PureTech Systems Inc.

a Pure Technologies Ltd. company

Using Technology to Safeguard LNG & Petrochemical Terminals

July 2006

Agenda

- Introduction
- Threats to LNG and Petrochemical Terminals
- Consequences of realized threats
- Preparation and Prevention
- Defining Maritime Domain Awareness
- Securing Perimeters
- Threat Scenario
- Conclusion

Introduction

Larry Bowe, Jr. –

- Over 25 years experience in the high-tech hardware and software industry.
- 17 years developing mission critical software and systems including avionics systems and video security systems.
- Previously Director, Global Solutions Development for Honeywell and Vice President Business Development for Verint/Loronix.
- Bachelors of Science in Computer Science from Arizona State.
- Master of Business Administration from University of Phoenix.

Threats to LNG and Petrochemical Terminals

- Attack of docked ship via water with small craft and an Improvised Explosive Device (IED).
- Attack of ship or storage facilities via land by foot across perimeter using an IED.
- Attack of docked ships or storage facilities via land by vehicle through perimeter using an IED.

IEDs pose a serious threat.

Consequences

Event	Immediate Consequences	Delayed Consequences
▪ **Fires / Explosions**	▪ **Injury and death**	▪ **Mass panic**
▪ **Chemical releases**	▪ **Infrastructure damage**	▪ **long-term illness/ death**
	▪ **Vessel damage / loss**	▪ **Environmental damage**
	▪ **Business disruption**	▪ **Economic Impact –**
		▪ **Port operations**
		▪ **Vessel loss**
		▪ **Energy shortages**

Significant human and economic impact.

Preparation and Prevention

Preparation

- Vulnerability assessments
- Improved facility designs
- Improved physical security infrastructure
- Improved communications infrastructure
- Evacuation plans
- Rescue plans
- Fire response plans
- Security response plans
- Recovery plans
- Cross agency communication plans
- Emergency training and exercises

Maritime Transportation Security Act of 2002

Prevention

- Improved intelligence
- Restricted access
- Detection
- Armed vessels
- Vessel escorts

Ports reduce risks with preparation and prevention measures.

Maritime Domain Awareness

Comprehensive understanding of the current port situation

- Current areas of risks and threats.
- Authorized ship and personnel location and information.
- Anomaly detection – type, location, video.
- Automated communications - notify those with need to know and those responsible to act.
- Policy based responses and recovery.
- and more…

MDA – A comprehensive understanding of the current situation.

Threat Scenario

The Threats:

Unauthorized small craft in proximity of LNG Tanker at dock.
Unauthorized person breaches perimeter.
Unauthorized vehicle breaches perimeter.

The Response:

1. Detect, locate, classify, and track the threat.
2. Open communications - Notify Coast Guard, Terminal Security, and Port Security. Share information among responders.
3. Shut off pipeline valves.
4. Restrict access to tanker.
5. Sound warning alarm to small craft.

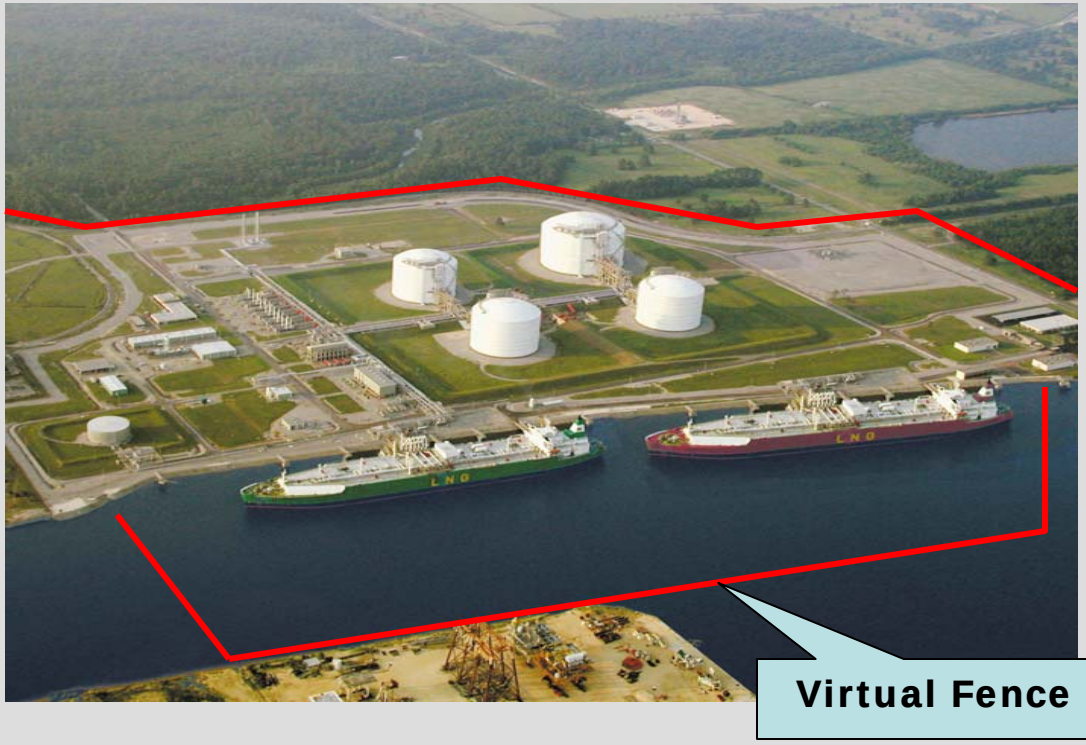
The Recovery:

1. Execute recovery procedures and checklists.
2. Notify all involved that coast is clear.
3. Return operations to normal.
4. Lessons learned report.

Securing Perimeters to Protect Against IED Attacks

What defines the perimeter of the port?

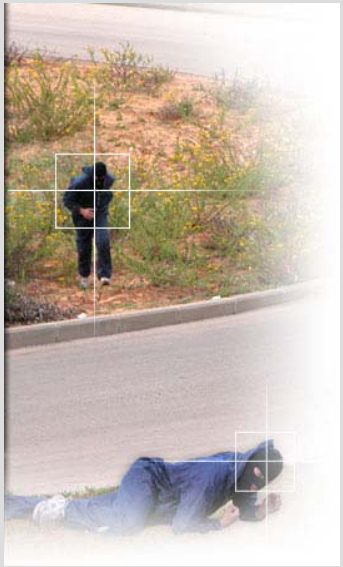
- Land-side
- Water-side
- Variable depending on threat level



Port perimeters are expansive and dynamic.

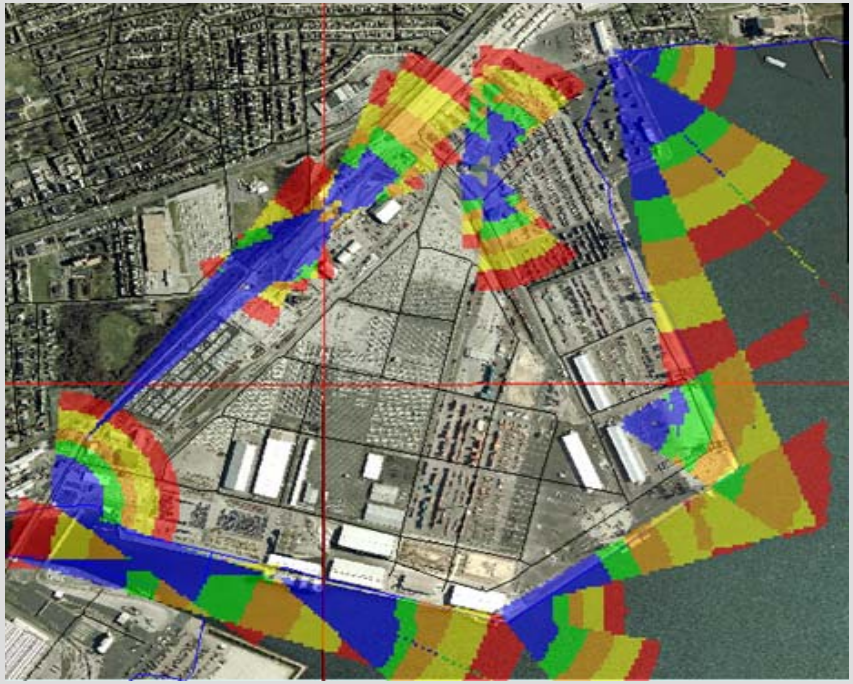
Sensor Considerations

- Sensor selection considerations
  - Required probability of detection
  - Tolerable false alarm rate
  - Required target detection range
  - Target size
  - Target speed
  - Weather conditions
  - Required response time
- Possible sensors
  - Vision sensors
  - Radar
  - Acoustic sensors
  - Fence sensors

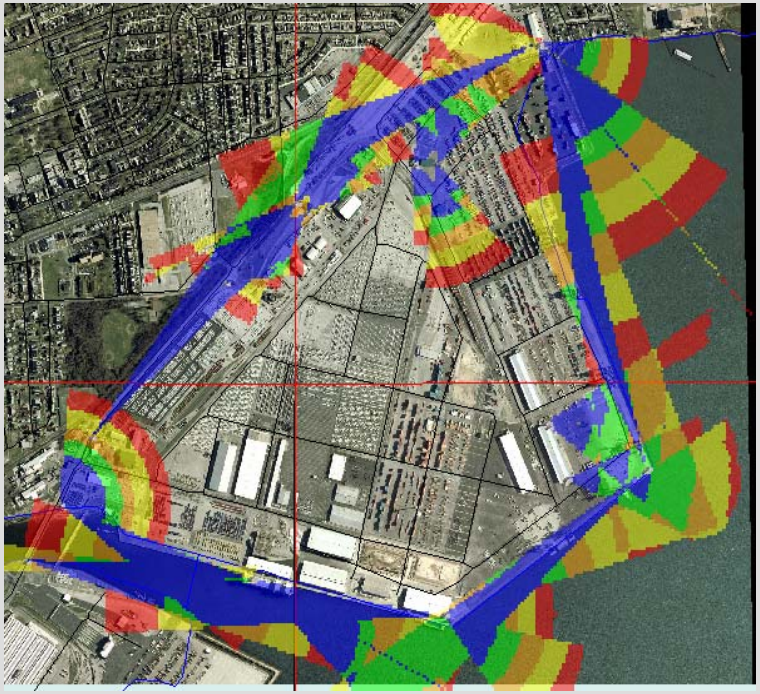


Operational requirements drive sensor selection.

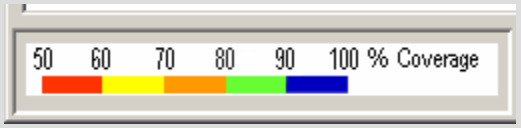
Sensor Coverage Assessment



Before



After



Proper sensor assessment yields improved detection.

rev 5

Layered Approach to Sensor Coverage

A layered sensor approach enhances protection.

rev 5

Interactive GIS Command and Control

- Live information is layered on top of GIS map.
- Camera locations and field of views are shown and updated in real-time
- Cameras are controlled by pointing and clicking on map

GIS technology enhances situational awareness.

Threat Scenario

The Threats:

Unauthorized small craft in proximity of LNG Tanker at dock.
Unauthorized person breaches perimeter.
Unauthorized vehicle breaches perimeter.

The Response:

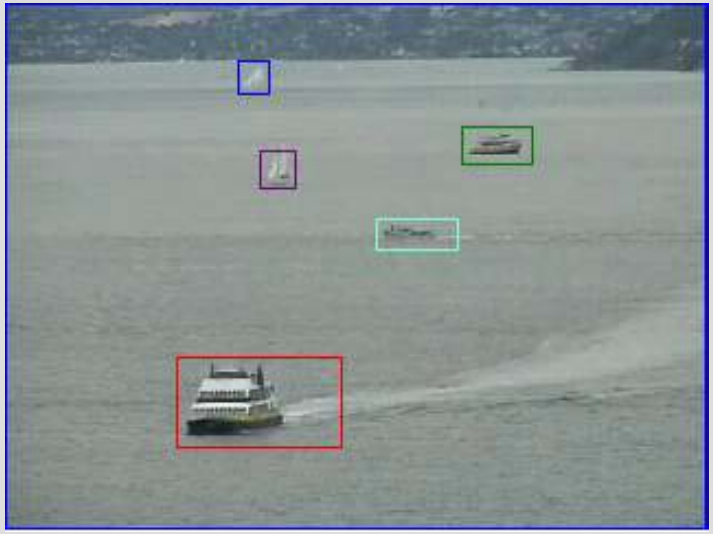
1. Detect, locate, classify, and track the threat.
2. Open communications - Notify Coast Guard, Terminal Security, and Port Security. Share information among responders.
3. Shut off pipeline valves.
4. Restrict access to tanker.
5. Sound warning alarm to small craft.

The Recovery:

1. Execute recovery procedures and checklists.
2. Notify all involved that coast is clear.
3. Return operations to normal.
4. Lessons learned report.

Response – Detect the Threat

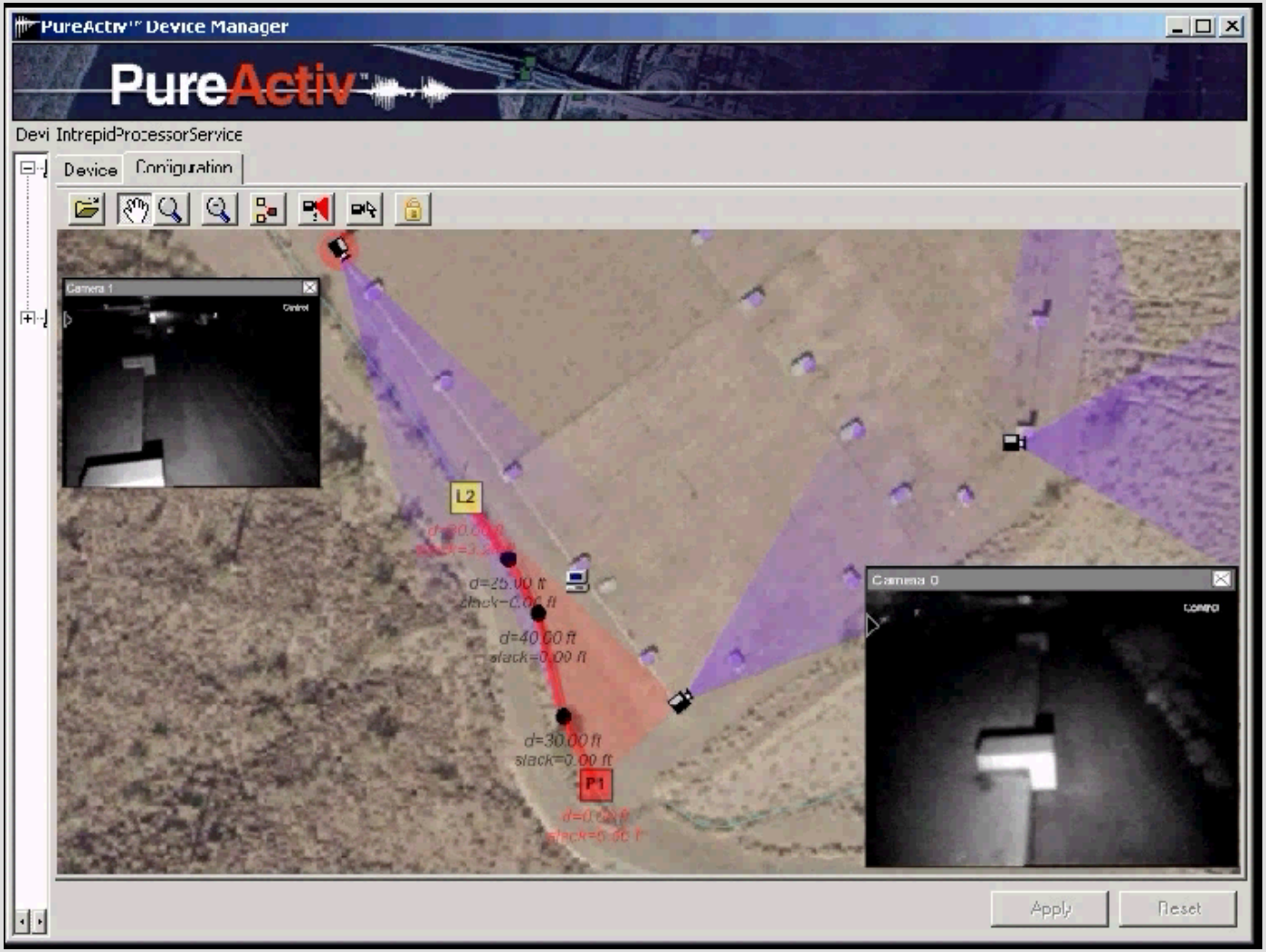
Detect watercraft and not birds, surf, or wakes.



Detect people intruding tunnel but not trains.

Detect anomalies.

Response – Detect the Threat



Slue camera to sensor position:

- Fixed camera
- Radar
- Acoustic sensors
- Fence sensors

Slue cameras to lat/lon from sensors.

Response – Detect the Threat

Continuously slue camera to sensor position:

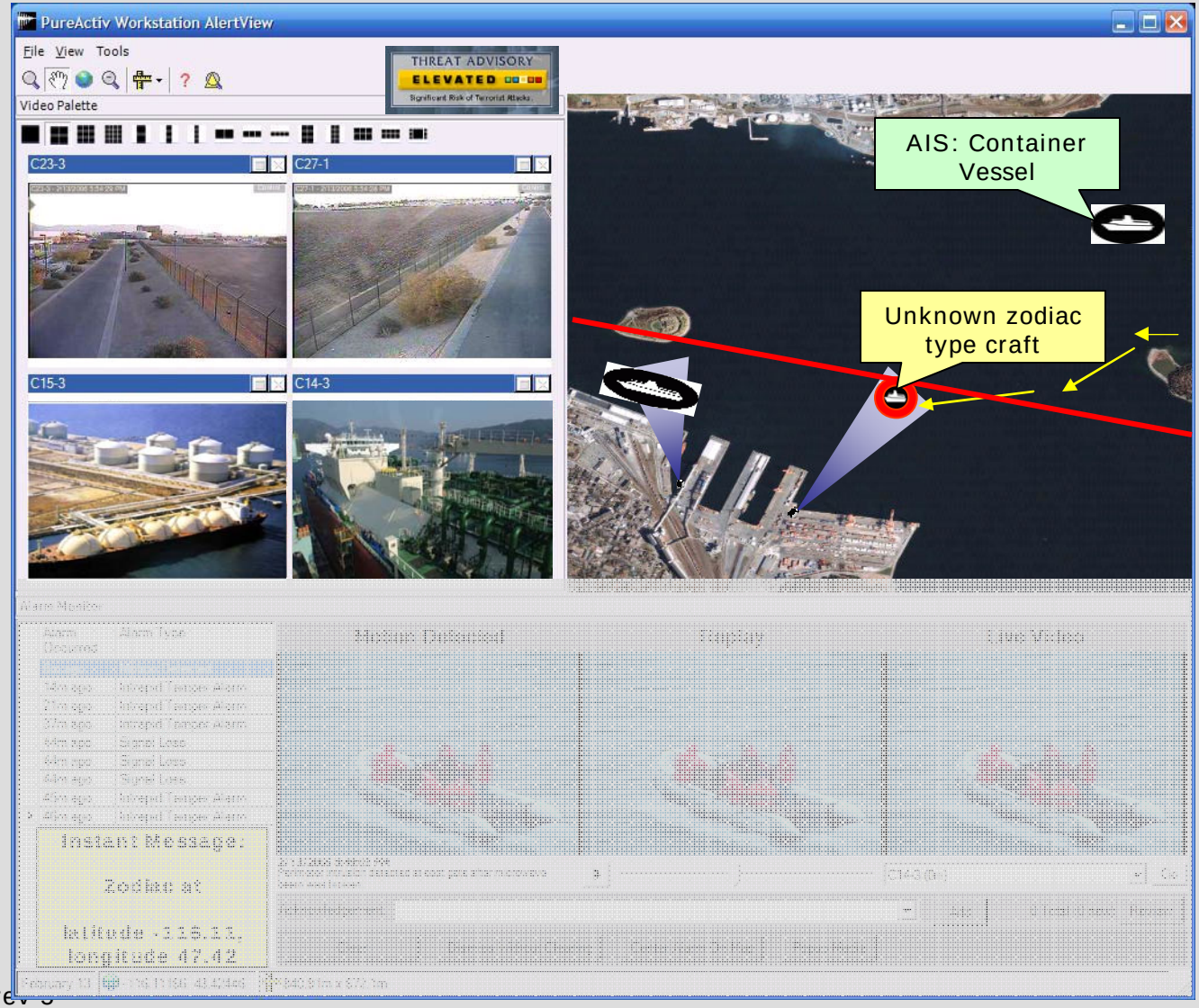
- Fixed camera
- Single PTZ camera
- Radar
- GPS receiver

System automatically tracks targets that violate policy.

Response – Detect the Threat

System analyzes scenes for abandoned objects.

Response – Detect, Locate, Classify, and Track the Threat

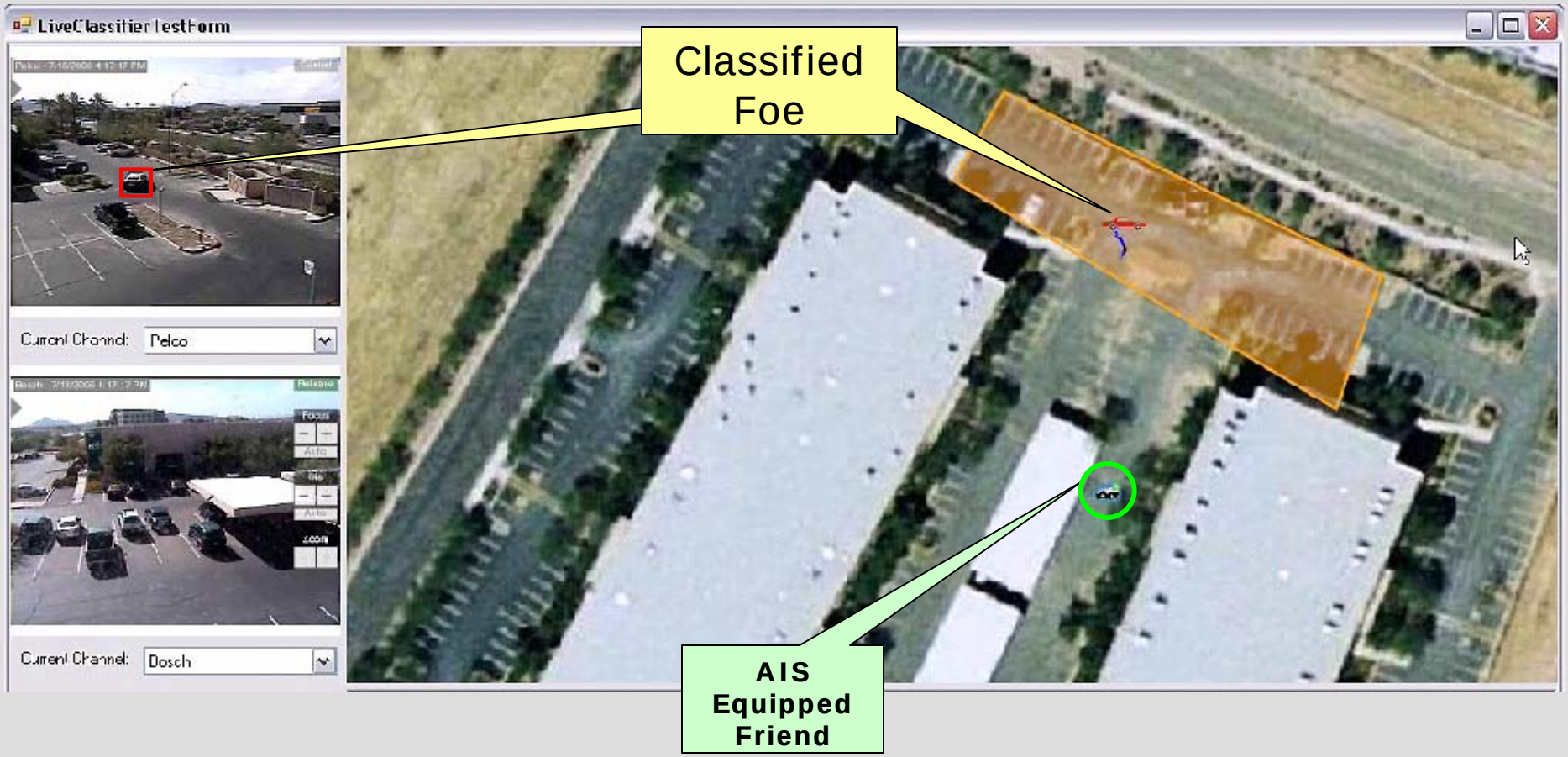


AIS tracks authorized vessels

Radar and cameras locate unauthorized vessels

Alarms when buffer zone is penetrated

Response – Detect, Locate, Classify, and Track the Threat



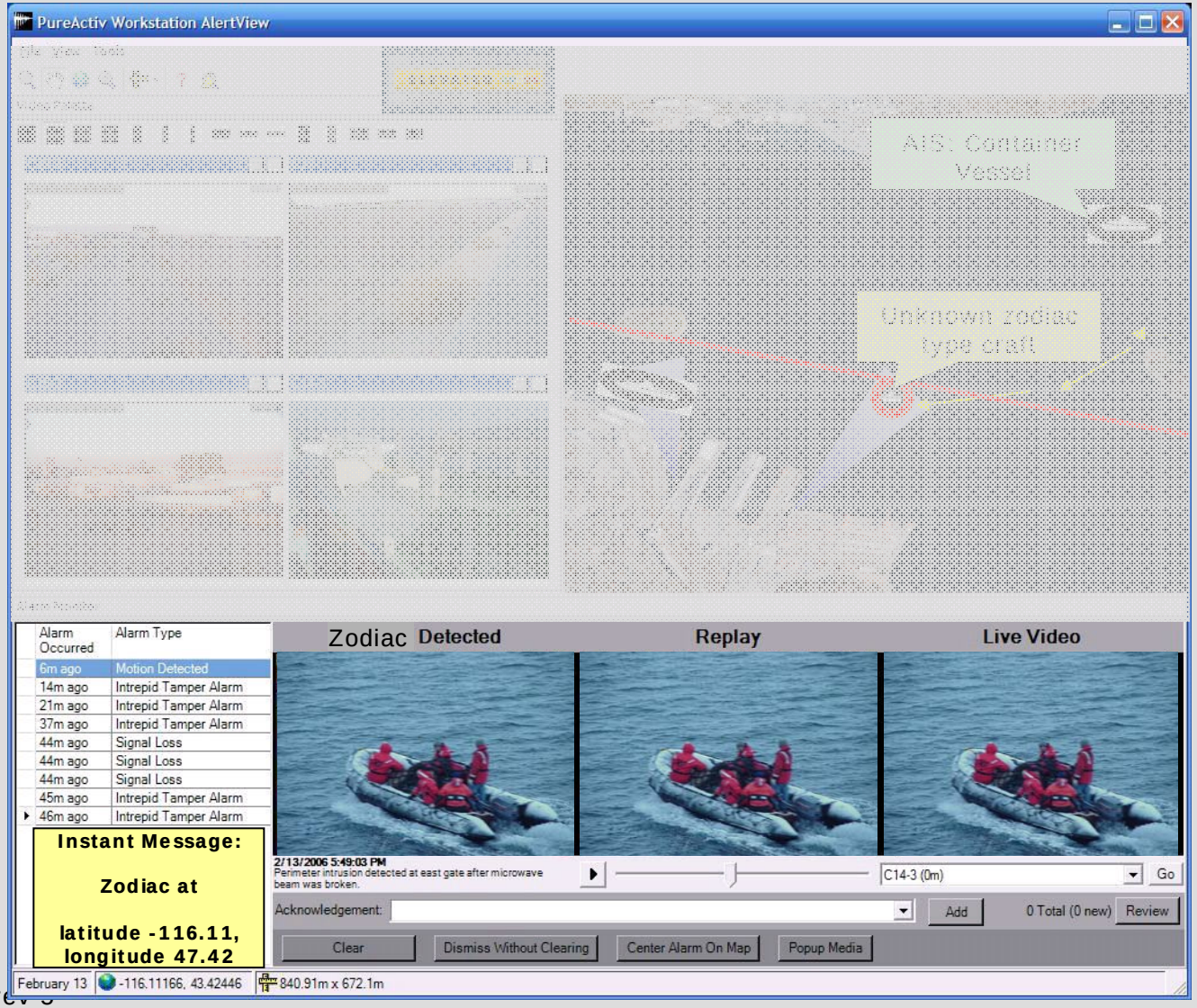
System focuses on unknown targets in areas of concern.

Response – Open Communications

Share information among responders.

rev 5

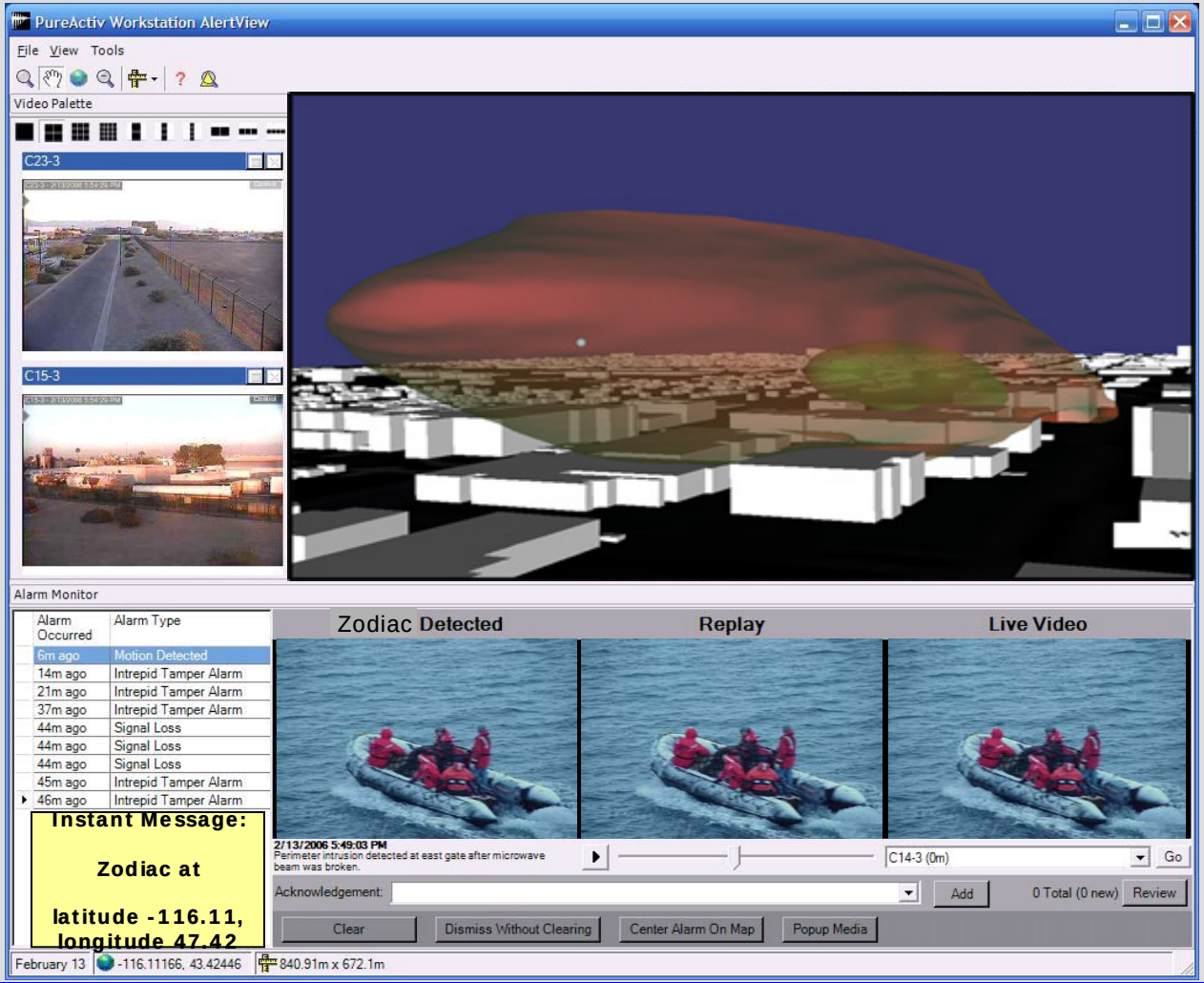
Response – Share Information



- Instant message sharing
- Still image of target
- Instant replay
- Live video
- Alarm acknowledgement
- Alarm clear

rev 3

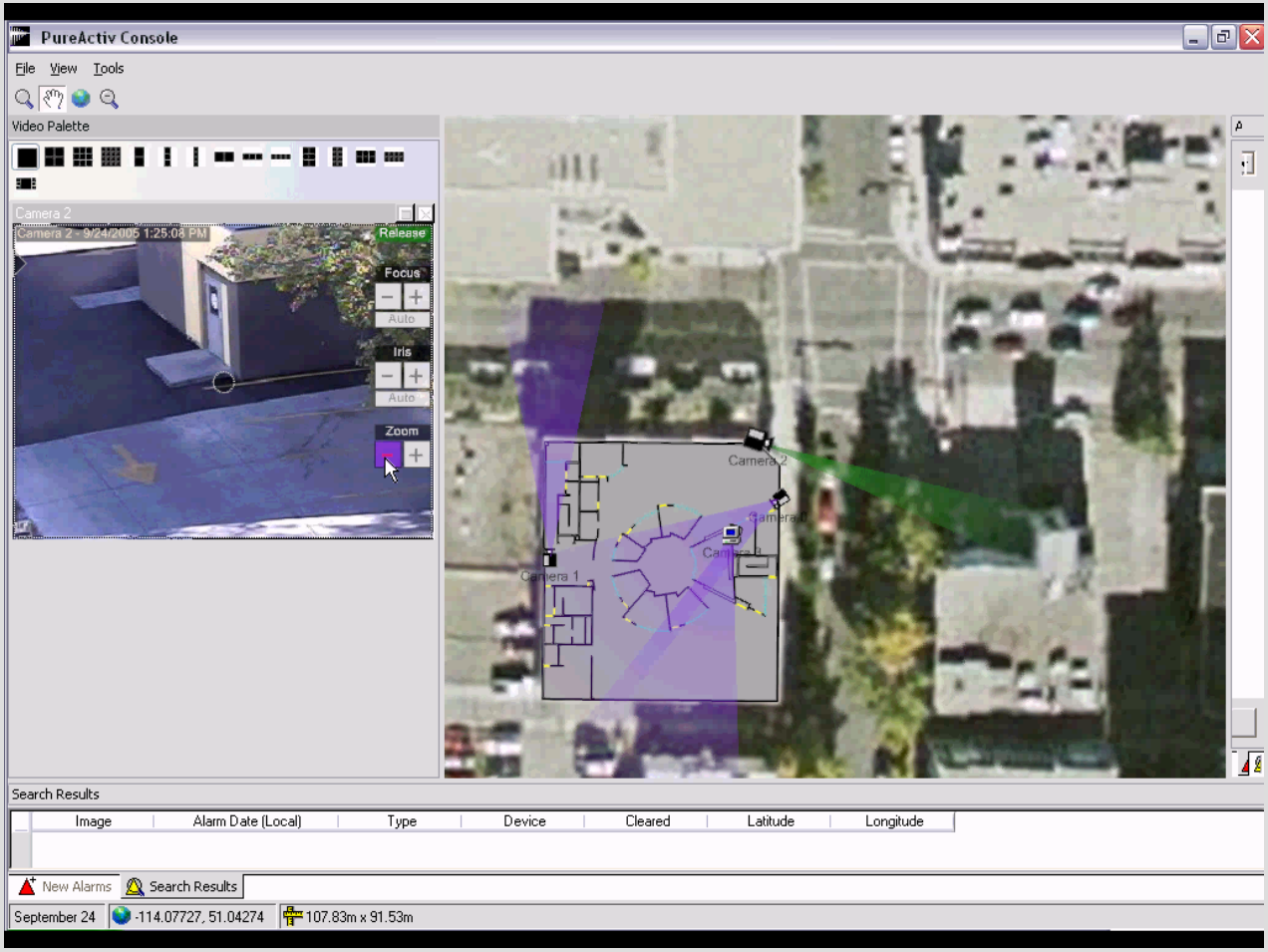
Response – Share Information
Recovery - Confirm Area is Clear



Assess current plume models for evacuation.

rev 5

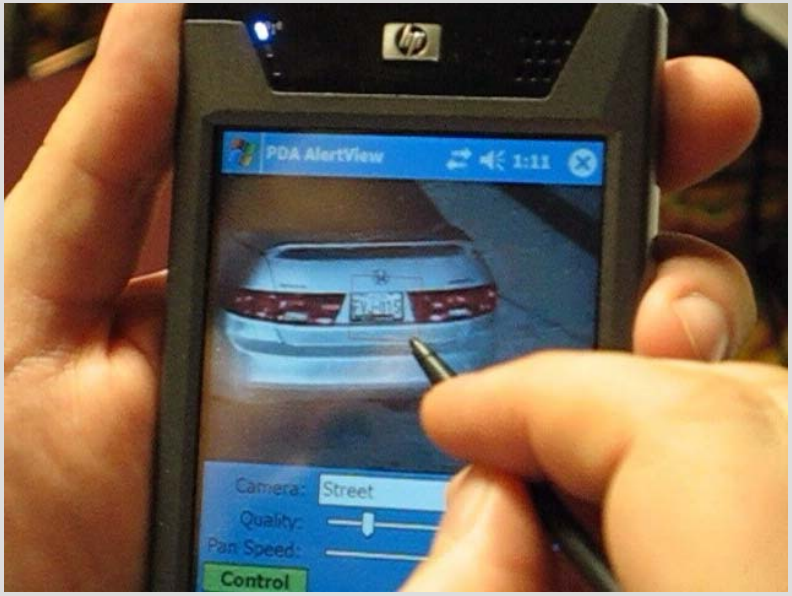
Response – Share Information
Recovery - Confirm Area is Clear



- Simple mouse or joystick control
- Control cameras by point and click
- Zoom map and video by dragging a rectangle
- Cameras' field of view shown on map

Responders control cameras to assess scene before entering.

Response – Share Information
Recovery - Confirm Area is Clear

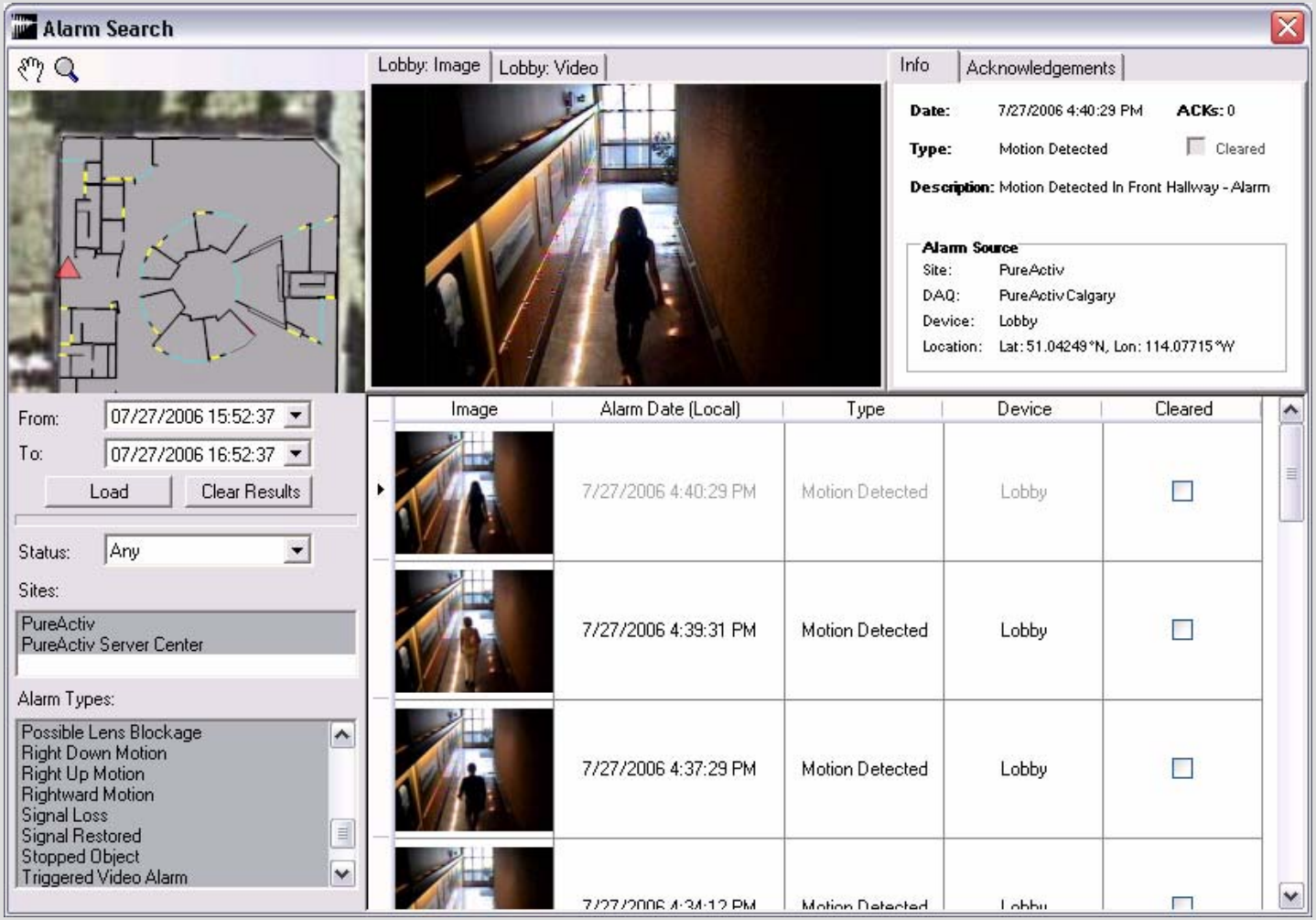


- Acknowledge and clear alarms
- Mobilize security personnel

- Control cameras by point and click
- Receive alarms in real-time

Responders control cameras to assess scene before entering.

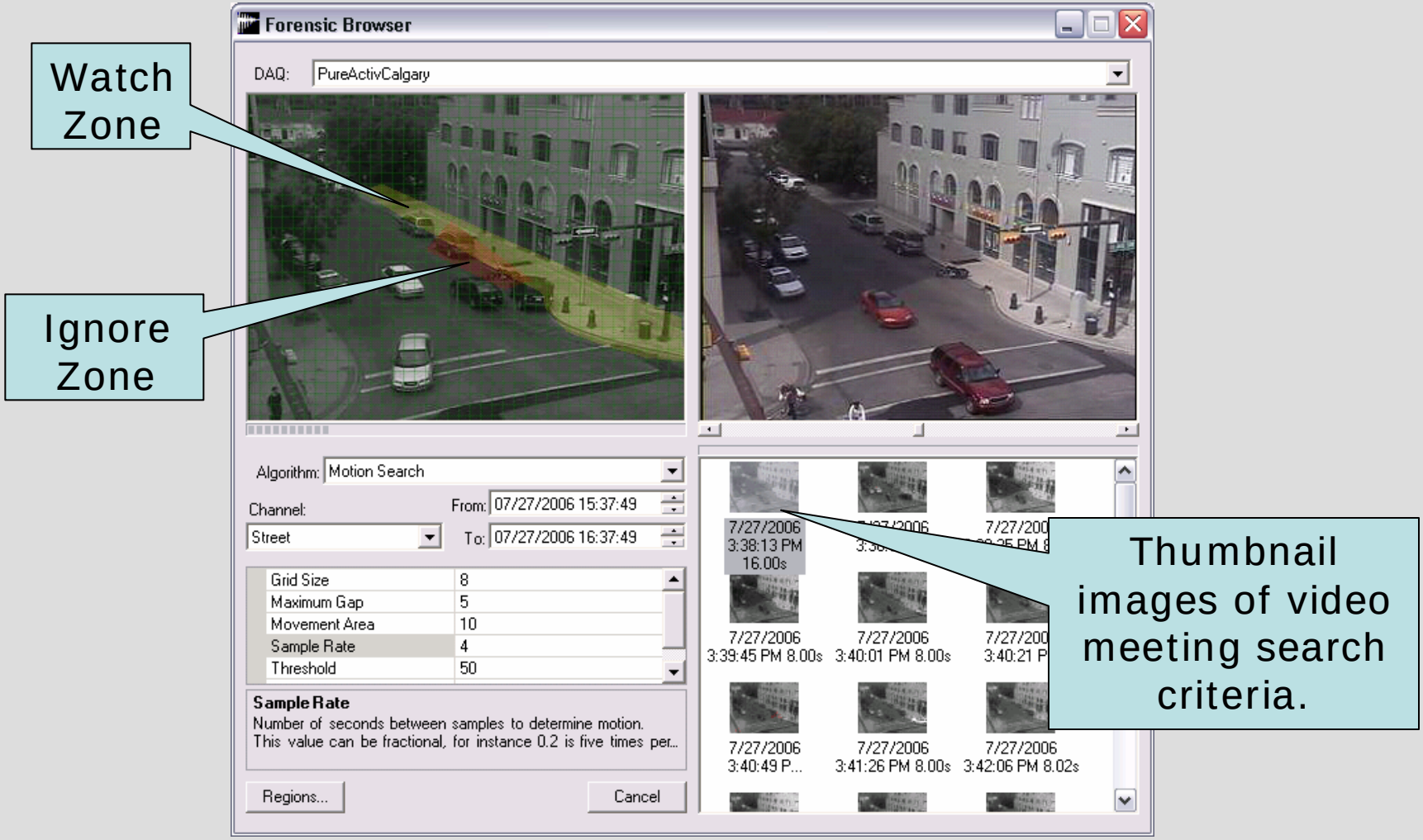
Recovery – Assess and document event.



Search for alarms that meet specified criteria.

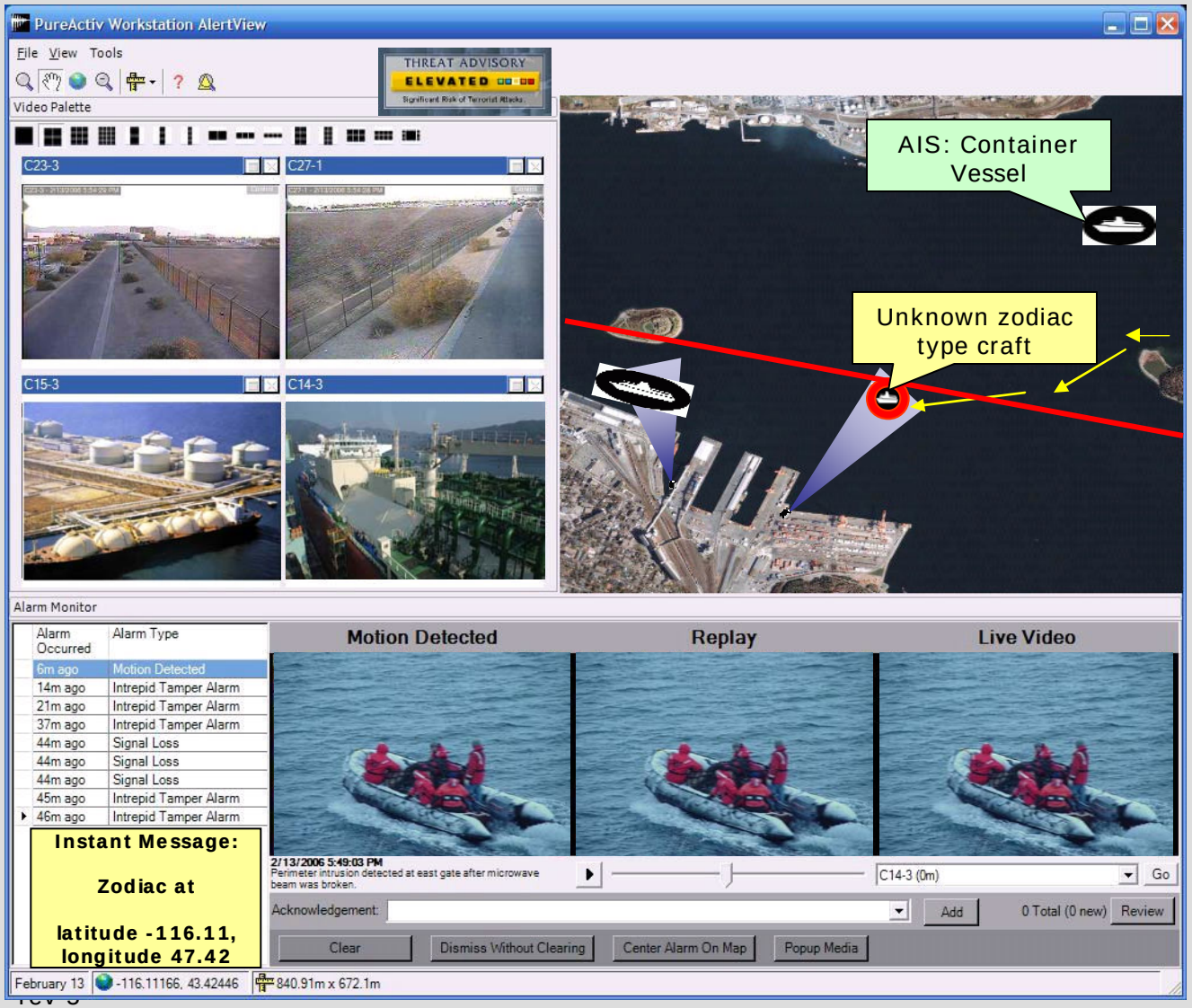
rev 5

Recovery – Investigate further



Quickly search recorded video for motion of interest.

Enhanced Maritime Domain Awareness



Current areas of risks and threats.

Authorized ship and personnel location and information.

Anomaly detection – type, location, video.

Automated communications - notify those with need to know and those responsible to act.

Policy based responses and recovery.

Conclusion

Technology can aid in safeguarding LNG and petrochemical terminals by enhancing Maritime Domain Awareness.