



XIII  
INTERNATIONAL  
WINTER ROAD  
CONGRESS

QUÉBEC, FEBRUARY 8 TO 11, 2010



Québec 

# SUSTAINABLE WINTER SERVICE FOR ROAD USERS

*Winter maintenance in Spain in areas  
seldom exposed to winter storms.*

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# Winter in Spain





# Spanish Road Network

- Road Administrations:

- Main network → Road General Directorate (Ministry of Public Works).
- Regional Roads → Regional Authorities (17 communities)
- Local Roads → Provincial Administrations & City Councils

- Traffic:

- Most of the networks → Traffic General Directorate (Ministry of Interior).

# Maintenance Organization

- Combined effort: Road Administration-Private Contractors.
- Road Network divided in Sectors.
- Private companies sign 4-year contracts to maintain a Sector.
- Length of a sector varies from about 50 km to 200 km of roads.
- There are 160 sectors for a network of about 23.000 km of State-run roads.

# Maintenance Organization

- Private Contractors provide:
  - Labor
  - Equipment
  - Materials
- Maintenance facilities are supplied by the Road Administration, and are used at no charge by the Private Contractors.
- Maintenance operations are directed by engineers from the Highway Departments.

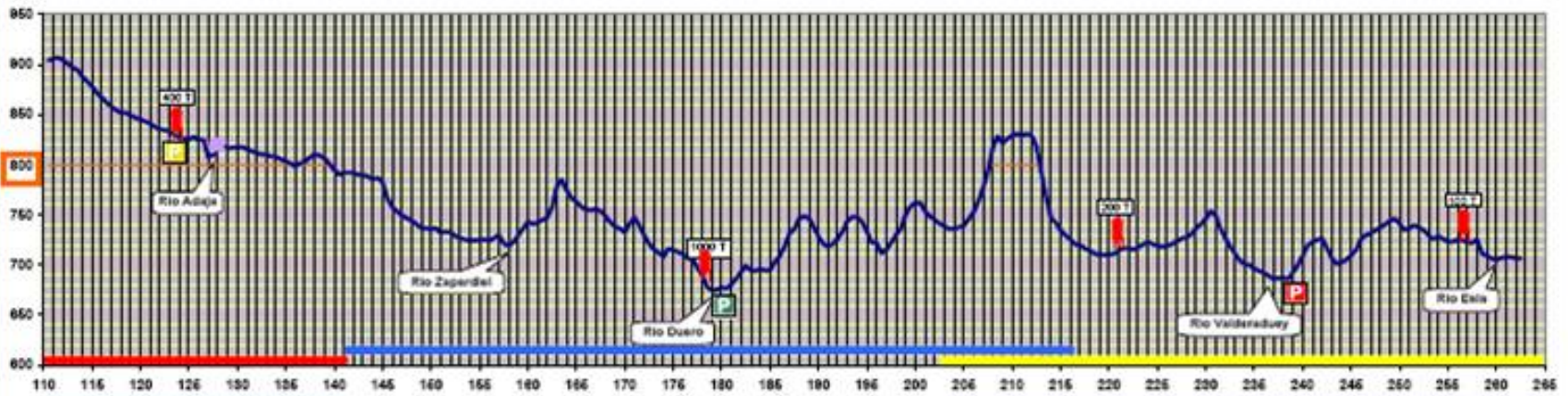
# Winter Maintenance

- For each sector an **OPERATION PLAN** is prepared. Each plan analyzes general and specific aspects of the contract:
  - Road, Traffic and Climate Conditions.
  - Available Resources.
  - Work Organization.
  - Communication Systems.
  - Storage Facilities.
  - Snow-truck routes and their waiting points.
  - Median cross-over points.
  - Truck parking areas, etc.



# Operational Plan

A-6 AUTOVÍA DEL NOROESTE Tramo: ADANERO - BENAVENTE



**DISPOSICIÓN DE EQUIPOS**

- Equipos 1 y 2
- Equipos 3 y 4
- Equipos 5 y 6
- Equipos 7 y 8 (Equipos de apoyo)

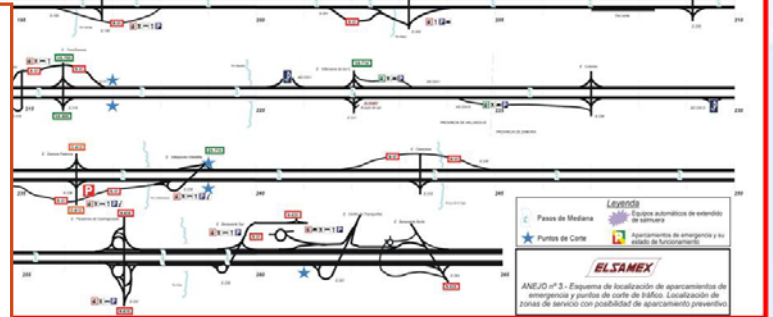
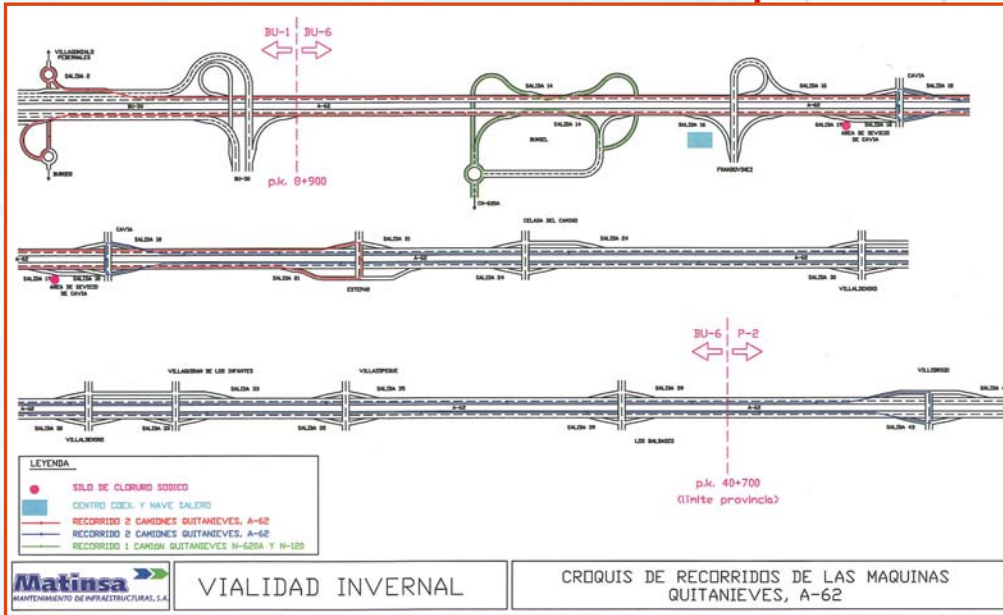
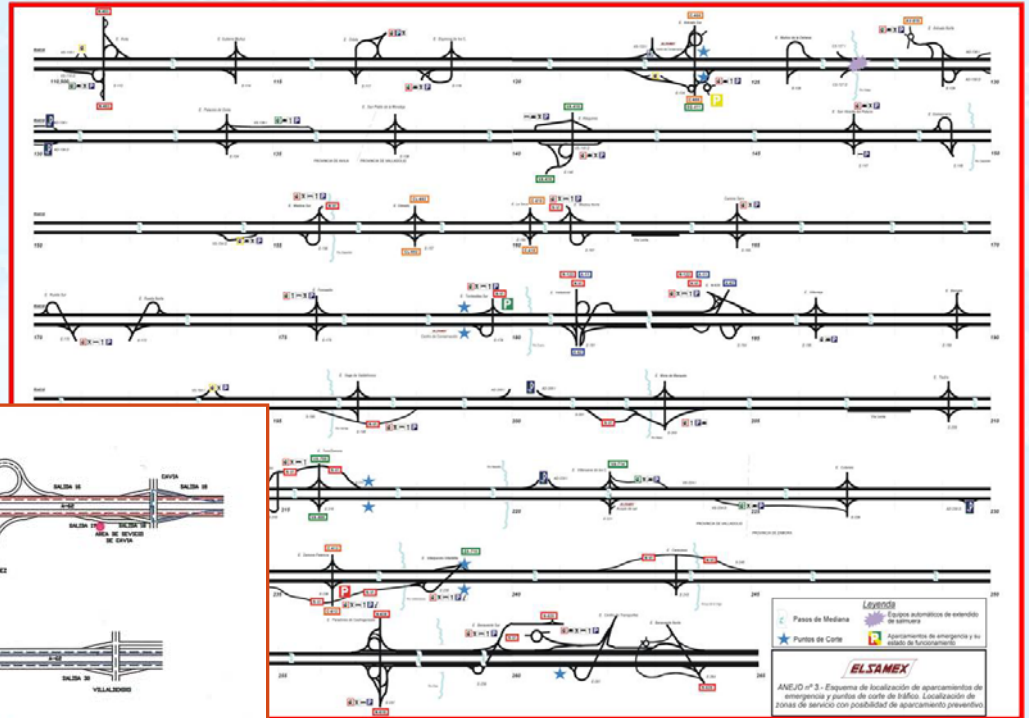
**DISPOSICIÓN DE ACOPIOS (1.700 T)**

- Pk. 125 Arévalo (Nave 400 T)
- Pk. 178,8 Tordesillas (Naves 1.000 T)
- Pk. 221 Villanueva de los Caballeros (Silo 200 T)
- Pk. 257 Castrogonzalo (Silo 100 T)
- Equipos automáticos de esparcido de salmuera

**APARCAMENTOS DE EMERGENCIA**

- P OPERATIVO CON RESTRICCIONES:  
MARTIN MUÑOZ DE LA DEHESA (42.340 m<sup>2</sup> / 550 plazas)
- P OPERATIVO:  
TORDESILLAS (17.990 m<sup>2</sup> / 200 plazas)
- P EN EJECUCIÓN:  
VILLALPANDO (43.640 m<sup>2</sup> / 580 plazas)

# Operational Plan





# Storage Facilities



Salt Silos

# Storage Facilities

Salt barns





# Storage Facilities



Brine plants  
& tanks



# Other Facilities

## Sprinkling Systems



# Equipment



Two axle

Three axle





# Equipment

Salt spreader



Brine tanks



Combi



# Equipment



V-shape blades

Angle blades



# Meteorological Information





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Buscar:

**El tiempo**  
 Observación  
**Predicción**  
 Avisos  
 Mapa de isobaras  
 Marítima  
 Playas  
 Montaña  
 Aeronáutica  
 Radiación ultravioleta  
 Prob. precipitación  
 Temperaturas máx./mín  
 Localidades  
 Provincias  
 CC. AA.  
 España  
 Mundo

**El clima**  
**Servicios**  
**Perfil del contratante**  
**Divulgación**  
**Anuncios**  
**Quiénes somos**

**Predicción** → → →  
 Municipios españoles  
 Ciudades del Mundo


Inicio > El tiempo > Predicción > Localidades > Cervera de Pisuerga

### Predicción por Localidades. Cervera de Pisuerga

Capital: Cervera de Pisuerga (altitud: 1008 m.)  
 Elaborado: sábado, 23 enero 2010 a las 05:50 (hora local)

Fecha	sáb 23		dom 24		lun 25	
	pm	am	pm	am	pm	am
Estado del cielo						
Prob. precip.(%)	75	45			65	
Cota nieve prov.(m)	1700	1100			700	
T. Máxima (°C)	9	7			5	
T. Mínima (°C)	3	1			-1	
Viento						
(km/h)	7	18	18	14	14	
Índice UV Máximo	2	2			1	
Nivel de aviso máximo	Sin riesgo	Sin riesgo			Riesgo	

Seleccione municipio:   
 Seleccione Provincia o Ciudad Autónoma:


 Inicio → Cantabria → El Tiempo en Vega de Liébana

Últimas ciudades consultadas  
 Vada  
 Vega de Liébana

Buscar

**Predicción** **1 Aviso**

### Hora por hora en Vega de Liébana

General **Detallada** Por hora

**Hoy: Mañana:**

hora	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Temperatura	1°	0°	0°	0°	-0°	-0°	-0°	-0°	-0°	-0°	-0°	0°	1°	1°	2°	2°	2°	2°	1°	0°	-1°	-1°	-0°	-0°	-0°
Precipitaciones (mm)	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	

Precipitaciones en mm.

**Hoy, 24 ene:**

hora	Predicción	Viento	Precipitaciones	Nubes	Probabilidad truenos	Humedad relativa	Presión
23:00	1°	10,8 km/h ↓	0,1 mm	93%	Baja	95%	1030 hPa

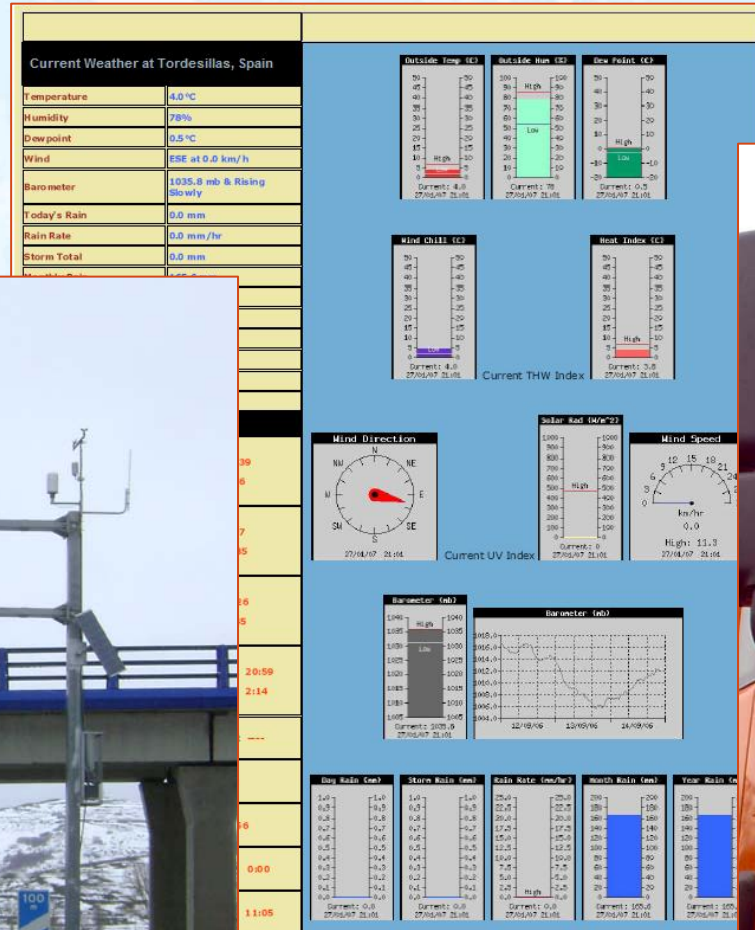
**Mañana, 25 ene:**

hora	Predicción	Viento	Precipitaciones	Nubes	Probabilidad truenos	Humedad relativa	Presión
00:00	0°	10,8 km/h ↓	0,1 mm	90%	Baja	94%	1030 hPa
01:00	0°	10,8 km/h ↓	0,1 mm	88%	Baja	94%	1030 hPa



# Road Weather Information Systems

Fixed



Portable





# Video Cameras

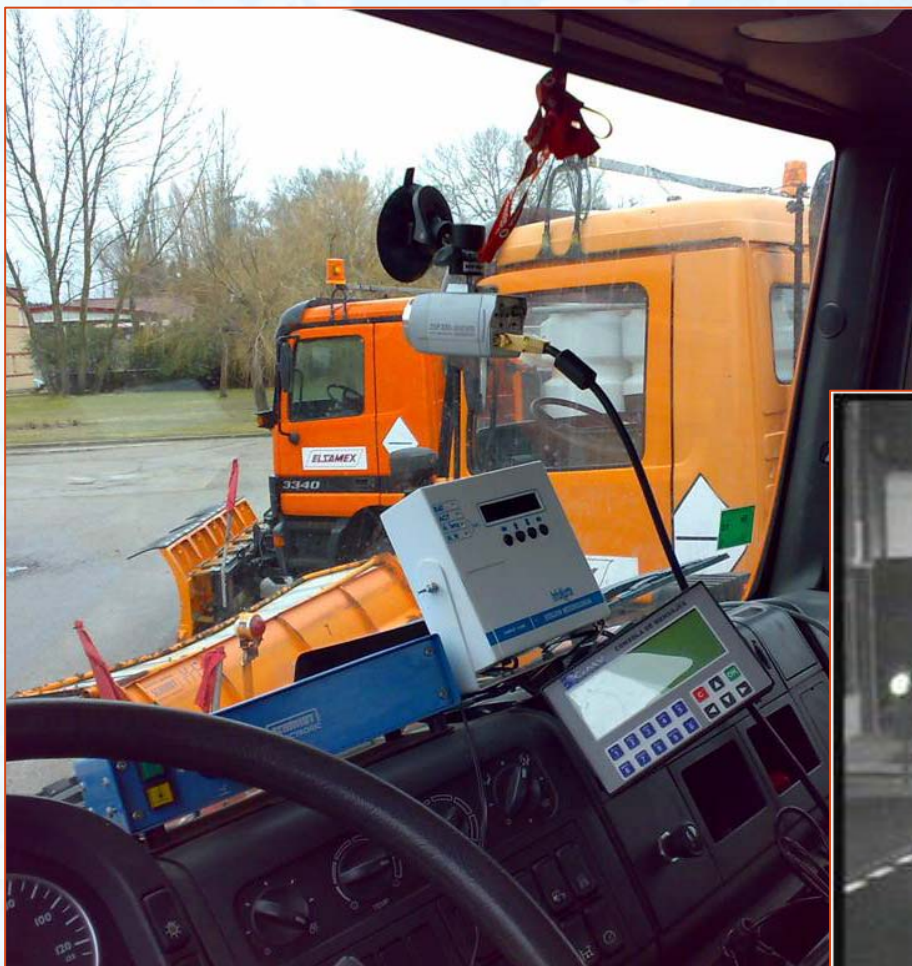
Fixed cameras

A screenshot of a video camera control interface. The interface is divided into several sections:

- Top Navigation:** A dark grey bar with buttons labeled "BUSCAR", "ALARMA", "CONFIG", "SOBRE", and "CERRAR".
- Left Panel:** A list of camera channels: "PENAFIEL" (with a yellow envelope icon), "CAM 2", "CAM 3", and "CAM 4". Below the list are buttons for "Open All", "Refresco", "IniciarDiálogo", and "Reproducción".
- Central Video Feed:** A large window showing a live video feed of a town street. The address "80.24.199.111-1-98Kbps S2" is visible at the top of the feed. A timer "T:028" is displayed in the bottom right corner of the feed.
- Right Panel:** A control panel with a directional pad, a "Vel(1-8): 5" dropdown menu, and buttons for "Zoom", "Foco", and "Iris". Below these are "Ajustes" and "Mas" tabs, followed by four sliders for various camera settings and a "Reset" button.
- Bottom Bar:** A row of icons for various camera functions, including a "25" and "36" icon.

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# Video Cameras

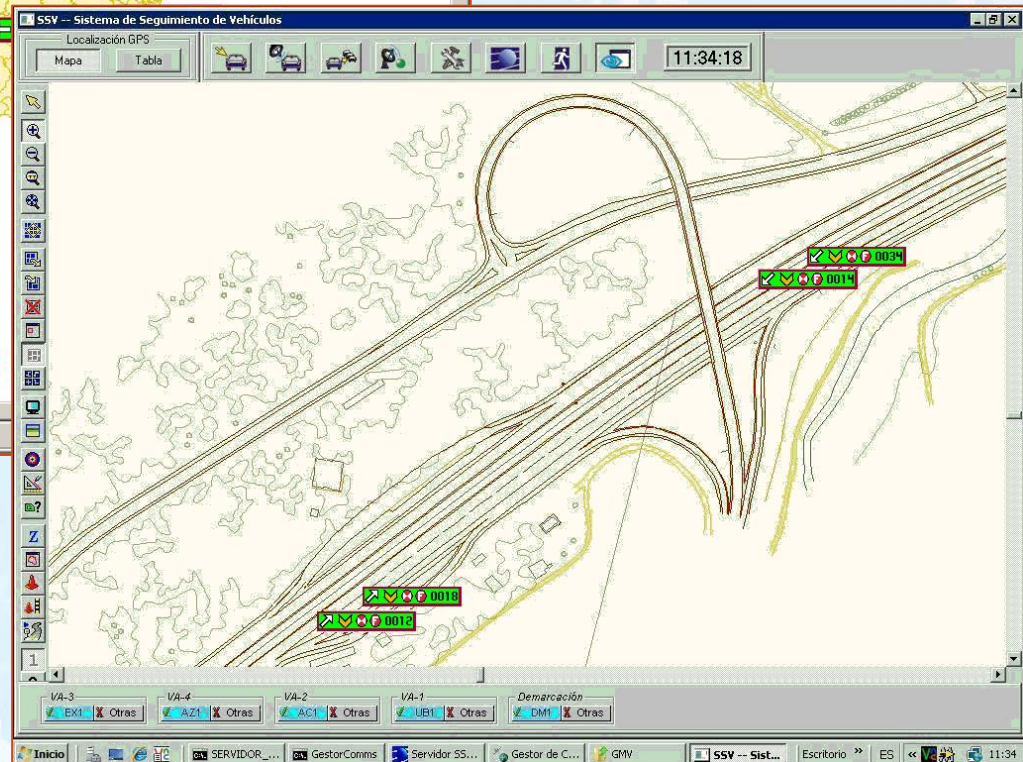
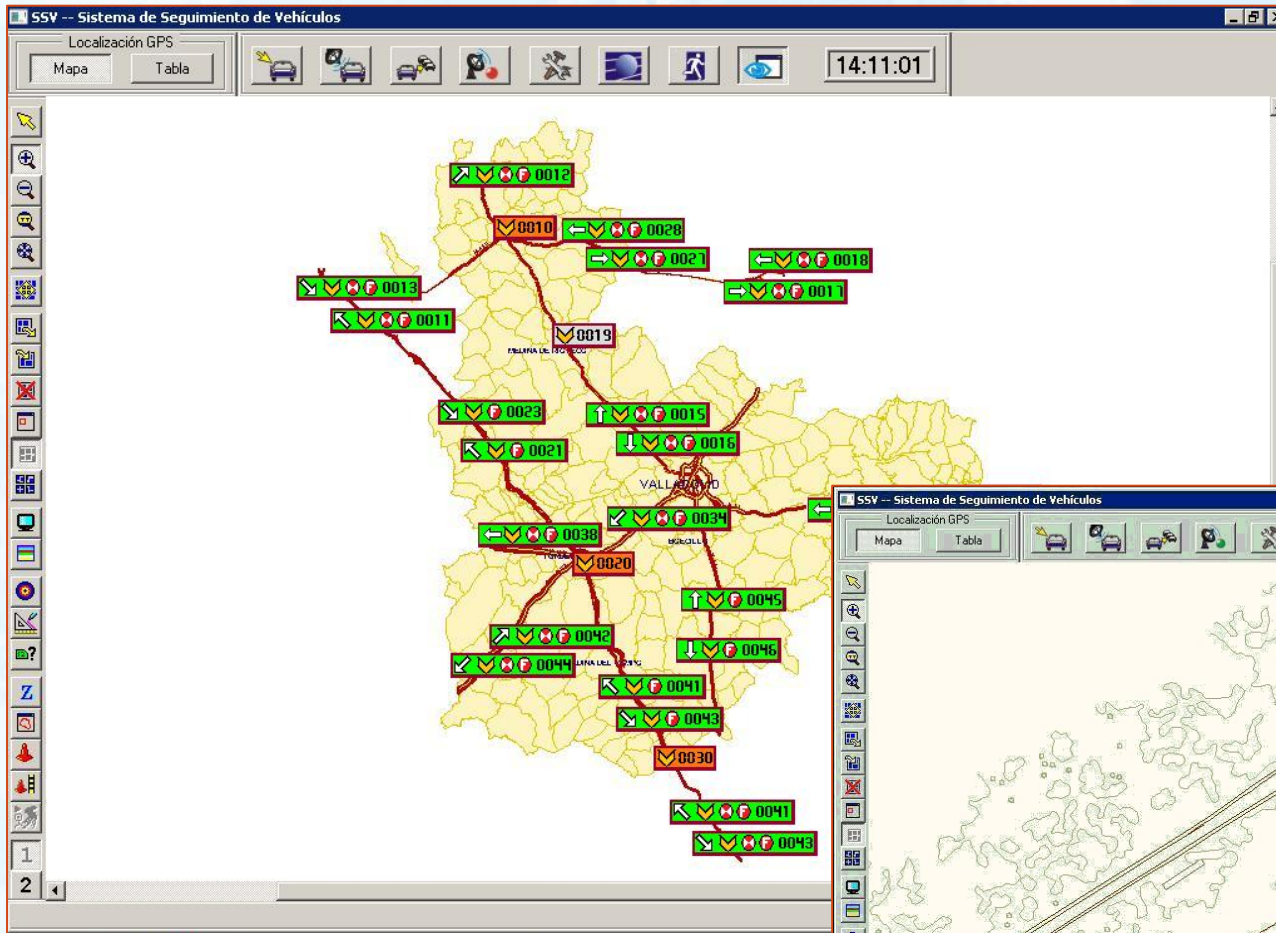


Portable cameras

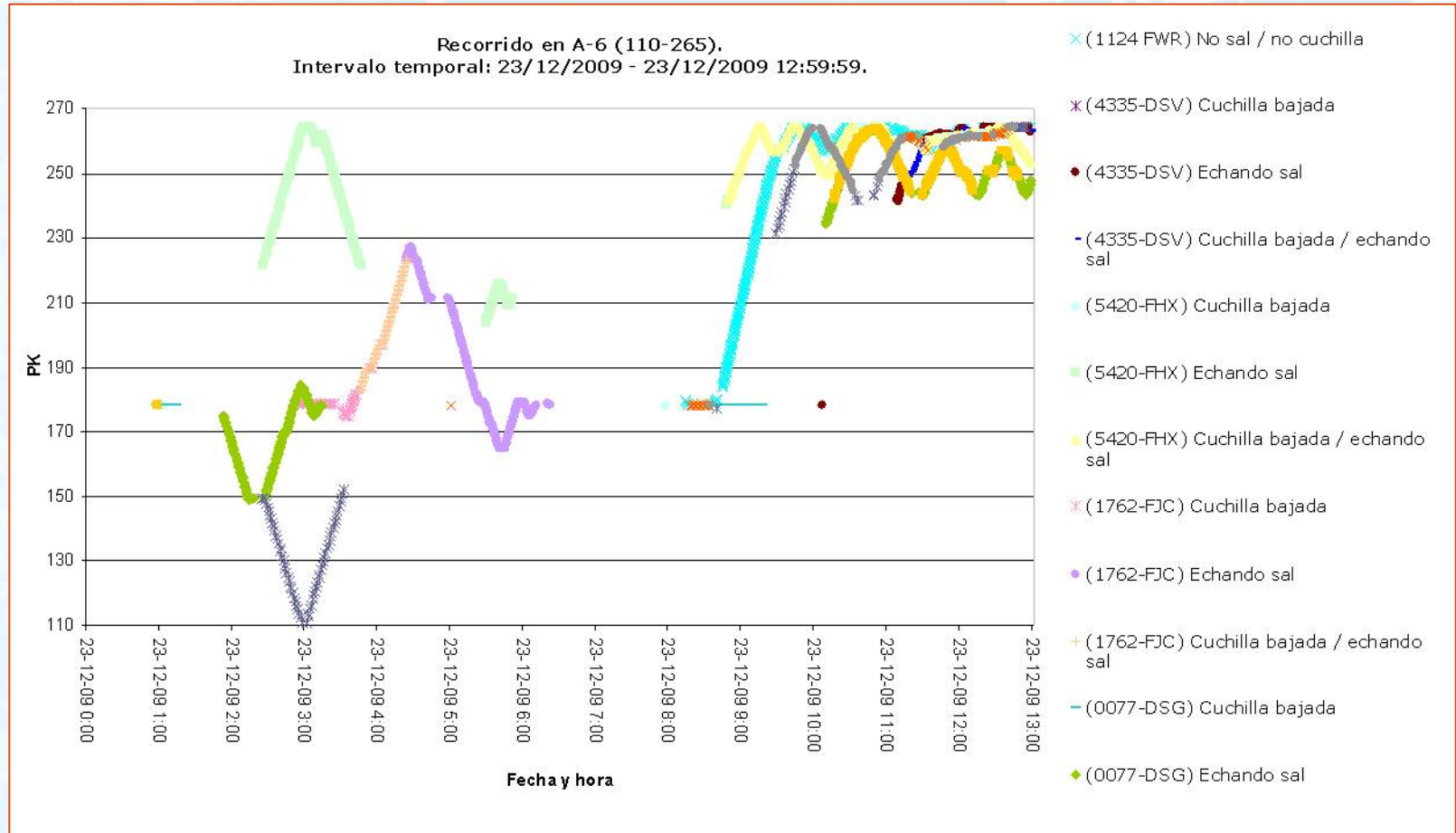




# Fleet Tracking System

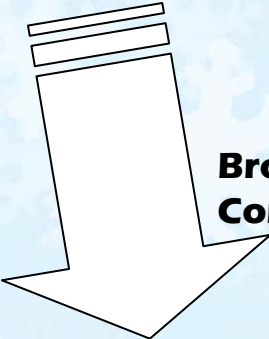
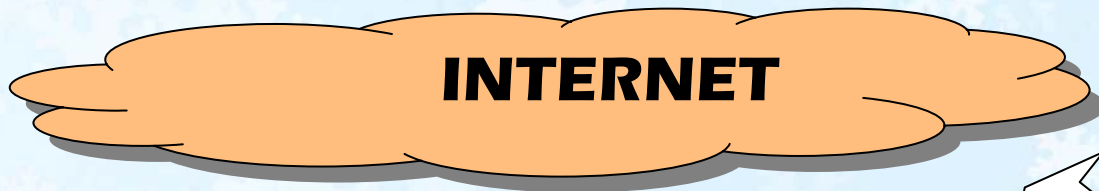


# Fleet Tracking System





# Information System



Webcam Videowall

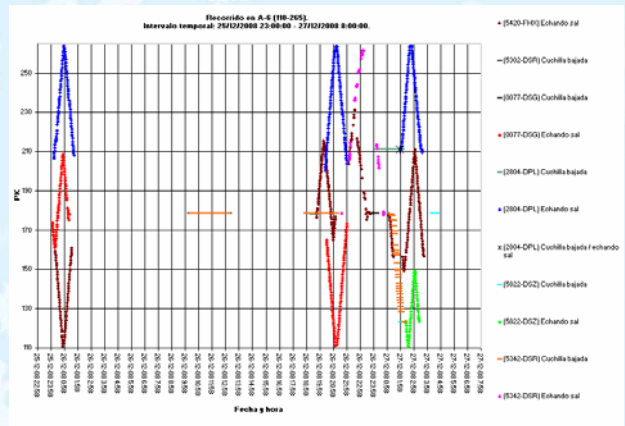
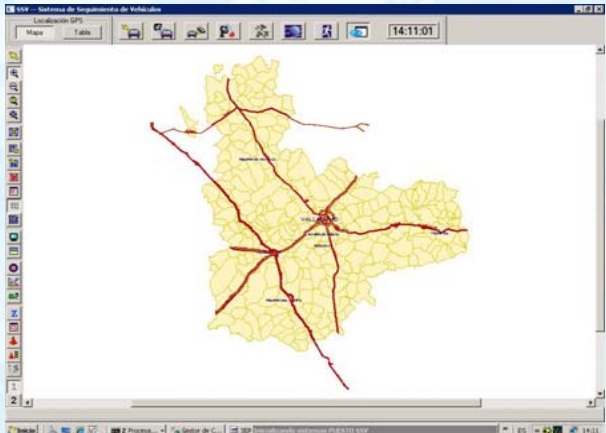


Portable Control Center



Control Center

GPS Control Panel + Report Generator



# Road Panels

