

Uso de Software Libre y de bajo costo para bases de datos y cartas aeronáuticas



Corporación Centroamericana de Servicios de Navegación Aérea

Es un compromiso del Estado cumplir con los SARPS OACI, algunos de ellos son:

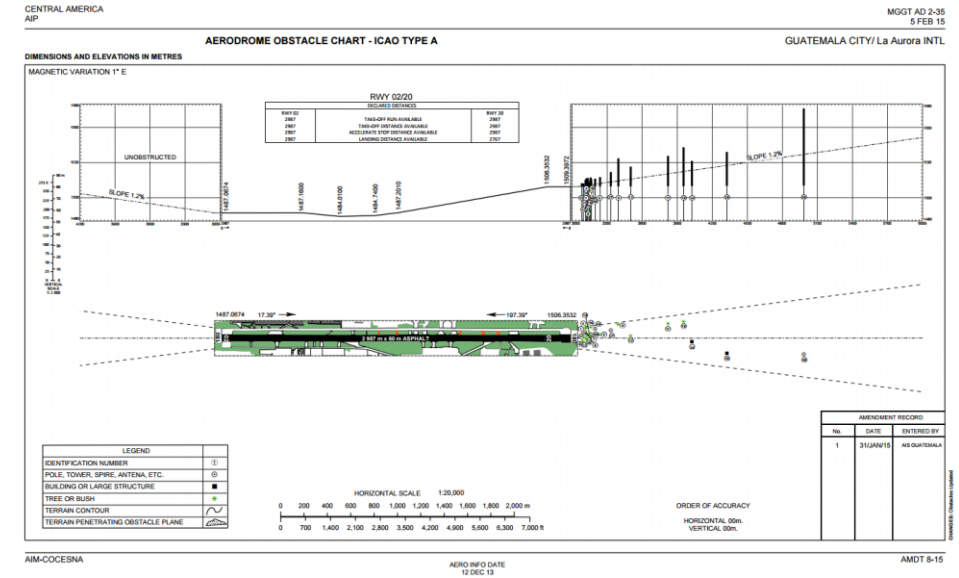
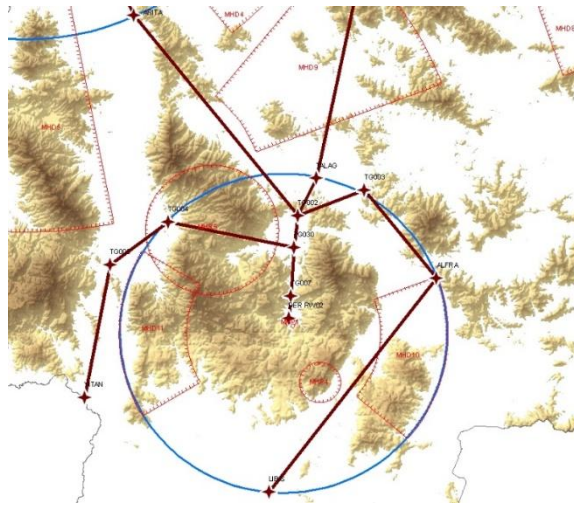
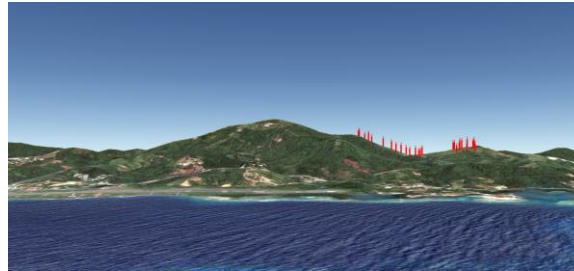
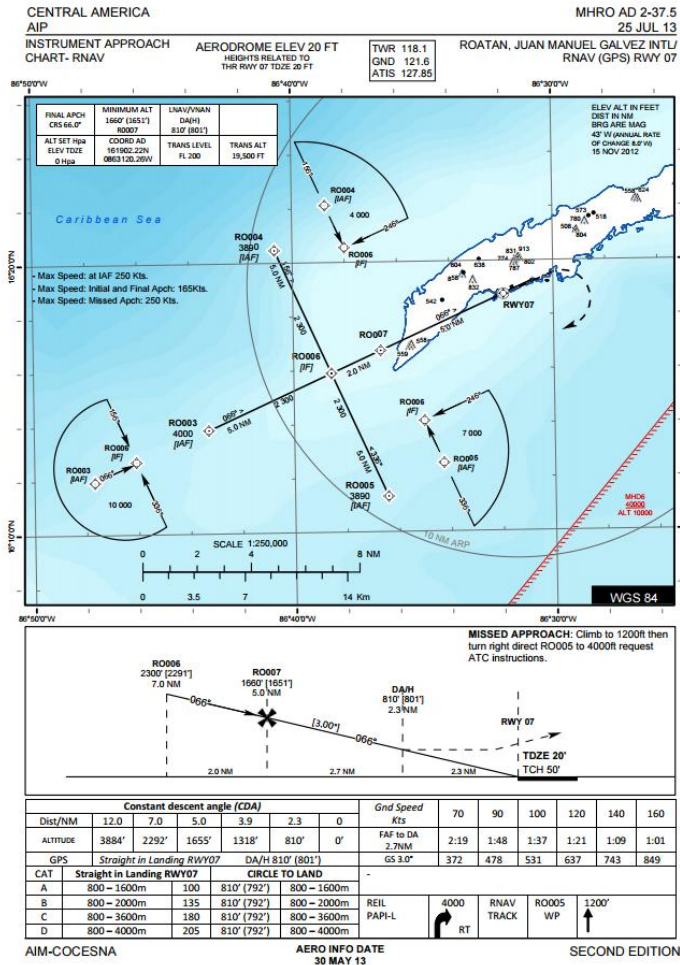
- Cartas Aeronáuticas (ANEXO 4)
- Aeródromos (ANEXO 14)
- Servicios de Información Aeronáutica (ANEXO 15)

La industria así como la OACI también cada vez esta solicitando nuevos requisitos:

- Bases de datos aeronáuticas (GIS)
- Datos electrónicos de obstáculos y de terrenos (eTOD)
- Airport Mapping Databases (AMDB)
- Cartas aeronáuticas electrónicas
- Archivos digitales de datos aeronáuticos (Feature Datasets)

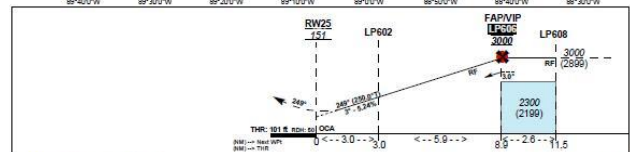
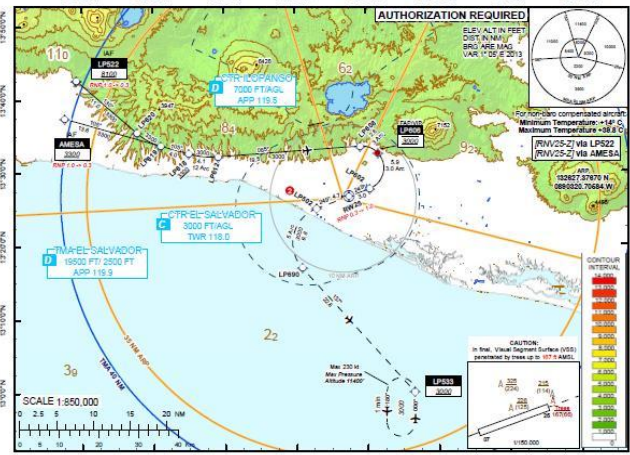
Introducción

En pocas palabras los Estados tienen que tener y ser capaces de producir



Introducción

CENTRAL AMERICA
AIP
MSL AD 2-39.33
18 SEP 14
EL SALVADOR / EL SALVADOR INTL
RNAV (RNP) Z RWY 25

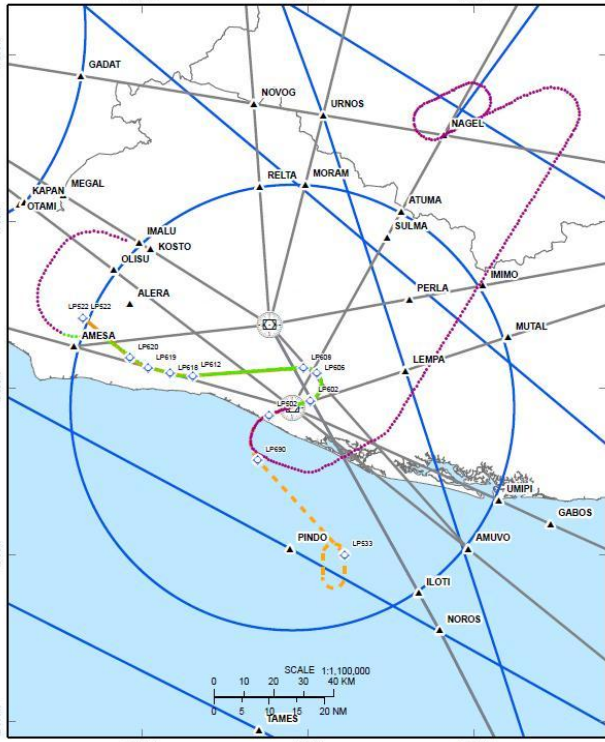


M.A. Climb Gradient: 2.5% 152 FT/NM			
RNP AR FINAL 0.3			
CAT	MA RNP 1.0		MA RNP 0.3
	OCA (H)	DA (H)	OCA (H)
A	374 (273)	389 (279)	348 (247)
B	385 (284)	400 (291)	357 (256)
C	414 (313)	430 (319)	385 (284)
D	433 (332)	449 (339)	378 (275)

AIM-COCESNA AERO INFO DATE 18 SEP 14 AIRAC SUP A18/14

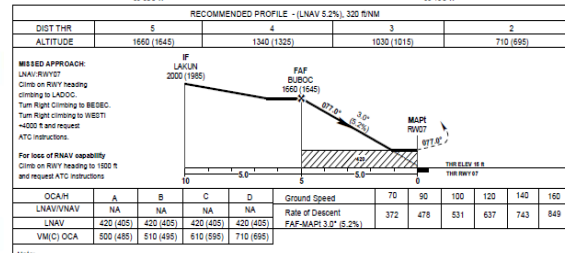
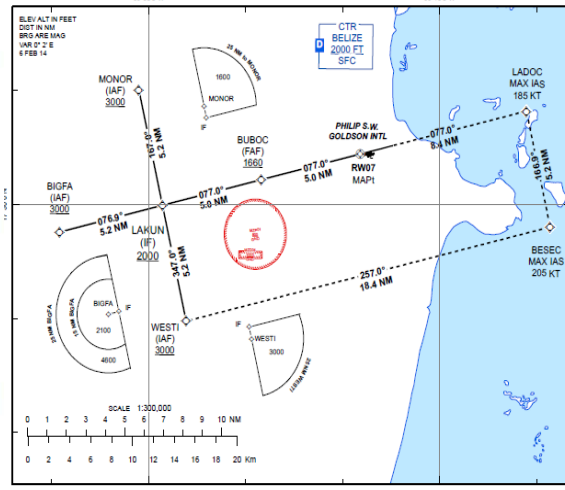


EL SALVADOR PBN APPROACHES RADAR PLOTS ANALYSIS
RNAV(RNP) Z RWY 25 via LP522 missed approach vector to NAGEL PBN SPECIFICATION RNP 0.3
08 AUG 14



AIM-COCESNA GIS ANALYSIS

INSTRUMENT APPROACH CHART
THR ELEV 15 ft HEIGHTS RELATED TO THR ELEVATION TRANSITION ALTITUDE 19 000 ft
APP 121.0 TWR 118.0 GND 121.9 ATIS 132.75
Belize City PHILIP S. W. GOLDSON INTL R/NAV (RNP) RWY 07



RECOMMENDED PROFILE - (LNAV 5.2%, 320 F/NM)		5	4	3	2
DIST THR		1860 (1545)	1340 (1125)	1030 (1015)	710 (695)
ALTITUDE		1860 (1545)	1340 (1125)	1030 (1015)	710 (695)
MISSED APPROACH:	IF LAKUN 2000 (1985)				
CLIMB TO 1800 ft	FAP SUBOC 1650 (1545)				
CLIMB TO 1500 ft	MAP1 RWY 07				
CLIMB TO 1210 ft	THR ELEV 15 ft				

Note: 1. No Turn before MAPI. 2. Timing not authorized for defining the MAPI. 3. NM to/from THR RWY 07. 4. Visual Circling not allowed North of Runway

INSTRUMENT APPROACH CHART
THR ELEV 15 ft HEIGHTS RELATED TO THR ELEVATION TRANSITION ALTITUDE 19 000 ft
APP 121.0 TWR 118.0 GND 121.9 ATIS 132.75
Belize City PHILIP S. W. GOLDSON INTL R/NAV (RNP) RWY 07

Designator	Path Description	Waypoint Identifier	Latitude	Longitude	Flyover	Course (M/T)	Turn Direction	Altitude (ft)	Distance (NM)	Speed Limit (KIAS)	Magenta Variation	WP/WY TO/FR	Navigation Specification
RNAV (GNSS) RWY07	IF	MONOR	17.38021039N	088.3021219W	-	-	-	+3000	-	-	-	070° E	- RNP APCH
RNAV (GNSS) RWY07	TF	LAKUN	17.29578146N	088.2911388W	-	0.167 (0.167)	L	+2000	6.2	-	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	BUBOC	17.11063284N	088.2411280W	-	0.277 (0.277)	-	+1660	6.0	-	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	WEST	17.32128422N	088.19052488W	Y	0.277 (0.277)	-	-	6.0	-	070° E	-070° RNP APCH	
RNAV (GNSS) RWY07	TF	LADOC	17.34260398N	088.10311127W	-	0.277 (0.277)	R	+1800	6.4	186	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	BESEC	17.28027465N	088.09137171W	-	0.167 (0.167)	R	+2140	6.2	206	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	WEST	17.24528928N	088.20429679W	-	0.287 (0.287)	-	+4000	18.4	250	-	- RNP APCH	

Designator	Path Description	Waypoint Identifier	Latitude	Longitude	Flyover	Course (M/T)	Turn Direction	Altitude (ft)	Distance (NM)	Speed Limit (KIAS)	Magenta Variation	WP/WY TO/FR	Navigation Specification
RNAV (GNSS) RWY07	IF	BIGFA	17.28478974N	088.2652668W	-	-	-	+3000	-	-	-	070° E	- RNP APCH
RNAV (GNSS) RWY07	TF	LAKUN	17.29578146N	088.2911388W	-	0.277 (0.277)	-	+2000	6.2	-	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	BUBOC	17.11063284N	088.2411280W	-	0.277 (0.277)	-	+1660	6.0	-	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	WEST	17.32128422N	088.19052488W	Y	0.277 (0.277)	-	-	6.0	-	070° E	-070° RNP APCH	
RNAV (GNSS) RWY07	TF	LADOC	17.34260398N	088.10311127W	-	0.277 (0.277)	R	+1800	6.4	186	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	BESEC	17.28027465N	088.09137171W	-	0.167 (0.167)	R	+2140	6.2	206	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	WEST	17.24528928N	088.20429679W	-	0.287 (0.287)	-	+4000	18.4	250	-	- RNP APCH	

Designator	Path Description	Waypoint Identifier	Latitude	Longitude	Flyover	Course (M/T)	Turn Direction	Altitude (ft)	Distance (NM)	Speed Limit (KIAS)	Magenta Variation	WP/WY TO/FR	Navigation Specification
RNAV (GNSS) RWY07	IF	WEST	17.24528928N	088.20429679W	-	-	-	+3000	-	-	-	070° E	- RNP APCH
RNAV (GNSS) RWY07	TF	LAKUN	17.29578146N	088.2911388W	-	0.247 (0.247)	R	+2000	6.2	-	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	BUBOC	17.11063284N	088.2411280W	-	0.277 (0.277)	-	+1660	6.0	-	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	WEST	17.32128422N	088.19052488W	Y	0.277 (0.277)	-	-	6.0	-	070° E	-070° RNP APCH	
RNAV (GNSS) RWY07	TF	LADOC	17.34260398N	088.10311127W	-	0.277 (0.277)	R	+1800	6.4	186	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	BESEC	17.28027465N	088.09137171W	-	0.167 (0.167)	R	+2140	6.2	206	070° E	- RNP APCH	
RNAV (GNSS) RWY07	TF	WEST	17.24528928N	088.20429679W	-	0.287 (0.287)	-	+4000	18.4	250	-	- RNP APCH	



Sin embargo tenemos los siguientes problemas:

- Falta de personal
- Falta de personal capacitado
- Falta de datos aeronáuticos (levantamientos geodésicos, cálculos, etc)
- Falta de Software

Introducción

Cada uno de los problemas enumerados anteriormente se solucionan fácilmente

Solamente se ocupa



El dinero es siempre uno de los temas importantes

¿Que hacemos si tenemos dinero?

¿Contratamos mas personal?
(Seguramente ocupamos mas)

ó

¿Compramos software que necesitamos?



¿Que hacemos si No tenemos dinero?

Introducción



A veces uno de los costos mas grandes es el Software, esto es debido a los costos por licencia y/o usuario.

Los modelos de intercambio AIXM, WXXM, etc. necesariamente requerirán de software especializado, el cual tiene un costo (\$\$\$)

Mientras se adquieren estos software especializados la pregunta es

¿Que podemos hacer?

Aun con la compra de software especializado seguramente se necesitara software capaz de cambiar de un formato a otro los datos

Software Libre y de bajo costo



¿Qué es el Software Libre?

Software Libre se refiere a la libertad de los usuarios para ejecutar, copiar, distribuir, estudiar, cambiar y mejorar el software. De modo más preciso, se refiere a cuatro libertades de los usuarios del software:

- **La libertad de usar el programa, con cualquier propósito** (libertad 0).
- La libertad de estudiar cómo funciona el programa, y adaptarlo a tus necesidades (libertad 1). El acceso al código fuente es una condición previa para esto.
- **La libertad de distribuir copias, con lo que puedes ayudar a tu vecino** (libertad 2).
- La libertad de mejorar el programa y hacer públicas las mejoras a los demás, de modo que toda la comunidad se beneficie. (libertad 3). El acceso al código fuente es un requisito previo para esto.

(<http://hispalinux.es/>)

¿Qué es el Software de bajo costo?

Software de bajo costo, es simplemente software cuyo costo de adquisición y mantenimiento anual es accesible y no representa una alta inversión.

www.qgis.org

Un Sistema de Información Geográfica libre y de Código Abierto



QGIS es capaz de leer/crear una gran cantidad de formatos:

- ESRI Shapefile
 - DXF
- Mapinfo File
 - CSV
 - Postgis
 - MSSQL
 - Oracle
- GPX...etc

QGIS 2.8.2-Wien - lower_ATS_routes

Project Edit View Layer Settings Plugins Vector Raster Database Web Processing Help

Layers

- volcanoesofficial
- runway
- obstacle
- fixes_required
- AREA_CTA_NICARAGUA
- AREA_CTA_EL_SALVADOR
- nav aids
- route_lines
- holding_pattern
- MARITIME
- designated_points
 - ICAO
 - Coordinates
 - Procedures
- ama_1deg
- 1
- atc_surveillance_minima
- Rutas
 - rnav_routes
 - designated_points_belize
 - ICAO
 - Coordinates
 - Procedures
 - lower_ats_routes
 - upper_ats_routes
 - star_leg
- airspace
- fir_area
- zprd
- tma
- ctr
- atz
- airport_heliport
- airport_heliport_national
- AMA
- OCH Landscape
- Google Physical
- OpenStreetMap
- Google Satellite

Processing Toolbox

Search...

Recently used algorithms

- r.aspect - Generates raster maps of aspect from a elevation rast...
- r.buffer - Creates a raster map layer showing buffer zones surro...
- r.slope - Generates raster maps of slope from a elevation raster ...
- Contour lines from grid
- Hillshade
- r.neighbors - Makes each cell category value a function of the ca...
- GDAL/OGR [45 geosalgorithms]
- GRASS commands [160 geosalgorithms]
- Models [0 geosalgorithms]
- Orfeo Toolbox (Image analysis) [83 geosalgorithms]
- QGIS geosalgorithms [103 geosalgorithms]
- SAGA (2.1.2) [235 geosalgorithms]
- Scripts [0 geosalgorithms]

Coordinate: -10154104,1665266 Scale: 1:2,500,000 Rotation: 0.0 Render EPSG:3857 (OTF)

QGIS es extensible, hay una gran cantidad de plugins que le agregan funcionalidad

The screenshot shows the QGIS Python Plugins Repository website. The page title is "QGIS Python Plugins Repository" and it indicates that 507 records were found. A table lists various plugins with their details.

Name	Stars (votes)	Stable	Exp.
ARPAT plugin	9874	0.3.3	—
Acca plugin	8495	0.3	0.2
AccurAssess	3163	0.2	0.1
Accuracy Assessment	30625	0.4.2	0.4.1
Affine Transformations	28537	1.0.2	—
AniMove for QGIS	16479	1.3.3	1.4.2
ArcGIS REST API Connector	2106	—	0.1.1
ArcheoCAD	17165	0.1.3	—
Area Along Vector	11015	1.1	0.1-beta
Arrows	12509	0.2.2	—
Astrogeology POW	1105	—	0.3
Atlas	27636	0.2.3	0.3
Attribute painter	12466	3.0	—
AutoPlot	3270	—	0.2
AutoTrace	30131	1.0.6	1.0.2
Auxiliary Window	615	—	0.4

Si saben programar usando Python se puede automatizar funciones

Attribute table - Pipes :: Features total: 5538, filtered: 5538, selected: 0

Conditional Format Rules

Primary_Me	Unit_Of_M
80.82	M
76.64	M
7.90	M
2.75	M
2.93	M
8.15	M
2.87	M
22.31	M
8.18	M

Condition: @value < 10

Format: abc - 123 (green), abc - 123 (orange), abc - 123 (red)

Custom: Background (green), Text (), B I U S, Comic Sans MS

Done Cancel

PRO TIP:

Si va a trabajar utilizando GIS necesita aprender a programar, al menos al nivel de poder crear scripts que son pequeños programas para automatizar tareas



JavaScript

Postgresql+Postgis

www.postgresql.org.es/

www.postgis.refractions.net/

PostgreSQL



PostGIS



PostgreSQL es un sistema de gestión de bases de datos objeto-relacional, distribuido bajo licencia BSD y con su código fuente disponible libremente.

PostGIS: Es una extensión al sistema de base de datos objeto-relacional PostgreSQL. Permite el uso de objetos GIS (Geographic information systems). PostGIS incluye soporte para índices GiST basados en R-Tree, y funciones básicas para el análisis de objetos GIS.

www.postgresql.org.es/
www.postgis.refractorions.net/

The screenshot shows the pgAdmin III interface. On the left, the Object browser displays a tree view of the database system, including Servers, Databases, Catalogs, Extensions, Schemas, and Tablespace. The 'aeronautical' database is selected. The main pane shows the Properties tab for the database, listing various configuration parameters and their values. The SQL pane at the bottom displays the SQL commands used to create the database.

Property	Value
Name	aeronautical
OID	17702
Owner	postgres
ACL	
Tablespace	pg_default
Default tablespace	pg_default
Encoding	UTF8
Collation	English_United States.1252
Character type	English_United States.1252
Default schema	public
Default table ACL	
Default sequence ACL	
Default function ACL	
Default type ACL	
Allow connections?	Yes
Connected?	Yes
Connection limit	-1
System database?	No
Comment	

```
-- Database: aeronautical
-- DROP DATABASE aeronautical;
CREATE DATABASE aeronautical
WITH OWNER = postgres
ENCODING = 'UTF8'
TABLESPACE = pg_default
LC_COLLATE = 'English_United States.1252'
LC_CTYPE = 'English_United States.1252'
CONNECTION LIMIT = -1;
```

Retrieving details on database aeronautical... Done.

Exported to Copy to 0.31secs

Postgresql+Postgis

The 'Add PostGIS Table(s)' dialog box shows a list of tables in the 'gis20150820' schema. The table 'topographic_level_curves' is selected. The dialog includes options to 'Also list tables with no geometry' and 'Keep dialog open', and buttons for 'Add', 'Set Filter', 'Close', and 'Help'.

Schema	Table	Column	Data Type	Spatial Type	SRID	Primary Key
gis20150820	airport_heliport	geom	Geometry	Point	4326	
gis20150820	airport_heliport_national	geom	Geometry	Point	4326	
gis20150820	ama_15min	geom	Geometry	Multipolygon	4326	
gis20150820	ama_1deg	geom	Geometry	Multipolygon	4326	
gis20150820	ama_30min	geom	Geometry	Multipolygon	4326	
gis20150820	atc_surveillance_minima	geom	Geometry	Multipolygon	4326	
gis20150820	atz	geom	Geometry	Multipolygon	4326	
gis20150820	ctr	geom	Geometry	Multipolygon	4326	
gis20150820	designated_points	geom	Geometry	Point	4326	
gis20150820	fir_area	geom	Geometry	Multipolygon	4326	
gis20150820	holding_pattern	geom	Geometry	Multiline	4326	
gis20150820	lower_ats_routes	geom	Geometry	Multiline	4326	
gis20150820	minimum_sector_altitude	geom	Geometry	Multipolygon	4326	
gis20150820	navaids	geom	Geometry	Point	4326	
gis20150820	obstacle	geom	Geometry	Point	4326	
gis20150820	rnav_routes	geom	Geometry	Multiline	4326	
gis20150820	runway	geom	Geometry	Multipolygon	4326	
gis20150820	sid_leg	geom	Geometry	Multiline	4326	
gis20150820	sid_leg2	geom	Geometry	Multiline	4326	
gis20150820	star_leg	geom	Geometry	Multiline	4326	
gis20150820	tma	geom	Geometry	Multipolygon	4326	
gis20150820	training_areas	geom	Geometry	Multipolygon	4326	
gis20150820	upper_ats_routes	geom	Geometry	Multiline	4326	
gis20150820	view_all_routes	geom	Geometry	Multiline	4326	gid
gis20150820	view_arp_10nm	geom	Geometry	Select...	Enter...	gid
gis20150820	view_arp_10nm	geom	Geometry	Polygon	4326	gid
gis20150820	volcanoesofficial	geom	Geometry	Point	4326	
gis20150820	zprd	geom	Geometry	Multipolygon	4326	

The 'DB Manager' window shows the 'gis20150820' schema details. The schema owner is 'postgres'. The user has privileges to 'create new objects' and 'access objects'.

gis20150820

Owner: postgres

Privileges

User has privileges:

- create new objects
- access objects



Postgresql+Postgis+QGIS (Fijos a 25 NM VOR/DME TNT)

SQL window - aimgis [PostGIS]

SQL query:

```
SELECT s.gid, s.designator,s.geom,s.geo_lat,s.geo_long,s.point_type
FROM gis20150820.designated_points s
LEFT JOIN nav aids n ON ST_DWithin(s.geom, n.geom, 46400,true)
WHERE n.designator = 'TNT'
ORDER BY designator
```

Execute (F5) 28 rows, 0.0 seconds

Result:

	gid	designator	geom	geo_lat	geo_long	point_type
1	156	ALFRA	0101000020E61...	141029N	0864937W	ICAO
2	196	ANGEL	0101000020E61...	142003N	0865615W	ICAO
3	216	GALAN	0101000020E61...	133921N	0872515W	ICAO
4	103	KARAK	0101000020E61...	140159N	0864759W	ICAO
5	151	KARID	0101000020E61...	135354N	0873812W	ICAO
6	96	LEPAX	0101000020E61...	140606N	0873906W	ICAO
7	218	LIBIS	0101000020E61...	133648N	0871600W	ICAO

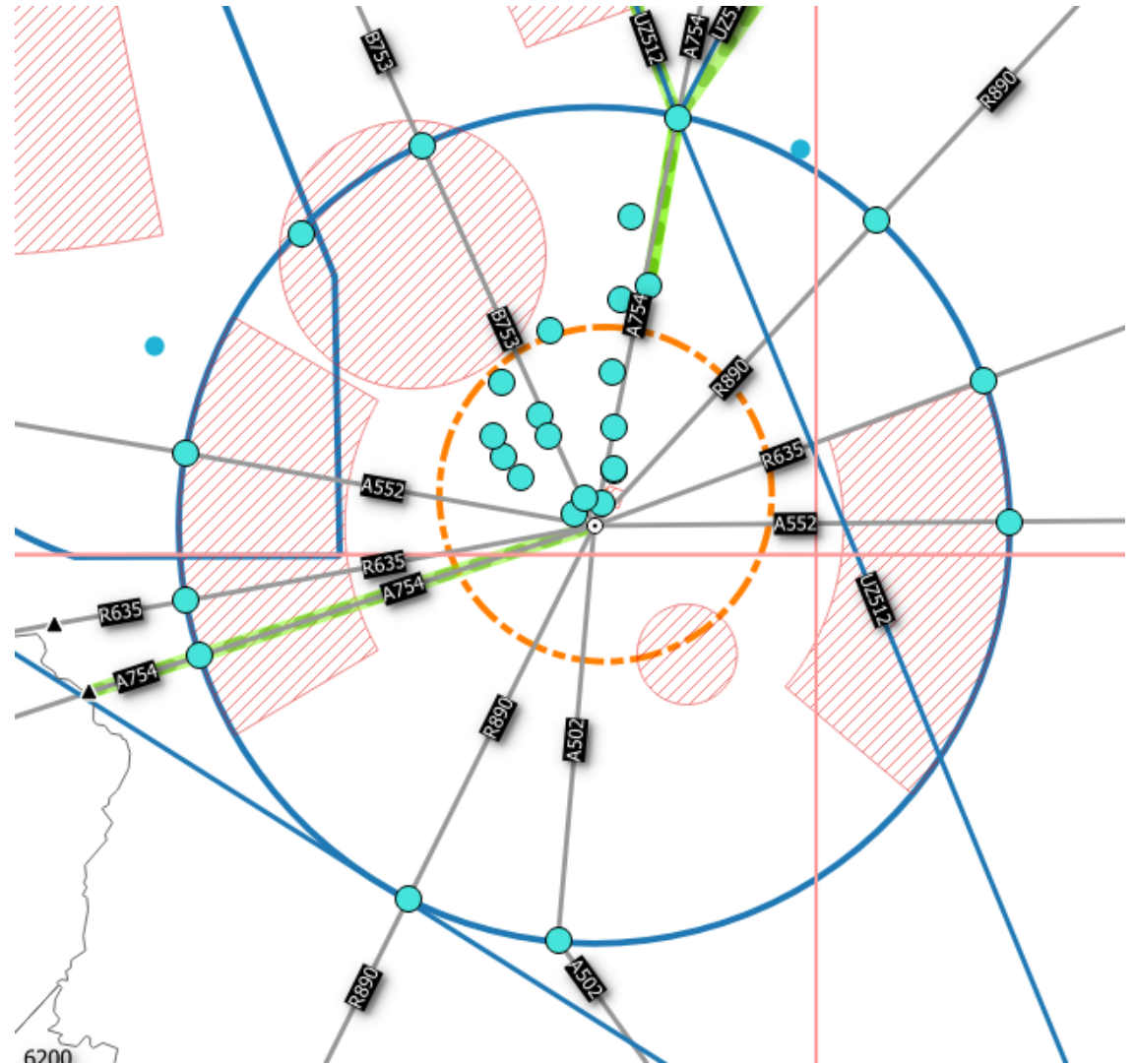
Load as new layer

Column with unique integer values: gid Geometry column: geom

Layer name (prefix): tnt_25nm_query

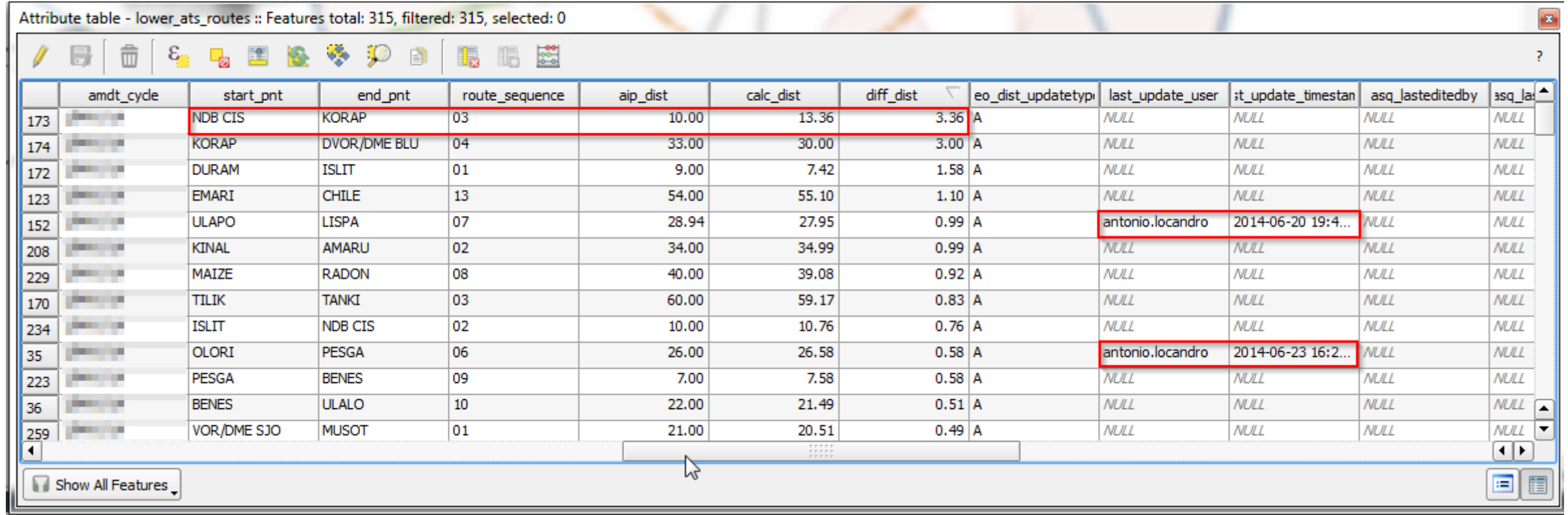
Avoid selecting by feature id

Retrieve columns Load now! Close



Postgresql+Postgis+QGIS (Revisión Automática y trazabilidad)

Attribute table - lower_ats_routes :: Features total: 315, filtered: 315, selected: 0



	amdt_cycle	start_pnt	end_pnt	route_sequence	aip_dist	calc_dist	diff_dist	eo_dist_updatetyp	last_update_user	st_update_timestan	asq_lasteditedby	asq_la
173		NDB CIS	KORAP	03	10.00	13.36	3.36	A	NULL	NULL	NULL	NULL
174		KORAP	DVOR/DME BLU	04	33.00	30.00	3.00	A	NULL	NULL	NULL	NULL
172		DURAM	ISLIT	01	9.00	7.42	1.58	A	NULL	NULL	NULL	NULL
123		EMARI	CHILE	13	54.00	55.10	1.10	A	NULL	NULL	NULL	NULL
152		ULAPO	LISPA	07	28.94	27.95	0.99	A	antonio.locandro	2014-06-20 19:4...	NULL	NULL
208		KINAL	AMARU	02	34.00	34.99	0.99	A	NULL	NULL	NULL	NULL
229		MAIZE	RADON	08	40.00	39.08	0.92	A	NULL	NULL	NULL	NULL
170		TILIK	TANKI	03	60.00	59.17	0.83	A	NULL	NULL	NULL	NULL
234		ISLIT	NDB CIS	02	10.00	10.76	0.76	A	NULL	NULL	NULL	NULL
35		OLORI	PESGA	06	26.00	26.58	0.58	A	antonio.locandro	2014-06-23 16:2...	NULL	NULL
223		PESGA	BENES	09	7.00	7.58	0.58	A	NULL	NULL	NULL	NULL
36		BENES	ULALO	10	22.00	21.49	0.51	A	NULL	NULL	NULL	NULL
259		VOR/DME SJO	MUSOT	01	21.00	20.51	0.49	A	NULL	NULL	NULL	NULL

Show All Features

Postgresql+Postgis+QGIS (Formularios de Entrada y Validaciones)

star_leg - Feature Attributes

gid: extval(gis20150820.star_leg_gid_seq::regclass)

icao_star_designator: NULL

star_type: [dropdown]

required_navigation_performance: CONV
PBN

star_sequence: NULL

leg_type_arinc: [dropdown]

start_pnt: NULL

end_pnt: NULL

brgmag: NULL

brggeo: NULL

geo_distance: NULL

remarks: NULL

amdt_cycle: amdt.getcurrentcydename()

calc_dist: NULL

diff_dist: NULL

uuid: amdt.generate_uuidstring()

aerodrome: [dropdown]

OK Cancel

star_leg - Feature Attributes

gid: extval(gis20150820.star_leg_gid_seq::regclass)

icao_star_designator: NULL

star_type: [dropdown]

required_navigation_performance: [dropdown]

star_sequence: NO
RNAV1
RNP2

leg_type_arinc: [dropdown]

start_pnt: NULL

end_pnt: NULL

brgmag: NULL

brggeo: NULL

geo_distance: NULL

remarks: NULL

amdt_cycle: amdt.getcurrentcydename()

calc_dist: NULL

diff_dist: NULL

uuid: amdt.generate_uuidstring()

aerodrome: [dropdown]

OK Cancel

star_leg - Feature Attributes

gid: extval(gis20150820.star_leg_gid_seq::regclass)

icao_star_designator: NULL

star_type: [dropdown]

required_navigation_performance: [dropdown]

star_sequence: NULL

leg_type_arinc: [dropdown]

start_pnt: NULL

end_pnt: NULL

brgmag: NULL

brggeo: NULL

geo_distance: NULL

remarks: NULL

amdt_cycle: amdt.getcurrentcydename()

calc_dist: NULL

diff_dist: NULL

uuid: amdt.generate_uuidstring()

aerodrome: MGGT
MGTK
MFLC
MFLM
MHRO
MHTG

OK Cancel

Postgresql+Postgis+QGIS (Formularios de Entrada y Validaciones)

The screenshot displays the QGIS 2.8.2-Wien interface. The main map area shows a satellite view of a region with various flight routes overlaid. The routes are represented by colored lines (orange, red, purple, green) connecting different airports. The airports are labeled with their ICAO codes and coordinates, such as BZE1 (16.0696N, 089.7199W) and LM001 (15.4078N, 087.5215W). The map also shows major roads and water bodies.

The left sidebar contains a 'Layers' panel with the following layers listed:

- New scratch layer
- designated_points
 - ICAO
 - Coordinates
 - Procedures
- navaids
- zprd
- sid_leg
 - MHLM
 - MHRO
 - MHTG
- star_wpt
- star_leg
 - MHLM
 - MHRO
 - MHTG
 - MRLB
 - MROC
- runway_centerline_point
 - group1
 - MARITIME
 - nav_routes
 - tma
 - upper_ats_routes
 - lower_ats_routes
 - atc_surveillance_minima
 - OSM Humanitarian Data Model
 - Google Satellite
 - OCM Landscape

Below the map, there is a table with the following columns: gid, iao_star_designato, star_type, navigation_pe, tar_sequenci, leg_type_arinc, start_pnt, end_pnt, brgmag, brggeo, geo_distance, remarks, amdt_cycle, calc_dist, diff_dist, uid, and aerodrome. The table contains 8 rows of data.

gid	iao_star_designato	star_type	navigation_pe	tar_sequenci	leg_type_arinc	start_pnt	end_pnt	brgmag	brggeo	geo_distance	remarks	amdt_cycle	calc_dist	diff_dist	uid	aerodrome
0	31 BZE1	PBN	RNP2	01	TF	BZE	LM001	165.80	166.00	105.95	NULL	20/AUG/2015	105.95	0.00	5ab1e668-50ad-...	MHLM
1	29 NAGEL1	PBN	RNP2	02	TF	LM004	LM015	24.90	25.00	22.64	NULL	20/AUG/2015	22.64	0.00	fb43d8b1-89e5-5...	MHLM
2	18 KIRAP1	PBN	RNAV1	01	TF	KIRAP	RO001	125.80	125.20	52.12	NULL	20/AUG/2015	52.12	0.00	b93056f8-8e40-...	MHRO
3	32 KIRAP1	PBN	RNP2	01	TF	KIRAP	LM001	192.30	191.70	75.51	NULL	20/AUG/2015	75.51	0.00	1374f56d-c508-e...	MHLM
4	33 GABIX1	PBN	RNP2	01	TF	GABIX	LM001	226.50	225.20	117.38	NULL	20/AUG/2015	117.38	0.00	90a62fd0-f4fb-3...	MHLM
5	45 COTALN	CONV	NO	01	TF	IMOLA	LINAS	157.00	NULL	10.00	NULL	20/AUG/2015	9.63	0.37	b2262a3c-dbca-c...	MRLB
6	46 COTALN	CONV	NO	02	TF	LINAS	ORADA	186.00	NULL	17.40	NULL	20/AUG/2015	17.42	0.02	c00fe203-23d3-2...	MRLB
7	47 COTALN	CONV	NO	03	TF	ORADA	GORDA	186.00	NULL	13.39	NULL	20/AUG/2015	13.39	0.00	398f51a6-12d7-...	MRLB
8	48 COTALN	CONV	NO	04	TF	GORDA	COTAL	100.00	NULL	5.00	NULL	20/AUG/2015	5.00	0.00	e9f4e49d-b150-...	MRLB

At the bottom of the interface, there is a coordinate field showing -9800636, 1834627, a scale of 1:1,248,755, and a rotation of 0.0. The EPSG coordinate system is set to EPSG:3857 (OTF).

Postgresql+Postgis+QGIS+Python (Limites)

The image shows a QGIS 2.8.2-Wien interface with a map of flight routes and various layers. The layers panel on the left includes:

- fixes_30
- fixes_30NM_TNT_2
- fixes_30NM_TNT
- volcanoesofficial
- runway
- obstacle
- fixes_required
- AREA_CTA_NICARAGUA
- AREA_CTA_EL_SALVADOR
- navaids
- route_lines
- holding_pattern
- MARITIME
- designated_points
- ICAO
- Coordinates
- Procedures
- ama_1deg
- 1
- atc_surveillance_minima
- Rutas
- mav_routes
- designated_points_belize
- ICAO
- Coordinates
- Procedures
- lower_ats_routes
- upper_ats_routes
- testt
- New scratch layer
- star_leg
- airspace
- fir_area
- zprd
- tma
- ctr
- atz
- airport_heliport
- airport_heliport_national
- AMA
- OCM Landscape
- Google Physical
- OpenStreetMap
- Google Satellite

The map displays several routes and areas with labels like 1600, 2000, 6000, 7000, 3500, 3000, and 5500. A Python console window is open, showing a script named `bbox_script.py` with the following code:

```
1 layer = iface.activeLayer()
2
3 def pbounds (Lextent,s):
4     e = Lextent
5     if s == 'no':
6         print 'bbox layer\nx,y\n%s,%s\n%s,%s' %(e.xMinimum(),e.
7             yMinimum(),e.xMaximum(),e.yMaximum())
8     else:
9         print 'bbox selected features\nx,y\n%s,%s\n%s,%s' %(e.xMinimum
10             (),e.yMinimum(),e.xMaximum(),e.yMaximum())
11
12 if layer.wkbType() == Qgis.WKBPolygon or layer.wkbType() == Qgis.
13     WKBMultiPolygon or layer.wkbType() == Qgis.WKBLinesString:
14     if layer.selectedFeatureCount() < 1:
15         s = 'no'
16         e = layer.extent()
17     else:
18         s = 'yes'
19         e = layer.boundingBoxOfSelected()
20         pbounds(e,s)
21
22 else:
23     if layer.featureCount() <= 1:
24         print 'less than 2 points'
25     else:
26         if layer.selectedFeatureCount() < 2:
27             s = 'no'
28             e = layer.extent()
29             pbounds(e,s)
30         else:
31             s = 'yes'
32             e = layer.boundingBoxOfSelected()
33             pbounds(e,s)
```

The Python console also shows the execution of the script, displaying the bounding box coordinates for the selected features:

```
1 Python Console
2 Use iface to access QGIS API interface or Type help(iface) for
3 >>> execfile(u'C:/Users/antonio.locandro/Desktop/bbox_scri
4 pt.py'.encode('mbcs'))
5 bbox selected features
6 X,y
7 -88.31398,15.8187166663
8 -86.43167,17.53962
9
10
11
12
13
```

The status bar at the bottom shows the coordinate: -86.468, 16.707.



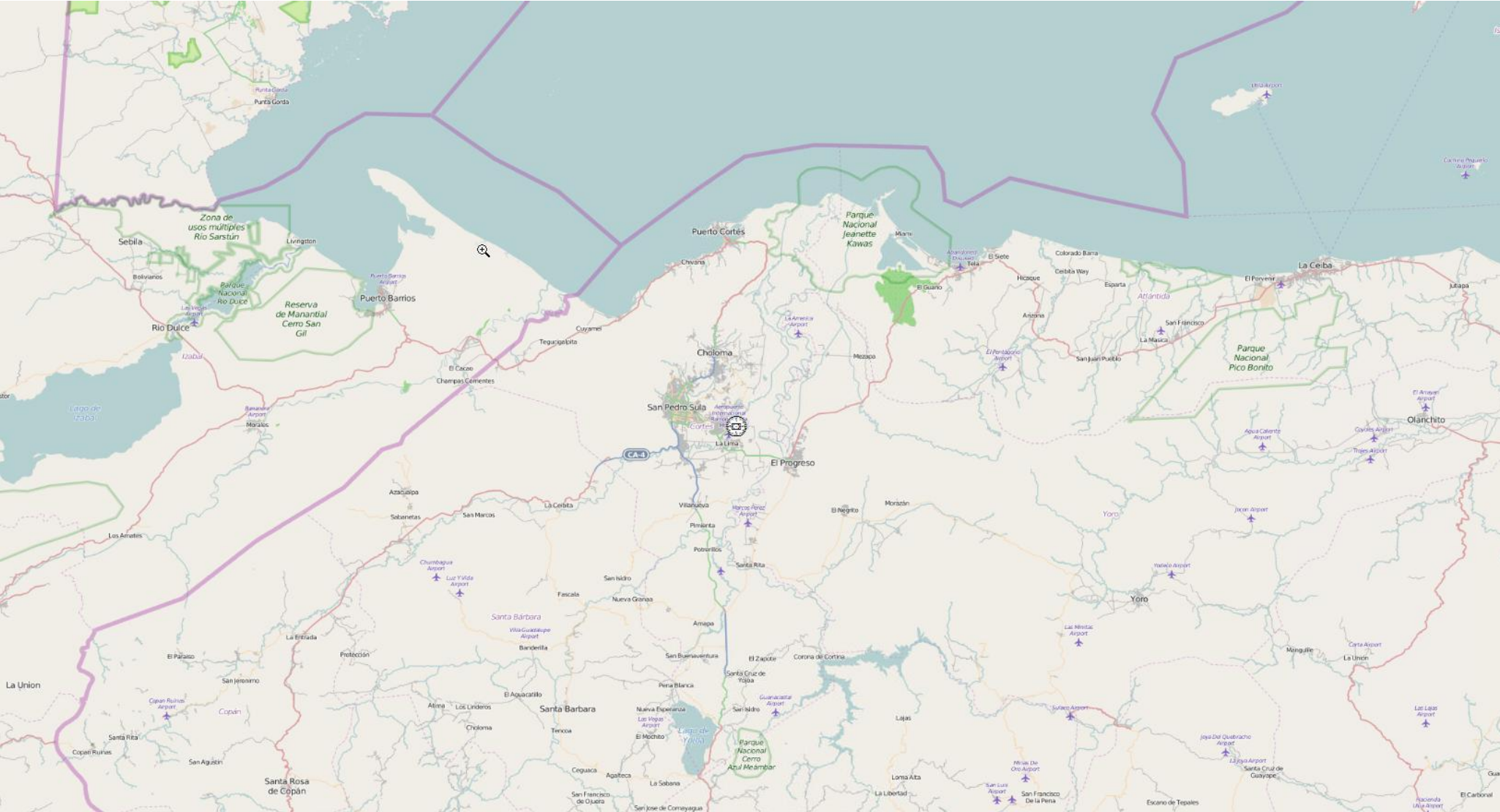
Postgresql+Postgis+QGIS+Python (Limites)

The image shows a QGIS interface with a map containing several geometric features. A Python console window is open, displaying the following text:

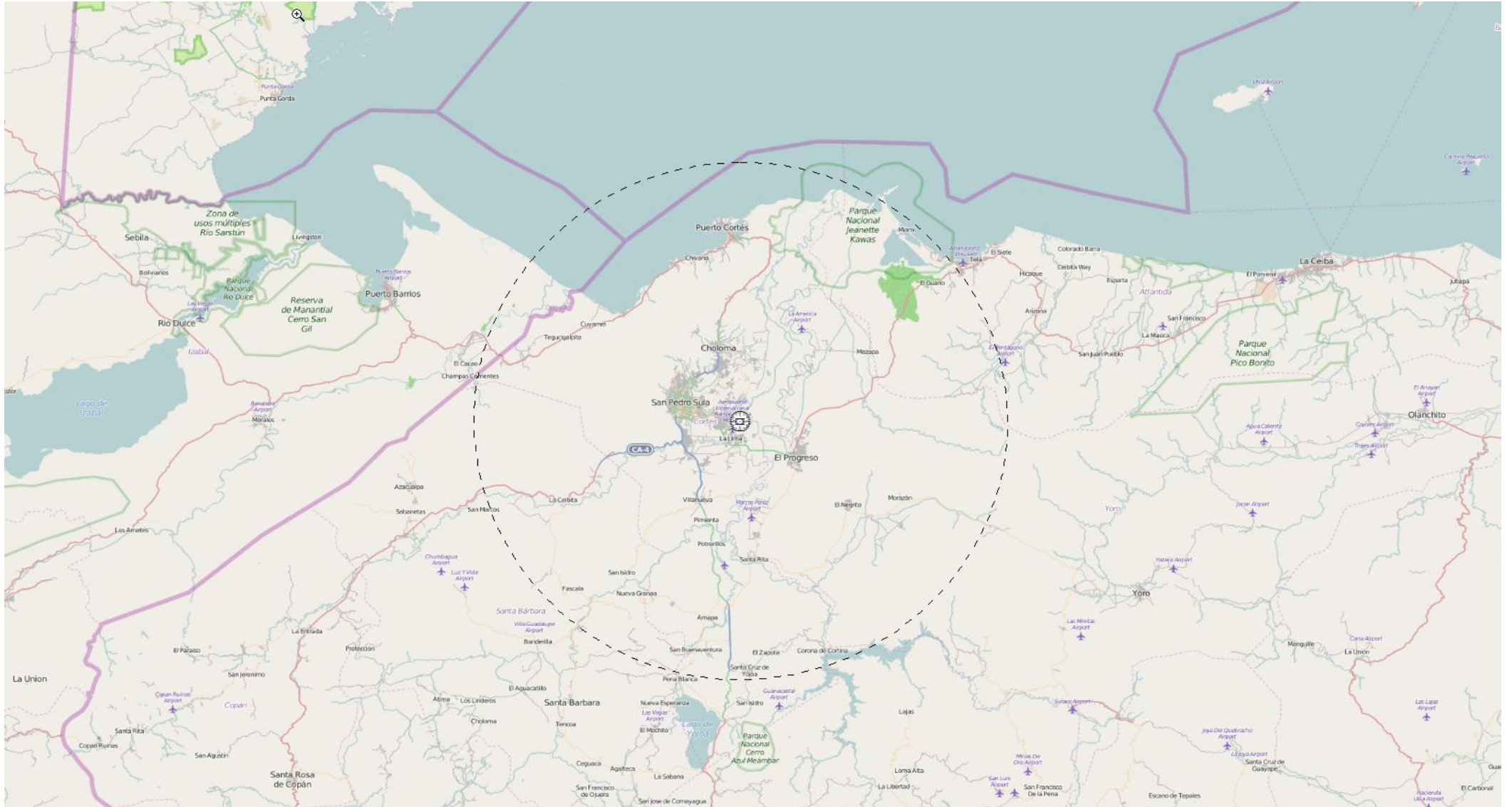
```
1 Python Console
2 Use iface to access QGIS API interface or Type help(iface) for
  more info
3 >>> execfile(u'C:/Users/antonio.locandro/Desktop/bbox_scri
  pt.py'.encode('mbcs'))
4 bbox selected features
5 x,y
6 -88.31398,15.8187166663
7 -86.43167,17.53962
8
```

The map features include a large orange hatched polygon, a blue grid, a green dashed line, and several circular and semi-circular features with radii labeled as 1600, 2000, 6000, 7000, 3500, 3000, and 5500. A red hatched polygon is also visible in the bottom right corner.

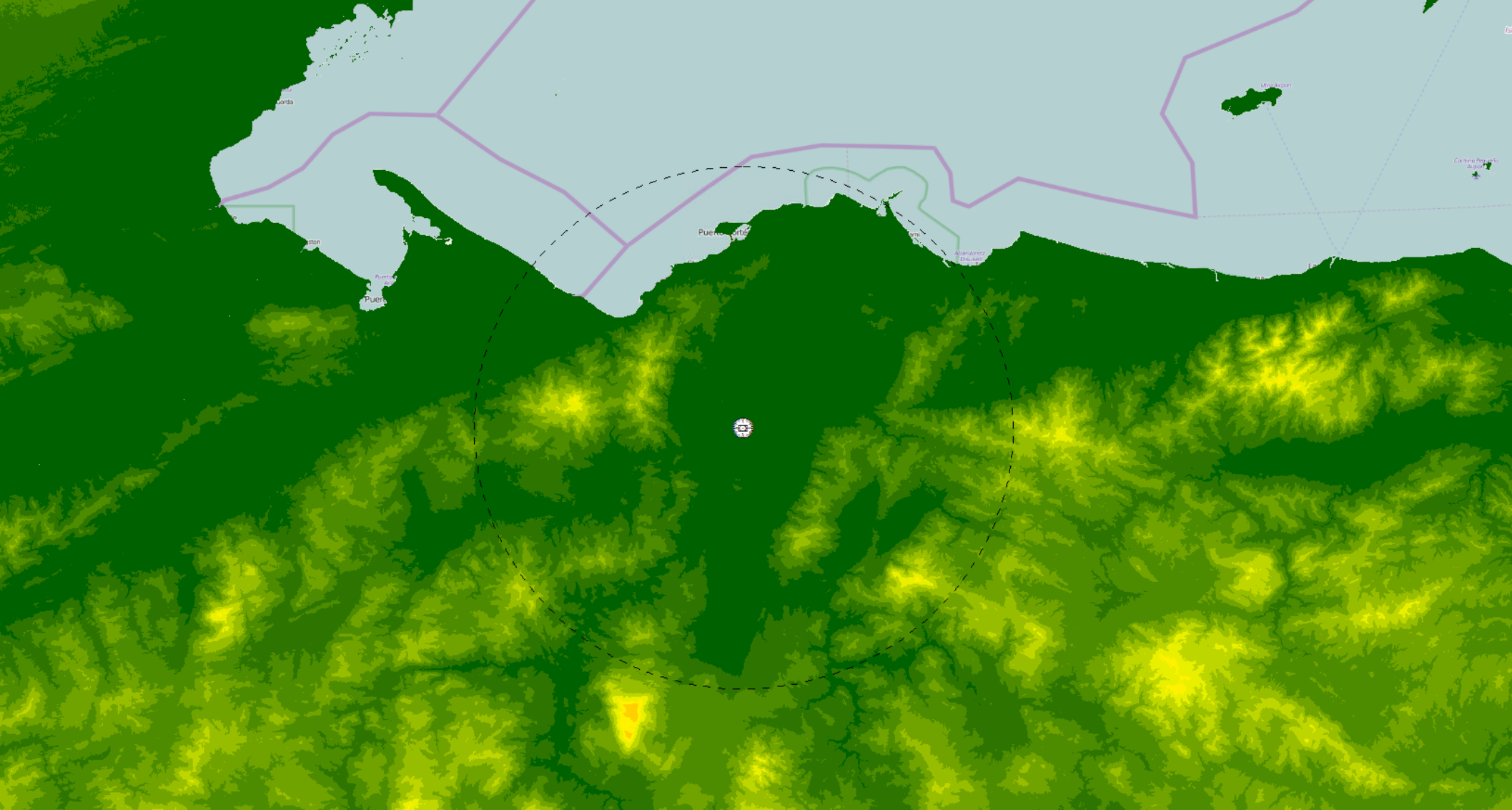
Postgresql+Postgis+QGIS+Python (Elevación Máxima MSA)



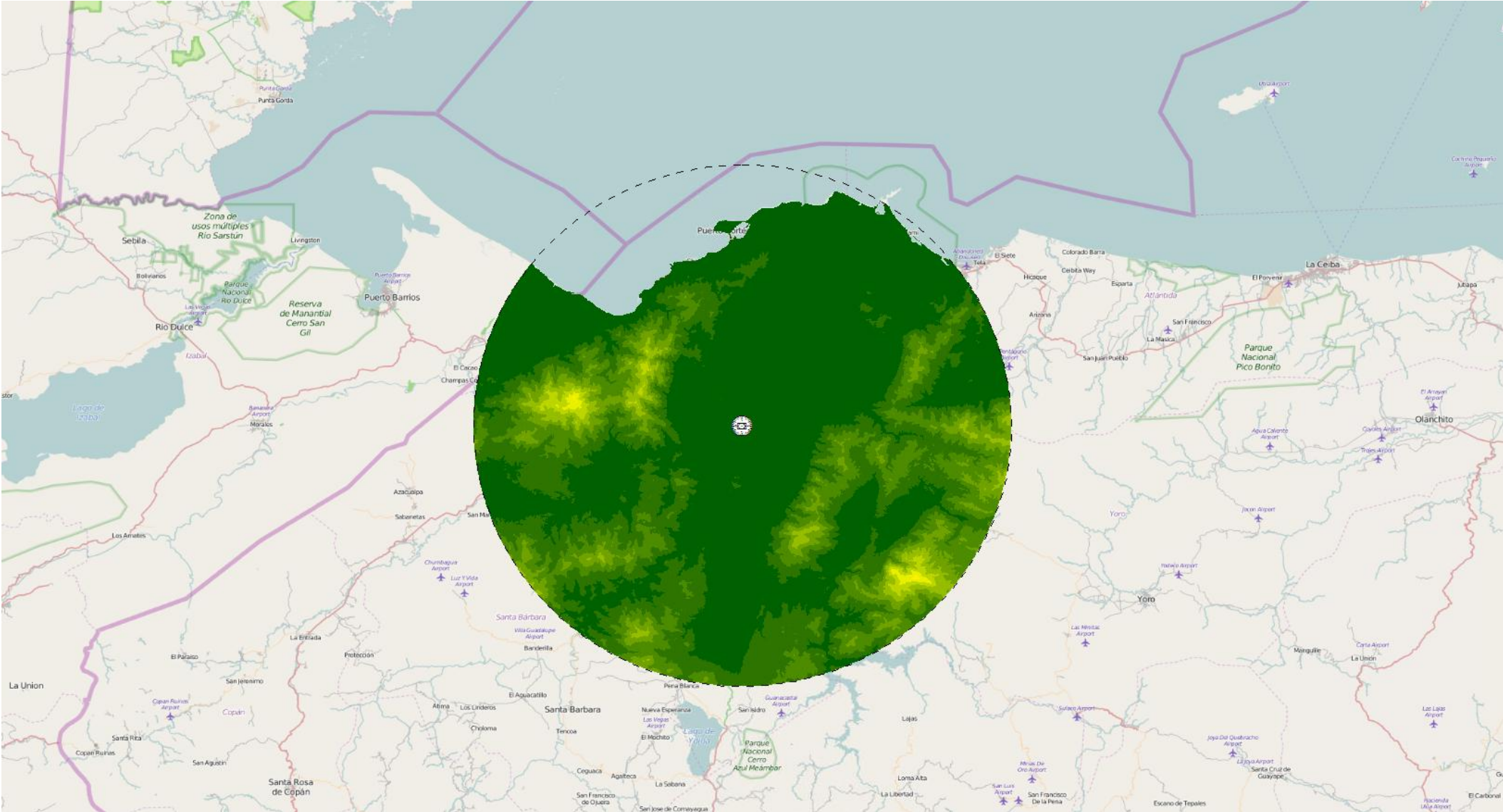
Postgresql+Postgis+QGIS+Python (Elevación Máxima MSA)



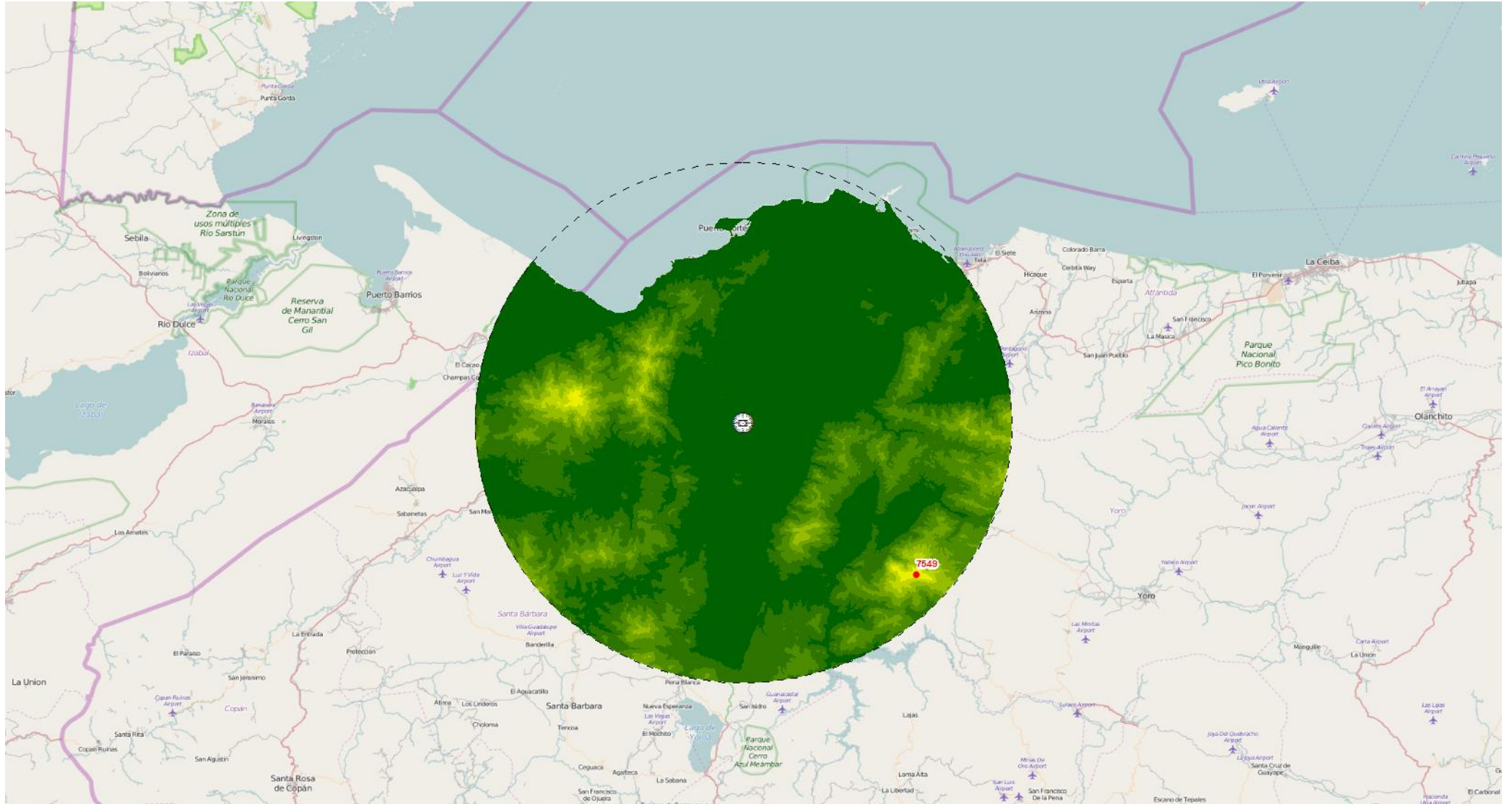
Postgresql+Postgis+QGIS+Python (Elevación Máxima MSA)



Postgresql+Postgis+QGIS+Python (Elevación Máxima MSA)



Postgresql+Postgis+QGIS+Python (Elevación Máxima MSA)



Fulcrumapp - Recolectar datos



fulcrum

fulcrumapp.com

También es necesario recolectar datos, para ello ahora podemos utilizar tablets y teléfonos inteligentes para poder llenar formularios que contienen validaciones.

Fulcrum a pesar de no ser de código libre tiene un precio razonable y una gran cantidad de prestaciones

¡Pero la precisión de los GPS de Tablet y celular no es adecuada!

Eso depende:

1. El propósito
2. La precisión requerida
3. Que GPS están usando

Fulcrumapp - Recolectar datos



Precision ~ 1 m raw

Precision .10 m – 0.50 m con post proceso

Fulcrumapp - Recolectar datos

Table I-1-3 Minimum Survey Accuracy and Integrity Requirements

	Horizont Accuracy	Vertical Accuracy	Integrity Classification
Aerodrome Control Network	1.0 m (*)	1.0 m (*)	1×10^{-8}
Aerodrome Facilities	0.5 m (#)	0.25 m (#)	1×10^{-8}
Obstacles and Off Aerodrome Facilities	3.0 m (#)	0.3 m (#)	1×10^{-5}

(*) Accuracy with respect to the appropriate geodetic reference frame

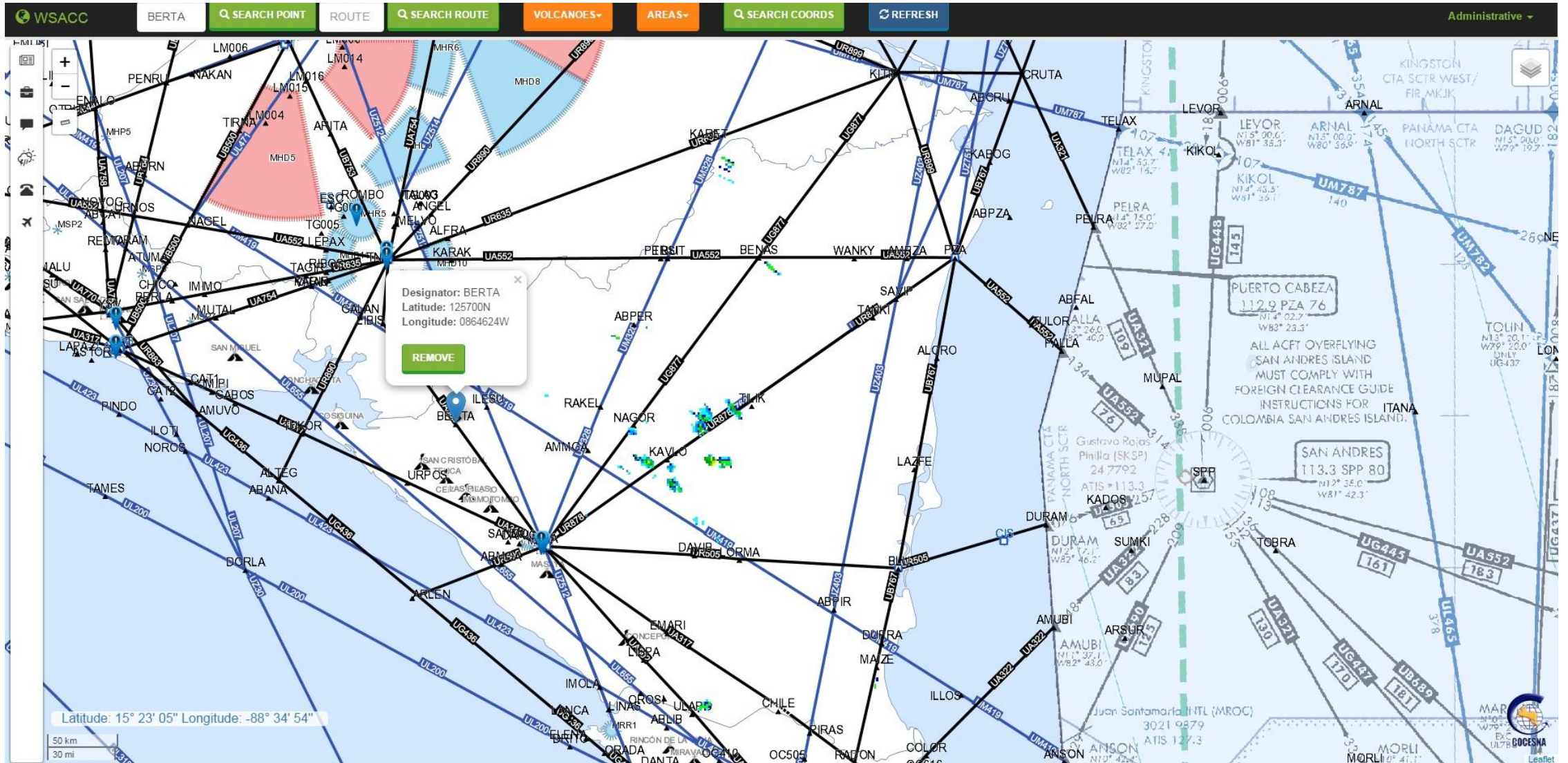
(#) Accuracy relative to the aerodrome control network

The more detailed list of accuracies and integrity is provided at the Part II of this document.

The logo for Fulcrum features the word "fulcrum" in a bold, lowercase, sans-serif font. A red triangle is positioned above the letter 'u', pointing upwards. The background of the logo area is white with a subtle grid pattern.

Airport Runway Surface Inspection

COCESNA Aplicaciones internas - WSACC



COCESNA Aplicaciones internas - WSACC

WSACC

POINT SEARCH POINT ROUTE SEARCH ROUTE VOLCANOES+ AREAS+ SEARCH COORDS REFRESH Administrative

News

ACUERDO CON MID ACC RESPECTO COORDINACIONES, EL ACC QUE TRANSIERE DEBE LLAMAR AL ACC QUE ACEPTA Y DECIR, -DISTINTIVO DE LLAMADA, -PUNTO DE COORDINACION, -HORA, -NIVEL DE VUELO, -CODIGO

SSR MZBZ SER SUSPENDE PROVIDING APP CTL SER BY PROC APP ONLY HASTA 30 SEP 2015

La Habana no aceptará los códigos que terminen en 00. En este caso el sistema asignará sus propios códigos.

El sistema por DEFAULT NO acepta los codigos 5500;4444;2222;1200.

PARA LLAMAR A BOGOTA ACC DIRECTO CON EL PLANNER

Latitude: 18° 28' 47" Longitude: -86° 32' 14"

100 km
50 mi

The screenshot displays the WSACC (World Sky Area Control Center) interface. At the top, there is a navigation bar with buttons for 'POINT', 'SEARCH POINT', 'ROUTE', 'SEARCH ROUTE', 'VOLCANOES+', 'AREAS+', 'SEARCH COORDS', and 'REFRESH'. A dropdown menu for 'Administrative' is visible on the right. The main area is a map showing a dense network of flight routes (black lines) and waypoints (blue dots) over the Caribbean and Central America. A sidebar on the left contains a 'News' section with several bullet points regarding flight coordination and procedures. At the bottom of the map, there is a scale bar (100 km / 50 mi) and coordinate information (Latitude: 18° 28' 47", Longitude: -86° 32' 14"). The COCESNA logo is in the bottom right corner of the map area.

COCESNA Aplicaciones internas - WSACC

The screenshot displays the WSACC application interface. At the top, there are navigation buttons: POINT, SEARCH POINT, ROUTE, SEARCH ROUTE, VOLCANOES, AREAS, SEARCH COORDS, and REFRESH. The main map shows a network of flight routes over Central America, with various airports and waypoints labeled. A 'View feature' popup window is open, displaying information for a selected airport.

News

Numeros de TWR CA2 BZE:120, AUR:210, SAL:320, OCO:610, LIB:630, MGA:510, LMS:481, ROA:490, LCE:460, PZA:502, CENAMER:401-402-403

MGXX VOLCÁN FUEGO ACT SFC- 14,500 FT. agosto 24- hasta agosto 25 de 2135 a 2359

FLUJOS DE SALIDA Y LLEGADA A LA AURORA YA FUERON PUBLICADOS, PONERLOS EN PRACTICA A PARTIR DEL 12 DE AGO 2015

ACUERDO CON MID ACC RESPECTO COORDINACIONES, EL ACC QUE TRANSIERE DEBE LLAMAR AL ACC QUE ACEPTA Y DECIR, -DISTINTIVO DE LLAMADA, -PUNTO DE COORDINACION, -HORA, -NIVEL DE VUELO, -CODIGO

View feature

Areas Fixed points Upper routes Airports Nav aids Notams

Airports Feature info

Id	8
Code	MHTG
Name	TONCONTIN
Country	HONDURAS

METAR Information

Conditions at	MHTG observed 2015-08-24 20:00:00
Temperature	
Dewpoint	
Pressure (altimeter)	30.00 inches Hg (101.0 mb)
Winds	
Visibility	99.99 km
Clouds	No clouds below 12,000 ft (3,700 m)

Raw Text

METAR MHTG 242000Z 09006KT 9999 SCT032 32/14 Q1016 A3000 NOSIG

Latitude: 14° 01' 10" Longitude: -88° 46' 46"

100 km
50 mi

COCESNA Leaflet

COCESNA Aplicaciones internas – SAR Tracking System

RCC/SPOC/SAR/TRACKING Dashboard

MENSAJERIA
 REPORTE
 BITÁCORA
 CONTACTOS
 SEGURIDAD

Mensaje Sar :: 29929

General | Bitacora | Status Report (SIT-166)

Information | SAR Message

MSG REF		DETECTED AT	
No.	29929	Ref.	35335
DETECTION FREQUENCY		Fecha Recibido	22/08/15 13:16
Frecuencia	406.0368 MHZ	Detectado	22 AUG 15
USER CLASS		Hora	1312
Tipo	ELT	Descripcion	Sar Satellite
SERIAL		ID	3397
POSITIONS		COUNTRY OF BEACON REGISTRATION	
Resolved Lat	1456.6N	Long	08920.4W
Doppler A Lat	2641.0N	Long	14320.8W
Doppler B Lat	1428.4N	Long	08923.9W
Encoder Lat	NIL	Long	NIL
Prob		Prob	
		Prob	50
		Prob	50
		Prob	

EMERGENCY CODE	
Emergency Code	NONE
HEX ID	
BEACON ID	A98C40351400315
OTHER ENCODED INFORMATION	
Manufacture	CSTA#197
Model	UNKNOWN
OPERATIONAL INFORMATION	
Email	
Aftn	

COCESNA Aplicaciones internas – SAR Tracking System


Header: SAR logos, helicopter images, RCC/SPOC/SAR/TRACKING, COCESNA logo, user: sar\local\admin, admin, Dashboard.

Search: Buscar en Ref. valor Comienza con

No.	Fecha Recibido	Detectado	Hora	Sar Satellite	No.	Country ID	Country	Tipo	ID		
29934	23/08/15 21:52	23 AUG 15	1455	SARSAT	11	307	ARUBA	ELT	P4-MDH	✓	✓
29934	23/08/15 15:11	23 AUG 15	1455	SARSAT	11	307	ARUBA	ELT	P4-MDH	✓	⚠
29932	23/08/15 10:16	23 AUG 15	1012	SARSAT	07	765	SURINAM	ELT	P2-HWC	✓	⚠
29930	22/08/15 13:17	22 AUG 15	1312	SARSAT	10	332	GUATEMALA	ELT	3397	✓	✓
29929	22/08/15 13:16	22 AUG 15	1312	SARSAT	10	332	GUATEMALA	ELT	3397	✓	✓
29928	22/08/15 12:18	22 AUG 15	1216	SARSAT	07	332	GUATEMALA	ELT	3397	✓	✓
29927	22/08/15 11:31	22 AUG 15	1132	SARSAT	10	332	GUATEMALA	ELT	3397	✓	✓
29926	22/08/15 10:42	22 AUG 15	1037	SARSAT	07	332	GUATEMALA	ELT	3397	✓	✓
29925	22/08/15 09:55	22 AUG 15	0951	SARSAT	10	332	GUATEMALA	ELT	3397	✓	✓
29924	22/08/15 09:16	22 AUG 15	0913	SARSAT	12	332	GUATEMALA	ELT	3397	✓	✓
29923	22/08/15 07:37	22 AUG 15	0732	SARSAT	12	332	GUATEMALA	ELT	3397	✓	✓
29921	22/08/15 04:40	22 AUG 15	0425	SARSAT	11	332	GUATEMALA	ELT	3397	✓	✓
29920	22/08/15 03:48	22 AUG 15	0339	SARSAT	13	332	GUATEMALA	ELT	3397	✓	✓
29919	22/08/15 02:55	22 AUG 15	0245	SARSAT	11	332	GUATEMALA	ELT	3397	✓	✓
29918	22/08/15 00:52	22 AUG 15	0036	SARSAT	10	332	GUATEMALA	ELT	3397	✓	✓

Navigation: << < > >>

COCESNA Aplicaciones internas – SAR Tracking System




Header area containing SAR logos, aircraft icons (EMIG, FLUJO, GEDIX, BETIS, ROTRO, POLSAM, PARKI, SEB, DRABU), COCESNA logo, and user information: sar\local\admin, admin, and a Dashboard icon.

- MENSAJERIA
- REPORTES
- BITÁCORA
- CONTACTOS
- SEGURIDAD

Dashboard

Mensajes recibidos por mes




A line chart showing the number of messages received per month. The x-axis represents months from Enero to Diciembre. The y-axis represents the number of messages, ranging from 0 to 80. The data points are: Enero (0), Febrero (0), Marzo (0), Abril (0), Mayo (50), Junio (50), Julio (70), Agosto (75), Septiembre (0), Octubre (0), Noviembre (0), Diciembre (0).

Mes	Mensajes Recibidos
Enero	0
Febrero	0
Marzo	0
Abril	0
Mayo	50
Junio	50
Julio	70
Agosto	75
Septiembre	0
Octubre	0
Noviembre	0
Diciembre	0

Ultimos Mensajes Recibidos

No.	Fecha Recibido	Detectado	Hora	Country	Tipo		
Sun Aug 23 2015 10:16:00 GMT-0600 (Hora estándar, América Central)							
29932	23/08/15 10:16	23 AUG 15	1012	SURINAM	ELT	✓	⚠
Sun Aug 23 2015 15:11:00 GMT-0600 (Hora estándar, América Central)							
29934	23/08/15 15:11	23 AUG 15	1455	ARUBA	ELT	✓	⚠
Sun Aug 23 2015 21:52:00 GMT-0600 (Hora estándar, América Central)							
29934	23/08/15 21:52	23 AUG 15	1455	ARUBA	ELT	✓	✓


Total Mensajes



A pie chart showing the distribution of total messages. The categories are: Vistos (blue), Con Bitacora (red), and Otro (yellow). The total number of messages is 259.

Categoría	Color
Vistos	Blue
Con Bitacora	Red
Otro	Yellow

Total de Mensajes 259



Gracias por su tiempo



Corporación Centroamericana de Servicios de Navegación Aérea