BTI Institute

Borders • Trade • Immigration

A Department of Homeland Security Center of Excellence

UNIVERSITY of HOUSTON

Kickoff: August 2nd, 2019

Measuring Border Wait Time at Land Ports of Entry: Technology Assessment and Data Dissemination

PI: Juan Carlos Villa

Other personnel:
Leonard Ruback, Senior Research Scientist
Swapnil Samant, Software Applications Developer
Carlos Silva, Research Specialist
Lorenzo Cornejo, Assistant Transportation Researcher
Jose Rivera, Assistant Transportation Researcher

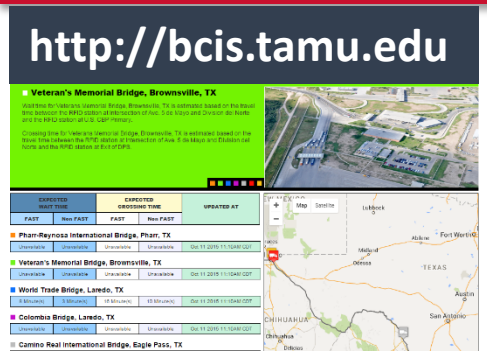
Project Overview

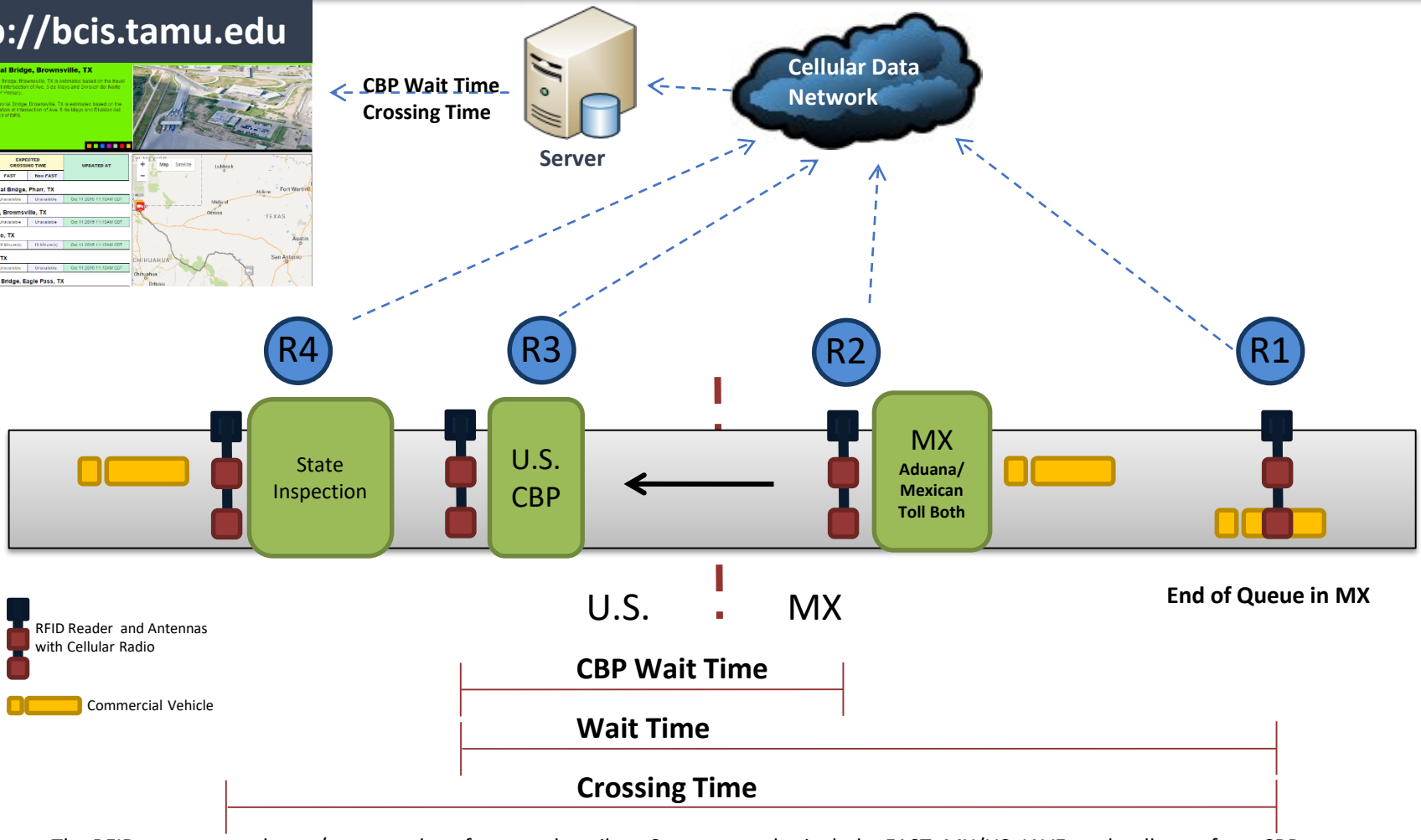
Goals: Improve the border crossing wait time measuring system, and analyze emerging technologies to strengthen the system capabilities to provide accurate border crossing times for Commercial Vehicles (CVs) and Privately Owned Vehicles (POVs).

Objectives:

1. Analyze current system operation and maintenance practices to identify improvements in system operation and information dissemination
2. Finalize Installation of RFID Equipment at Otay Mesa border crossings
3. Identify improvements to POV border wait time measurement
4. Research emerging technologies for dynamic vehicle wait time reporting
5. Overhaul the current border wait time measurement system software

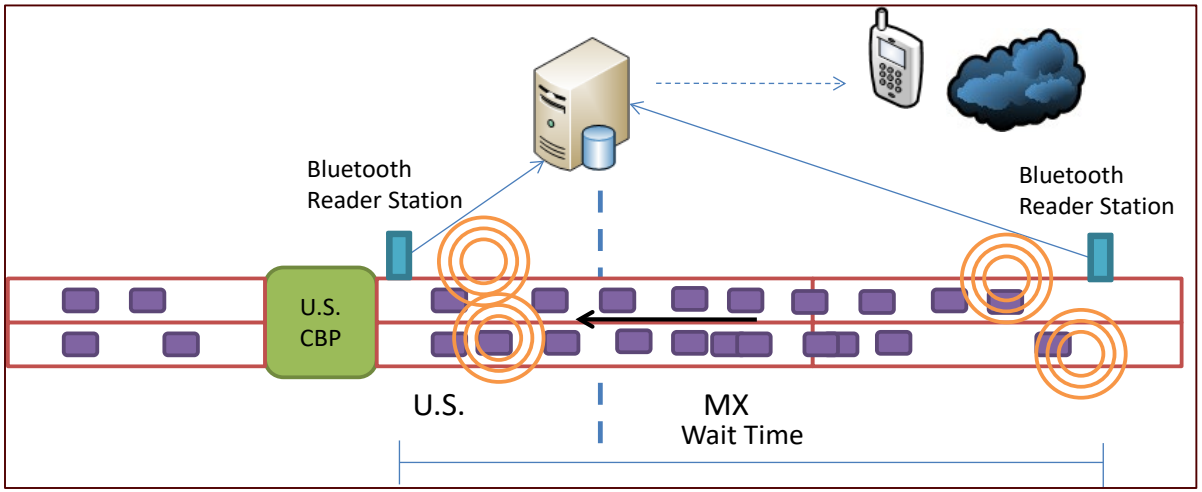
How RFID Based Wait and Crossing Time System Works?

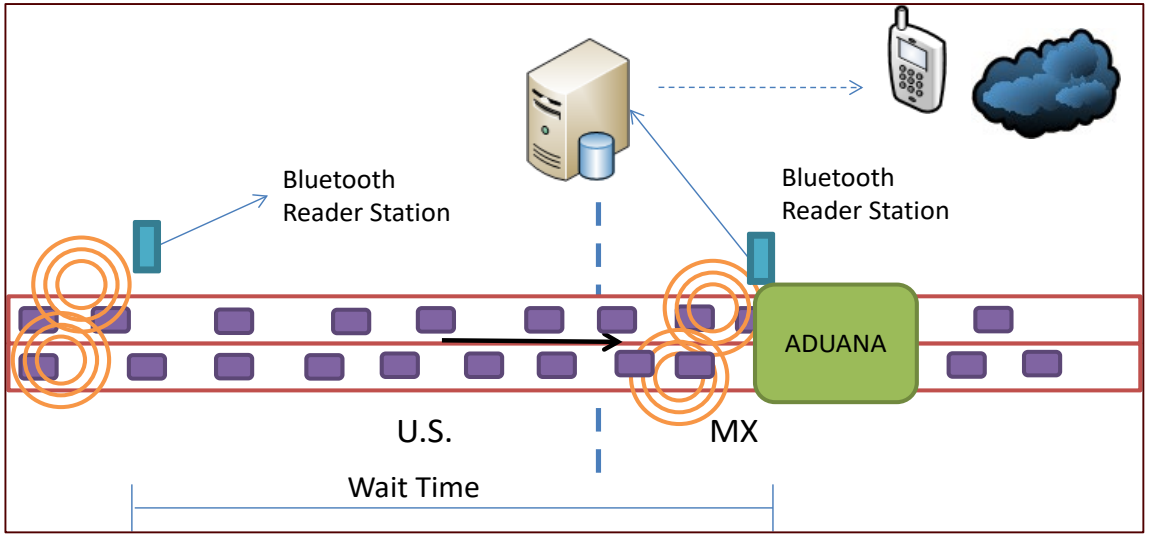




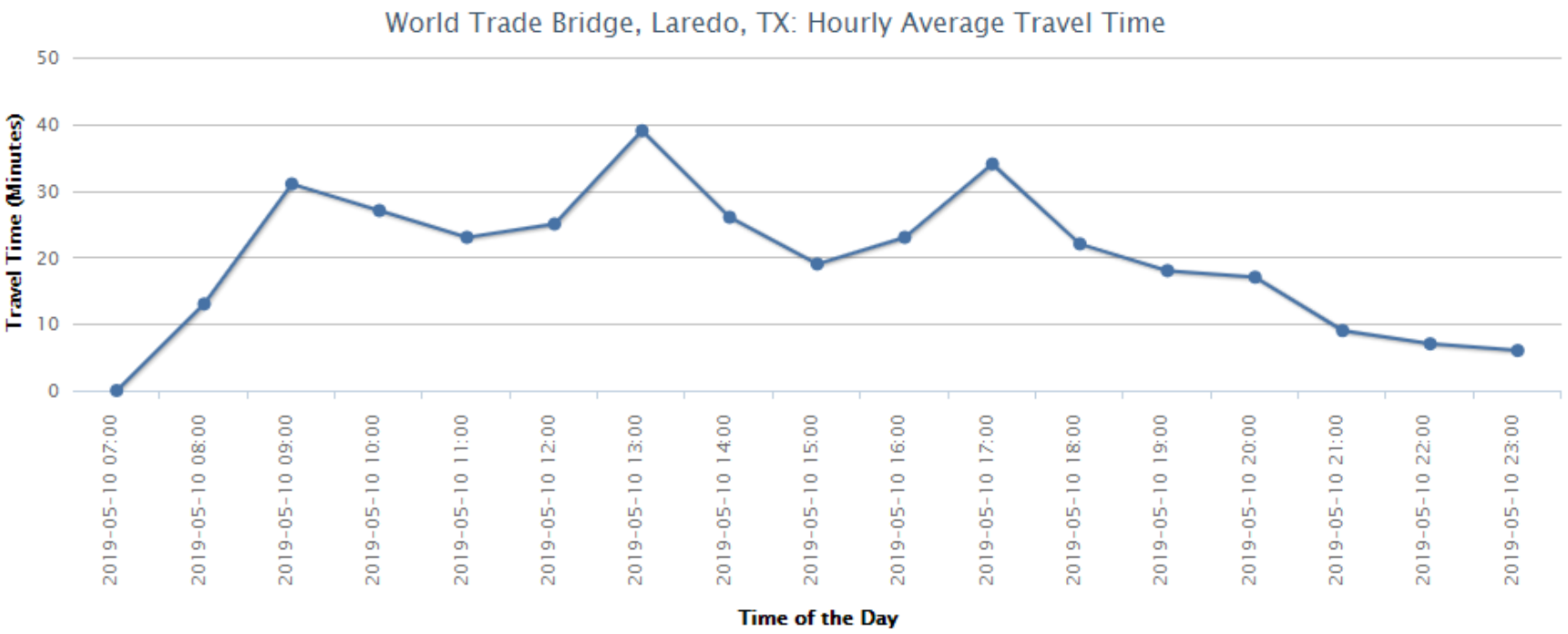
- The RFID sensors read tags/transponders from truck-trailers. Some examples include: FAST, MX/US, IAVE card, toll tags from CBP, etc.
- The system only captures the ID of the tag, does not include information about the vehicle.

How the POVs System Works?





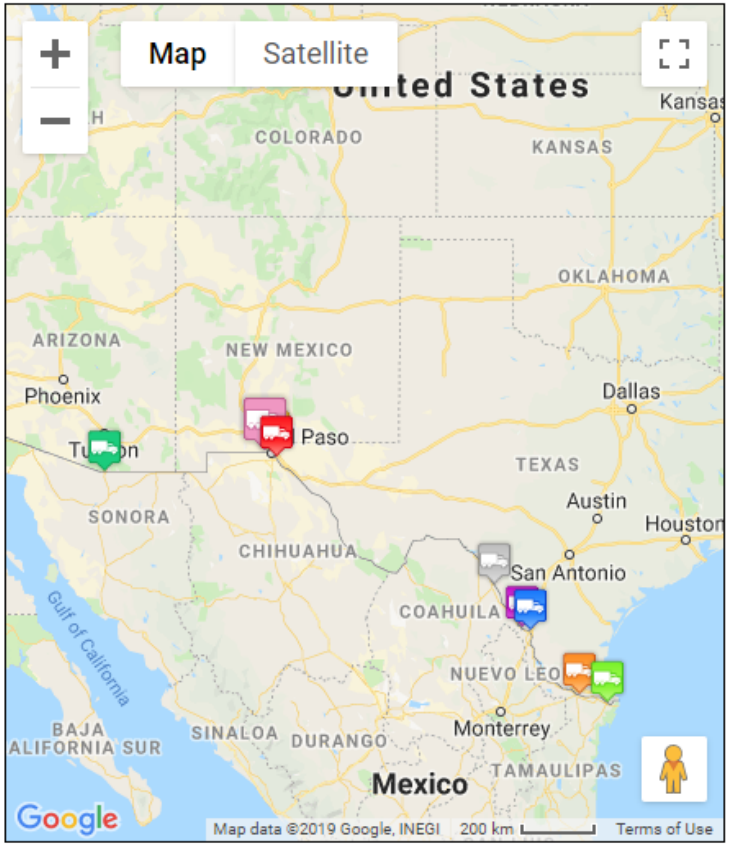
Archived Data – Hourly Average Wait Time



BCIS - Real Time Data

EXPECTED WAIT TIME		EXPECTED CROSSING TIME		UPDATED AT
FAST	Non FAST	FAST	Non FAST	
Veteran's Memorial Bridge, Brownsville, TX				
No Delay	No Delay	13 Minute(s)	13 Minute(s)	Jul 29 2019 10:40AM CDT
Pharr-Reynosa International Bridge, Pharr, TX				
18 Minute(s)	18 Minute(s)	46 Minute(s)	29 Minute(s)	Jul 29 2019 10:40AM CDT
World Trade Bridge, Laredo, TX				
No Delay	No Delay	20 Minute(s)	17 Minute(s)	Jul 29 2019 10:40AM CDT
Colombia Bridge, Laredo, TX				
No Delay	No Delay	12 Minute(s)	15 Minute(s)	Jul 29 2019 10:40AM CDT
Camino Real International Bridge, Eagle Pass, TX				
N / A [1]	No Delay	N / A [1]	No Delay	Jul 29 2019 10:40AM CDT
Ysleta Bridge, El Paso, TX				
44 Minute(s)	25 Minute(s)	71 Minute(s)	48 Minute(s)	Jul 29 2019 9:40AM MDT
Bridge of the Americas, El Paso, TX				
32 Minute(s)	33 Minute(s)	53 Minute(s)	66 Minute(s)	Jul 29 2019 9:40AM MDT
Santa Teresa Port of Entry, Santa Teresa, NM				
No Delay	No Delay	14 Minute(s)	14 Minute(s)	Jul 29 2019 9:40AM MDT
Nogales-Mariposa Port of Entry, Nogales, AZ				
No Delay	No Delay	18 Minute(s)	15 Minute(s)	Jul 29 2019 8:40AM MST

N / A[1] = Not available as there are no FAST lanes at this crossing



Data

Objective 1: Analyze current system operation and maintenance practices

- Monitor the sample size for each segment at the border crossings equipped with the Border Crossing Information System (BCIS).
- Monitor the number of RFID tags read by each RFID reader.
- Researchers will create monitoring metrics which would trigger automated notifications for maintenance.
- Data collected from RFID readers would be processed in real-time, at a centralized server, to compute wait times and crossing times.
- The computed wait times will be made available to CBP through an automated interface in real-time and also on the BCIS web portal for general public.

Objective 2: Finalize Installation of RFID Equipment at Otay Mesa border crossings

- Perform a penetration rate analysis for the Wait Time segment of the border crossing process

Student Involvement

Master's degree student will participate in:

- Assisting during the analysis of Bluetooth equipment (Task 4) as well as the Blockchain, GPS and emerging technologies (Task 5).
- Assisting on the project and could participate in preparing a submission for publication based on the work performed during the course of this project.

Undergraduate students will participate in:

- Assisting in data collection, technology analysis
- Assisting in programming and supporting the website status check.

Tasks

ID	Task	Start	End
T.1	**Project Management**		
	Task description: Kickoff Meeting and recurring meetings with stakeholders	08/19	12/20
		Deliverables	
		Meeting minutes, agreements, status meetings	
T.2	**Analyze current system operation and maintenance practices**	Start	End
	Task description: Analyze current practices to identify improvements in the way BCIS is operating. Operate and maintain the system, disseminate information to CBP and other stakeholders	08/19	12/20
		Deliverables	
		Inception report and monthly operations report	

Tasks

ID	Task	Start	End
T.3	**Finalize Installation of RFID Equipment at Otay Mesa border crossing**		
	Task description: Install and test RFID equipment at the California Otay Mesa Border crossing	08/19	12/20
		Deliverables	
		Penetration test report and Installation report	
T.4	**Research Blockchain and GPS technologies for dynamic vehicle wait time**	Start	End
	Task description: Study the viability of integrating vehicle GPS tracking and Blockchain technologies to report commercial vehicle wait times from Mexico into the U.S. dynamically.	02/20	09/20
		Deliverables	
		Emerging technologies White paper	

Tasks

ID	Task	Start	End
T.5	**Research Blockchain and GPS technologies for dynamic vehicle wait time**		
	Task description: Study the viability of integrating vehicle GPS tracking and Blockchain technologies to report commercial vehicle wait times from Mexico into the U.S. dynamically.	02/20	09/20
		Deliverables	
		Emerging technologies White paper	
T.6	**Develop a more efficient border wait time measurement system**	Start	End
	Task description: Overhaul the current border wait time measurement system software.	10/19	09/20
		Deliverables	
		Website and Database report, and algorithm for server side software report.	

Tasks

Texas A&M Transportation Institute		Duration	Calendar Year 1 (2019)					Calendar Year 2 (2020)									
ID	Tasks		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
T.1	Project Management	16 months																
T.2	Analyze current system operation and maintenance practices	16 months																
T.3	Finalize Installation of RFID Equipment at Otay Mesa border crossings	6 Months																
T.4	Identify improvements to POV border wait time measurement	6 months																
T.5	Research Blockchain and GPS technologies for dynamic vehicle wait time	8 months																
T.6	Develop a more efficient border wait time measurement system	12 months																

Deliverables

ID	Description	Type	Date
	Task 1		
D.1	Monthly system operation report	Report	Recurring
	Task 3		
D.2	Penetration test report	Report	01/2020
D.3	Final installation report	Report	01/2020
	Task 4		
D.4	Bluetooth analysis report	Report	06/2020
	Task 5		
D.5	Innovative technologies white paper	Report /Paper	09/2020
	Task 6		
D.6	New border wait time measurement system software	Report	09/2020

Milestones

ID	Description	Date	Means of verification
		Task 2	
M.1	System Operation (continuous)	10th day of the month	Reliability of the system measured in hours of system downtime
		Task 3	
M.2	Otay-Mesa System reporting Wait Time	October 2019	System transmitting information to CBP on a regular basis
M.3	Otay-Mesa System reporting Crossing Time	January 2020	System transmitting information to CBP on a regular basis
		Task 4	
M.4	POV research prototype	March 2020	POV lane detection prototype
M.5	POV research test	May 2020	Prototype test at the RELLIS campus
M.6	Bluetooth analysis report	June 2020	Bluetooth analysis report

Milestones

ID	Description	Date	Means of verification
		Task 5	
M.7	Emerging technologies white paper	September 2020	Paper submitted for publication
		Task 6	
M.8	Border wait time measuring system	September 2020	System is estimating border wait times accurately and responds to queries efficiently

Performance Metrics

Research and Innovation KPIs		Date	Means of verification
KPI-RI-1	Bluetooth system functionality to measure border wait time by lane	May 2020	Successful test at RELLIS
KPI-RI-2	Improved software to measure and report border wait times	September 2020	System operates efficiently and provides information to CBP
Dissemination KPIs (HSE, scientific community, public)		Date	Means of verification
KPI-D-1	Innovative Technologies Paper	September 2020	Paper submitted for publication
KPI-D-2	Data delivered in a timely manner	Throughout the project in a regular basis	CBP receives data

Transition Plan

- Stakeholder Engagement
  - The Research Team will work closely with CBP's field offices to ensure that the estimated border wait time information is disseminated efficiently and will respond to any request to prepare special reports.
  - The Research Team will consult with CBP field office representatives in Washington to identify any new technological developments at the U.S./Canada border that could be used to improve the system.

- Notional Transition Plan
  - The Research Team will work with the Project Champion to assure the border wait time information is reliable.
  - The results of the new technology analysis will include recommendations for implementation that will be presented to CBP for further analysis and potential transition to pilots.

Programmatic Risks and Mitigation Plans

R.1 Uncooperative Mexican Customs – Medium Risk (task 3)

- Present objectives and benefits to Mexican Customs Director and obtain approval from Headquarters
- Obtain support from Mexican DOT
- Inform CBP and request support as needed

R.2 Delays in obtaining permits from California authorities – Low (task 3)

- Present project objectives to local authorities
- Secure local authorized contractor with experience working at the CHP site

R.3 Major natural disaster – High (task 2 and 3)

- Have a reserve budget for parts and other elements that would need to be replaced in case of a major disaster damaging the field equipment

Next Steps

- Define start date
- Define monthly conference call schedule