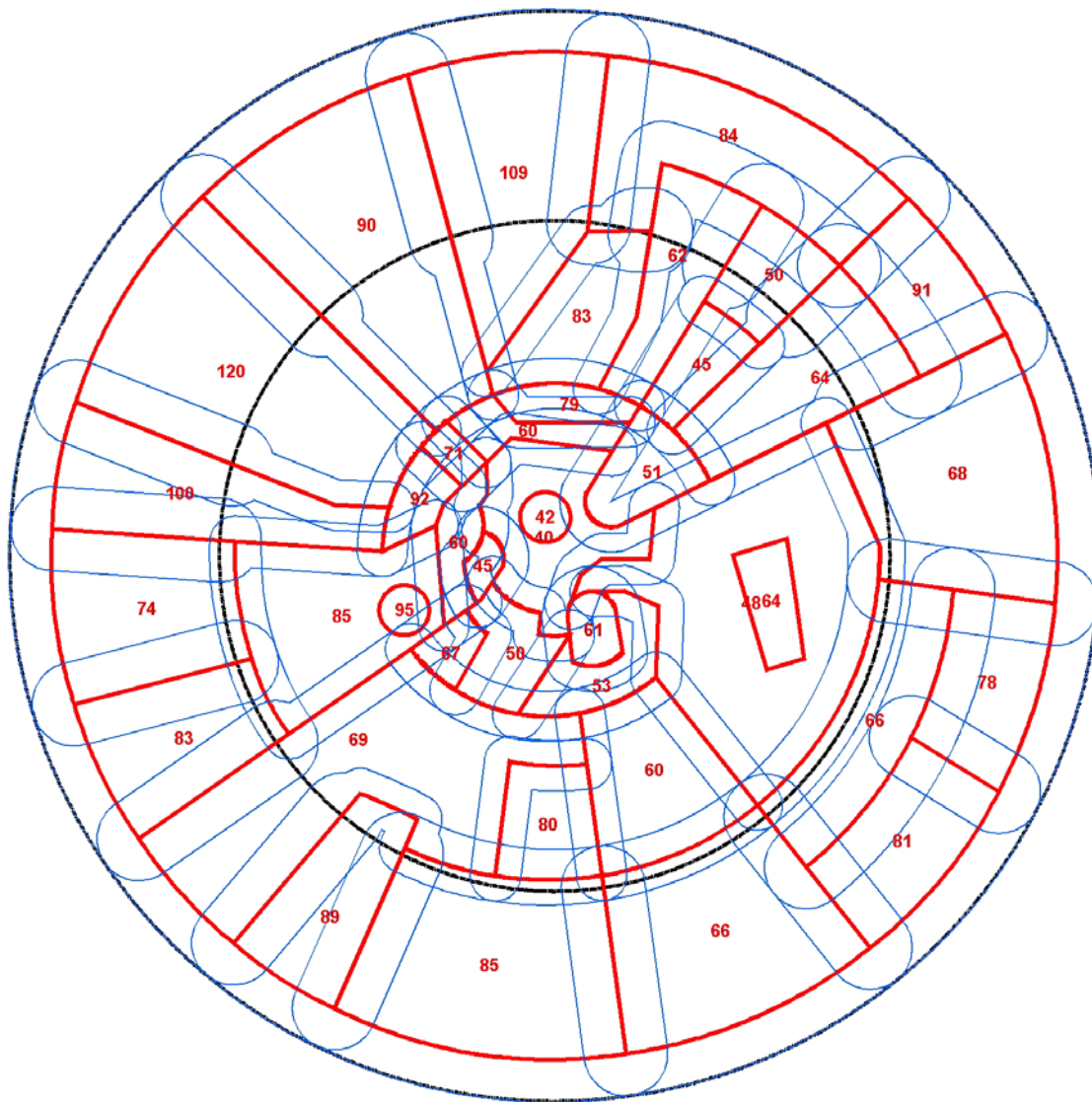


Dissolve Feature

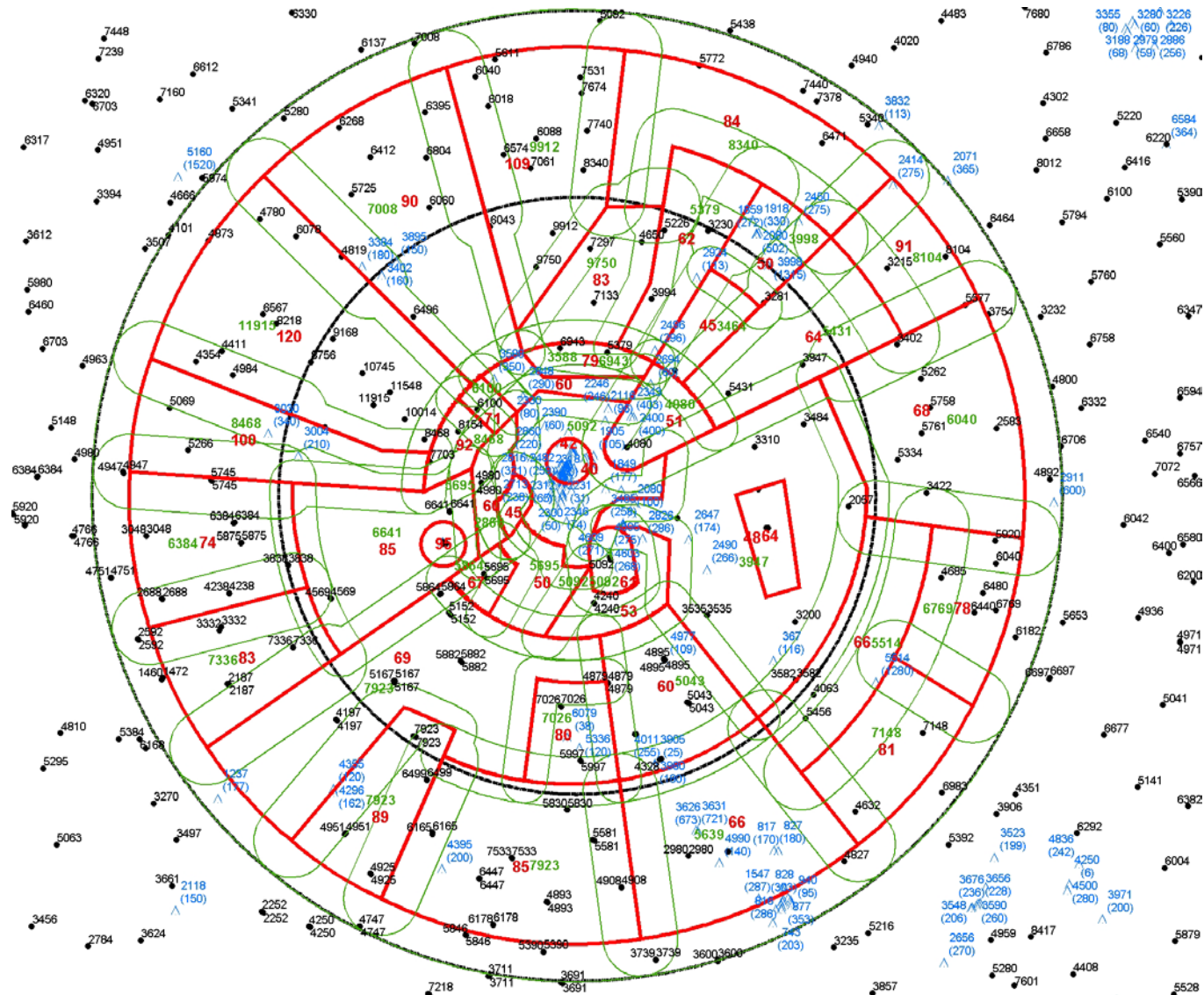
Merge Sectors



Sector Buffers



Calculate Values Highest Obstruction

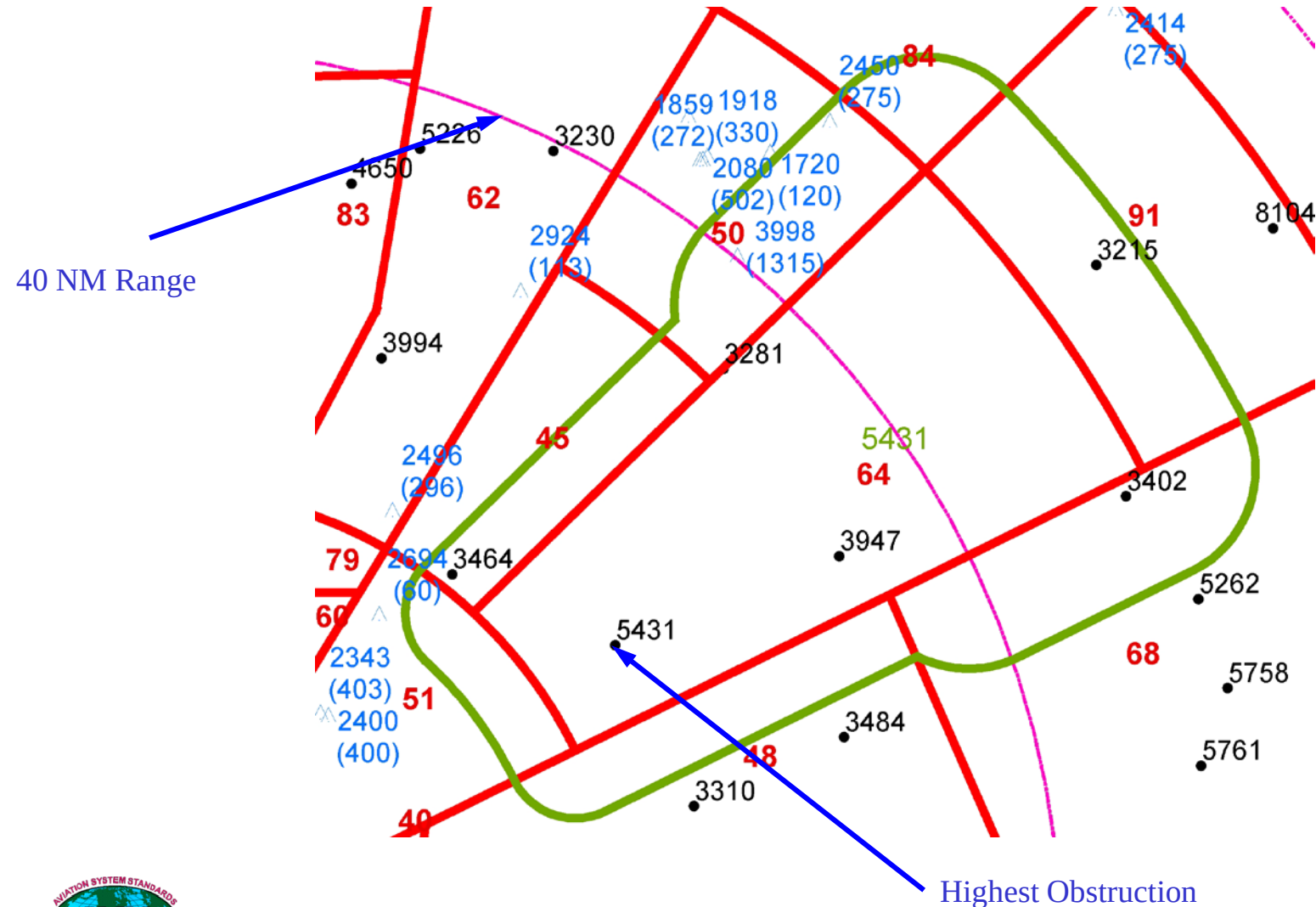


Calculated Values Table

Attributes of Max_Obstruction_within_Sectors							
FID	Shape	FID_1	Descriptio	Cnt_Descri	Max_Max_RV	Count	Max_msl
0	Polygon	0	Sector 1	1	60	7	3588
1	Polygon	1	Sector 10	2	83	8	9750
2	Polygon	2	Sector 11	1	53	16	5092
3	Polygon	3	Sector 12	2	100	14	8468
4	Polygon	4	Sector 13	2	120	26	11915
5	Polygon	5	Sector 14	2	90	20	7008
6	Polygon	6	Sector 15	2	109	16	9912
7	Polygon	7	Sector 16	2	62	12	5379
8	Polygon	8	Sector 17	1	45	5	3464
9	Polygon	9	Sector 18	2	50	10	3998
10	Polygon	10	Sector 19	2	84	14	8340
11	Polygon	11	Sector 2	1	71	3	6100
12	Polygon	12	Sector 20	2	64	8	5431
13	Polygon	13	Sector 21	1	91	7	8104
14	Polygon	14	Sector 22	2	68	15	6040
15	Polygon	15	Sector 23	2	74	24	6384
16	Polygon	16	Sector 24	1	85	12	6641
17	Polygon	17	Sector 25	2	83	18	7336
18	Polygon	18	Sector 26	2	69	24	7923
19	Polygon	19	Sector 27	1	40	48	5092
20	Polygon	20	Sector 28	1	80	10	7026
21	Polygon	21	Sector 29	2	89	14	7923
22	Polygon	22	Sector 3	1	51	12	4080
23	Polygon	23	Sector 30	2	85	33	7923
24	Polygon	24	Sector 31	1	60	16	5043
25	Polygon	25	Sector 32	2	66	38	5639
26	Polygon	26	Sector 33	1	61	15	5092
27	Polygon	27	Sector 34	1	48	27	3947
28	Polygon	28	Sector 35	2	66	10	5514
29	Polygon	29	Sector 36	1	78	11	6769
30	Polygon	30	Sector 37	1	81	8	7148
31	Polygon	31	Sector 4	1	92	6	8468
32	Polygon	32	Sector 5	1	60	8	5695
33	Polygon	33	Sector 6	1	79	4	6943

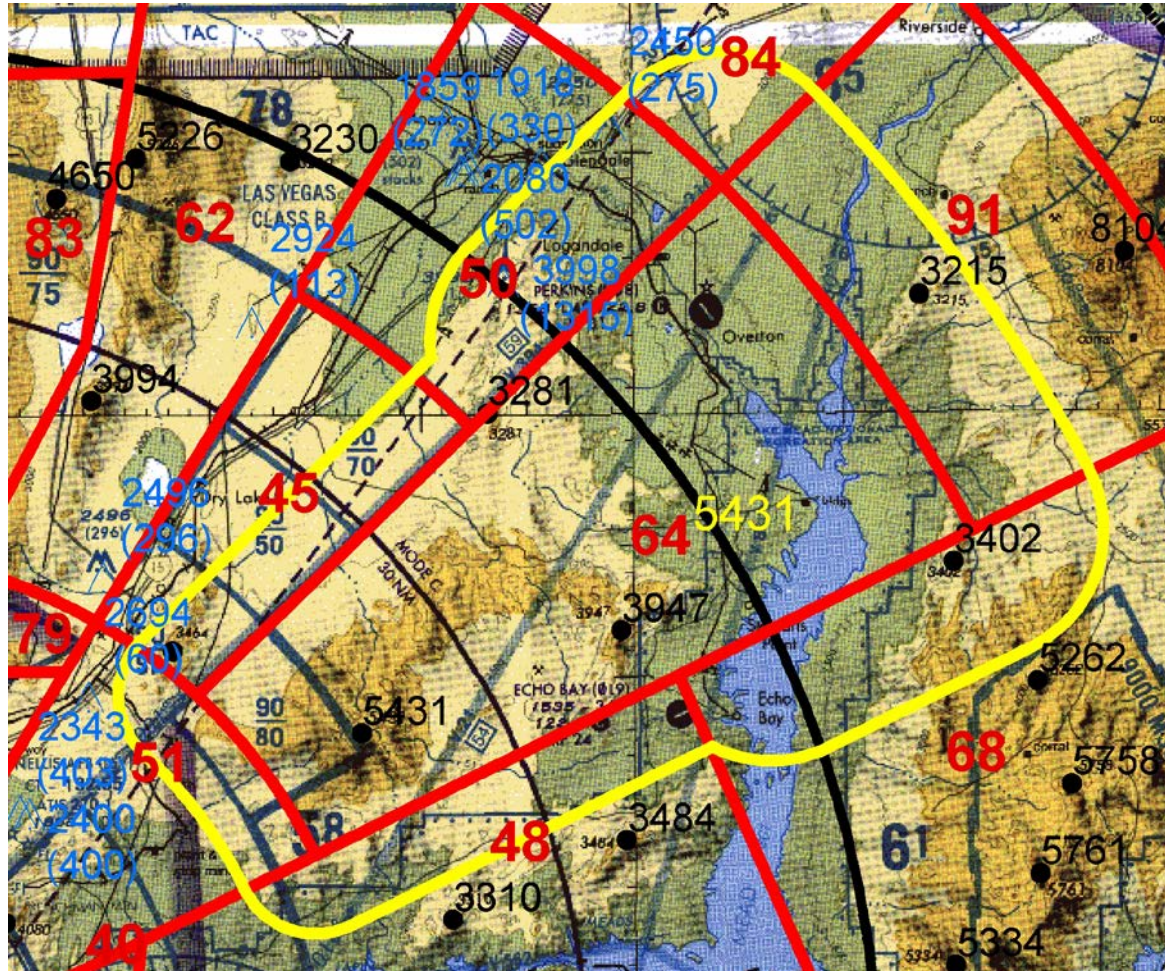
Record: 0 Show: All Selected Records (0 out of 37 Selected.) Options

Specific Sector Buffer



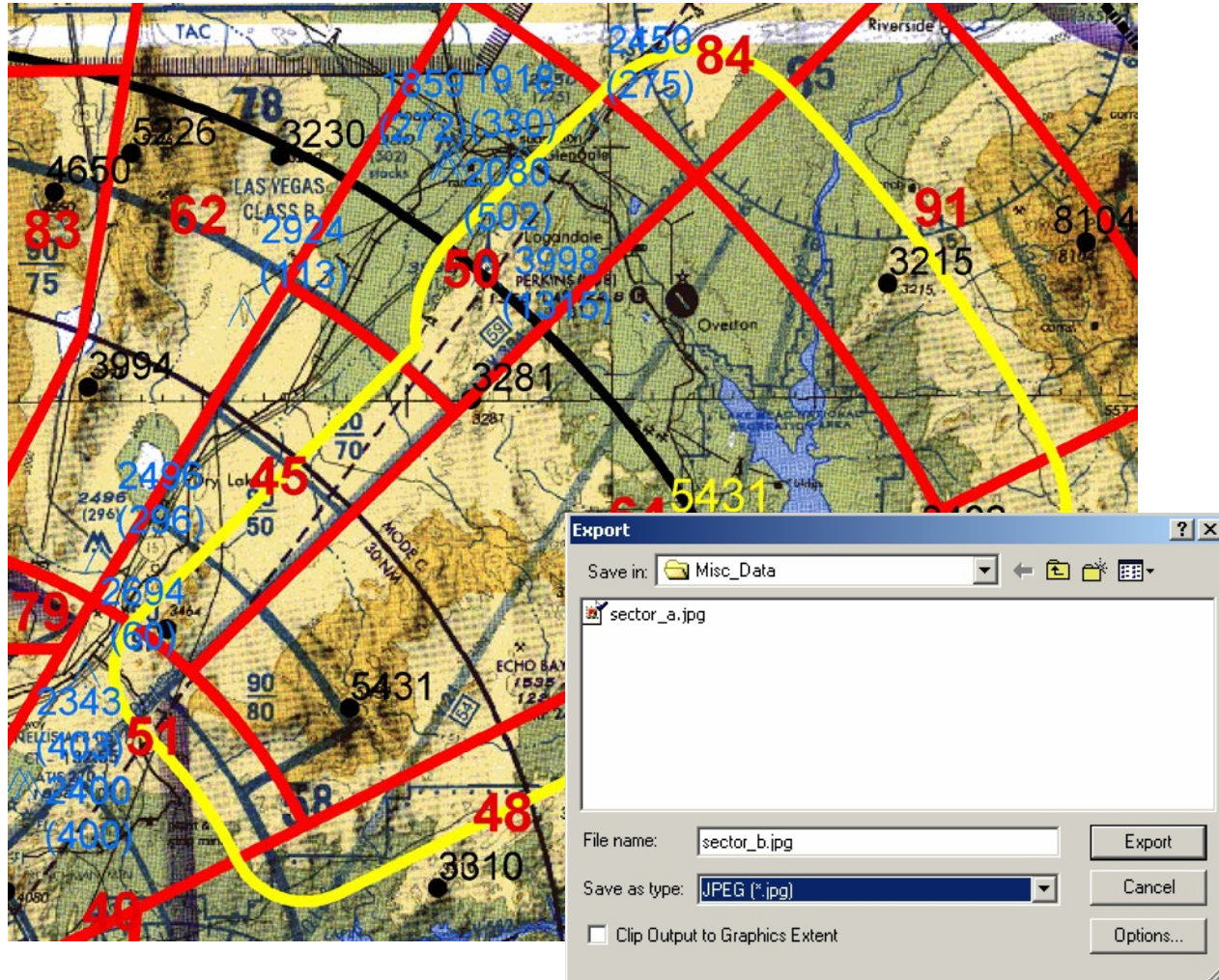
Note: Values do not include ROC buffer and rounding.

Highest Obstruction Raster VFR Sectional GeoTiff

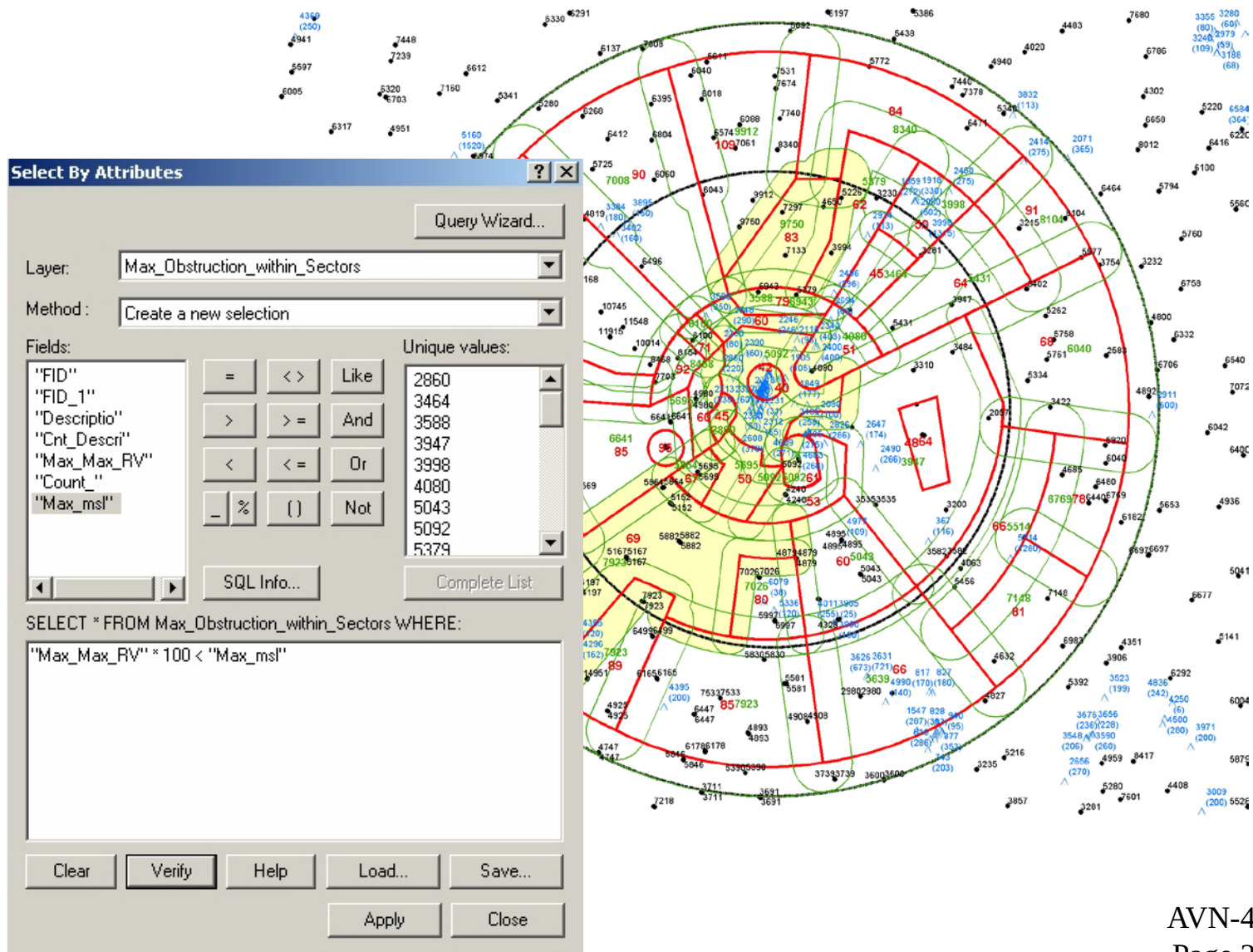


Export Formats

JPEG, BMP, PDF, Etc..



Analysis



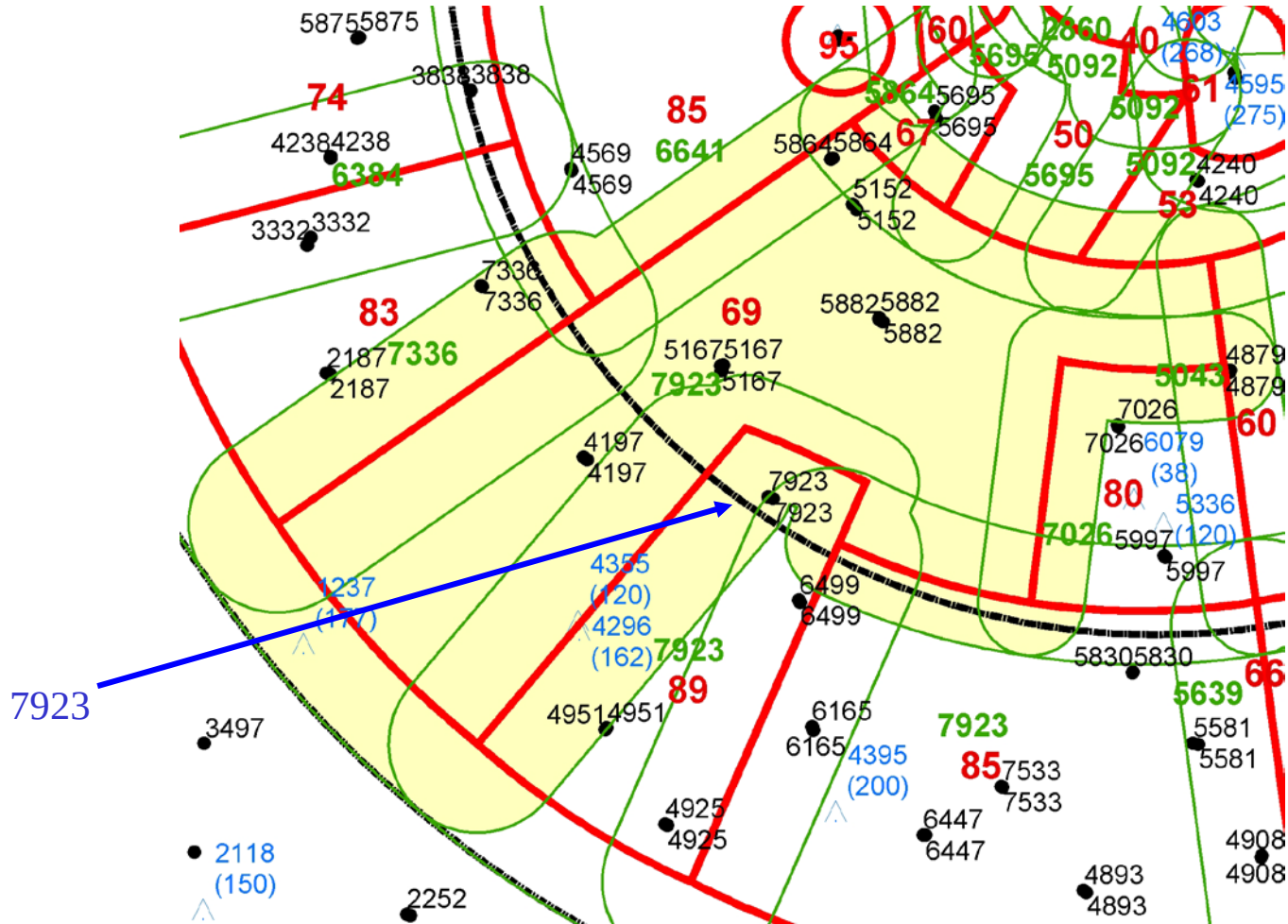
Calculated Values Table

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FID	Shape	FID_1	Descriptio	Cnt_Descri	Max_Max_RV	Count_	Max_msl
0	Polygon	0	Sector 1	1	60	7	3588
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3	Polygon	3	Sector 12	2	100	14	8468
4	Polygon	4	Sector 13	2	120	26	11915
5	Polygon	5	Sector 14	2	90	20	7008
6	Polygon	6	Sector 15	2	109	16	9912
7	Polygon	7	Sector 16	2	62	12	5379
8	Polygon	8	Sector 17	1	45	5	3464
9	Polygon	9	Sector 18	2	50	10	3998
10	Polygon	10	Sector 19	2	84	14	8340
11	Polygon	11	Sector 2	1	71	3	6100
12	Polygon	12	Sector 20	2	64	8	5431
13	Polygon	13	Sector 21	1	91	7	8104
14	Polygon	14	Sector 22	2	68	15	6040
15	Polygon	15	Sector 23	2	74	24	6384
16	Polygon	16	Sector 24	1	85	12	6641
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19	Polygon	19	Sector 27	1	40	48	5092
20	Polygon	20	Sector 28	1	80	10	7026
21	Polygon	21	Sector 29	2	89	14	7923
22	Polygon	22	Sector 3	1	51	12	4080
23	Polygon	23	Sector 30	2	85	33	7923
24	Polygon	24	Sector 31	1	60	16	5043
25	Polygon	25	Sector 32	2	66	38	5639
26	Polygon	26	Sector 33	1	61	15	5092
27	Polygon	27	Sector 34	1	40	27	2047

Value
Higher
than Sector
on RVM

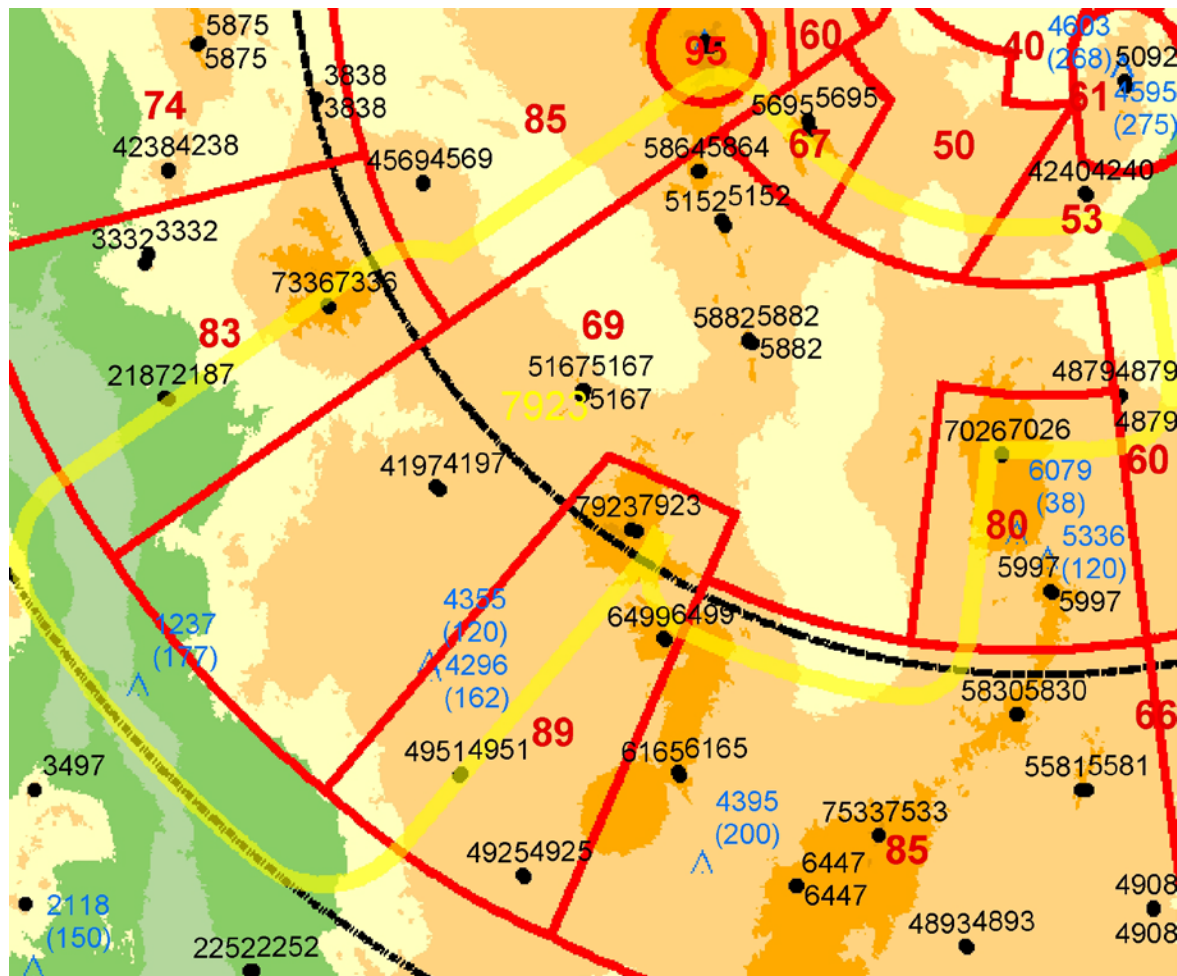
Analysis

Sector Value 6900, Terrain 7923



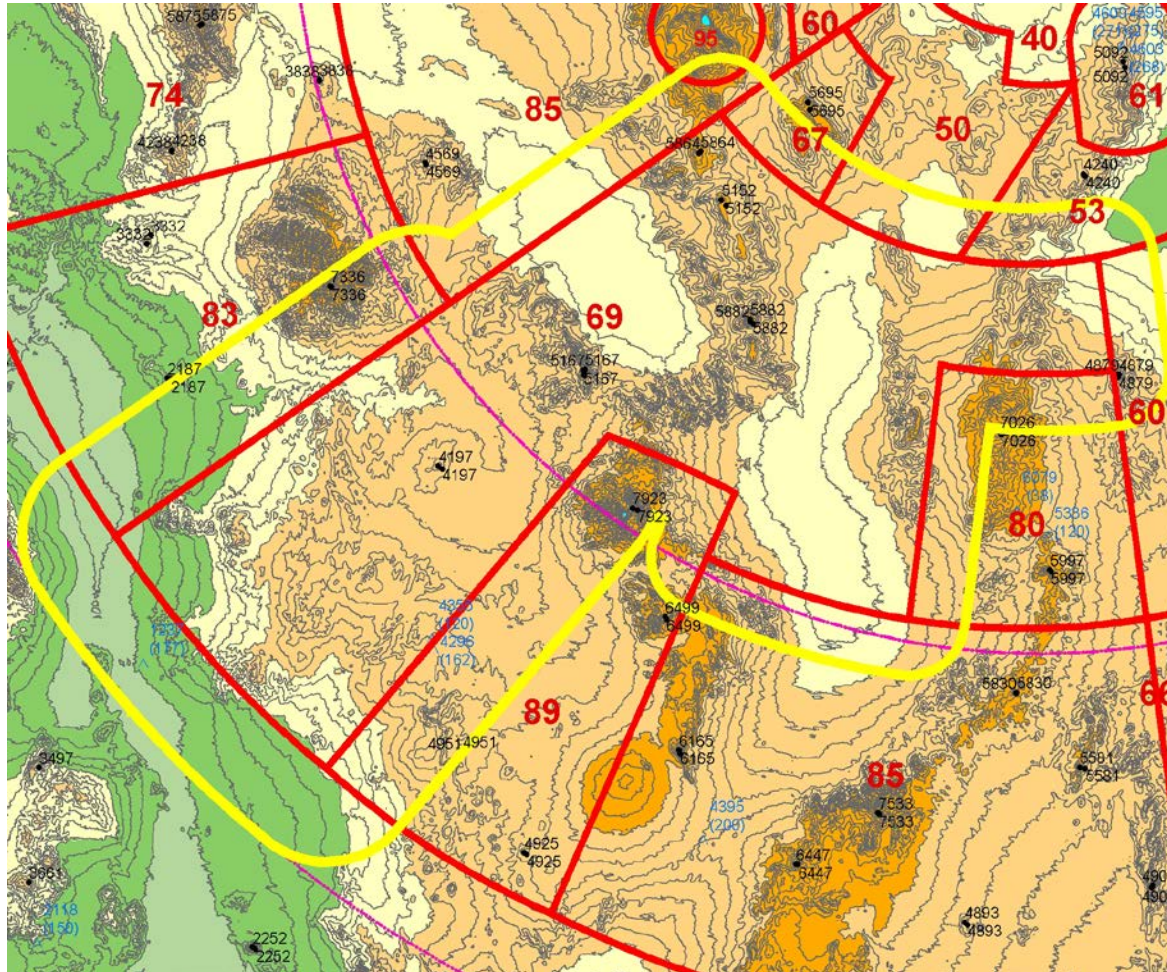
Analysis

With Terrain Data Display



Analysis

Digital Contours



Terrain Data Problem

- AVN-41 has not found an adequate mechanism to determine the highest terrain value without effecting the accuracy of the data source.
- Continuing to evaluate technology and techniques using ARCGIS products.

Possible Solutions

- Generate digital contours:
 - Terrain values in between contour lines.
 - Digital contours do not match exactly what is portrayed on the VFR Sectional.
- Convert terrain data into point features:
 - Processing Time.
- Manipulate data as raster cells:
 - AVN-41 has met with ESRI on a possible work flow.
 - Evaluating as an option.

Questions

Contact Information

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