

Government of Puerto Rico
Department of Transportation and Public Works
Highway and Transportation Authority
Environmental Studies Office

New Approaches in the Evaluation of Highway Design to Avoid and Minimize Impacts on Trees

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Presentation Outline

- **Design Modifications in Medians**
- **Design Modifications in Route Alignments**
- **Design Modification in Slopes**
- **Design Modification in Drainage**
- **Tree Impact Minimization**
- **Tree Impact Avoidance**
- **Other Related Initiatives**
- **Conclusions**

Introduction

- **The concern about tree conservation has grown dramatically in the last decade. One of the most important measures taken by the Government of PR related to this matter was the creation and implementation of the Tree Regulation for Planting, Cutting and Reforestation for Puerto Rico, Regulation Number 25 of March 16, 1996.**
- **On February 11, 1997, our Agency signed the Resolution Number 97-03. This resolution reinforces Regulation Number 25 by establishing an internal policy for the conservation of all trees that can be protected in the design and development of transportation project, within a reasonable framework and economic feasibility.**

Introduction

- **Under the leadership of our Agency, an Urban Reforestation Advisory Group was also created with representatives from leading environmental organizations with special interest in reforestation and tree conservation such as: Department of Natural and Environmental Resources, Forest Service, Conservation Trust of Puerto Rico, Fondo Dotal Enrique Martí Coll, among others.**
- **The organization of this presentation is based on the design modification carried out in the development of transportation projects whether it is related to the median, route alignment, slopes, or drainage.**

Location of Highway Projects in which Tree Impact Avoidance or Minimization is Proposed or has been Accomplished



Projects

- | | |
|---|---|
| 1. "Ceiba "Trees" at PR-2, Quebradillas | 8. PR-10, Utuado |
| 2. Widening of PR-115, Rincón | 9. Widening of PR-30 from PR-1 to PR-203, Caguas - Gurabo |
| 3. Widening of PR-3, Arroyo | 10. Improvement to PR-18 and PR-22, San Juan |
| 4. Piñones Trail by PR-187, Loiza | 11. Improvement to Buchanan Toll Station at PR-22, Guaynabo |
| 5. Improvement to PR-303, Cabo Rojo | 12. Conector PR-149 to PR-6685, Manatí |
| 6. PR-138 South Bypass, Coamo | 13. Improvement and Relocation of the Driving Test Area on PR-187, Carolina |
| 7. PR-53, Maunabo - Yabucoa | |

Design Modifications in Medians

“Ceiba” Trees at PR-2, Quebradillas



- **Before Regulation Number 25 and Resolution Number 97-03 an alignment modification to conserve two “Ceibas” trees in highway PR-2 median was done from approximately 1987 to 1989.**
- **Community awareness and public participation were some of the principal reasons that convinced the agency to make the design modifications.**
- **The success of the work done has created a precedent in letting the community know the willingness of the agency to make a design modification to conserve trees.**

Widening of PR-115, Rincón



- The original design was a threat to the conservation of a typical rural road where you can find big mature trees at both sides of the road.
- After a process of effective coordination with an environmental group “Liga Ecológica de Rincón”, an innovative way for carrying out the widening was undertaken.
- Trees at both sides of the original two lanes road were maintained by creating a road parallel to the original road. Now the trees between the old road and the new one is a forested median by well developed trees.

Widening of PR-3, Arroyo



- This project is under construction and has similar conditions as the previously mention project at PR-115 in Rincón.
- Trees at both sides of the original road were maintained. A median 6 meters wide and 90 meters long will be protected with the existing trees.

Design Modifications in Route Alignment

Improvements to PR-303, Cabo Rojo



- **This is an already constructed project to improve an original dirt road of 2.6 kilometers.**
- **Successful coordination between the Environmental Studies Office of our agency and the Design Area made possible several design modifications that resulted in the preservation of several healthy mature “Guayacán” trees.**

PR-138 South Bypass, Coamo



- Under project construction, a healthy mature Ceiba tree of 60 feet in height and 4 feet in trunk diameter was found near the centerline.
- To avoid cutting this tree, several alternatives were evaluated including transplanting, a split road, or a side bypass.
- After evaluation of different alternatives, the “west bypass” was selected as the design with the least impact on existing trees.

Design Modification In Slopes

PR-10, Utuado



PR-10, Utuado



PR-22, Barceloneta

- The purpose of this project is to connect the north and south portions of Puerto Rico through the middle of the island.
- One segment of this road crosses the eastern part of the Río Abajo State Forest located on the karst region of PR where several endangered and threatened species are found.
- One of the measures taken to minimize the impact was the reduction of slopes cuts. Instead of making terraces, an almost a vertical cut was made and in this way a significant portion of the forest was maintained and preserved.

Widening of PR-30 from PR-1 to PR-203, Caguas – Gurabo



- This project consists of the widening of approximately 6 kilometers of highway PR-30.
- This project was the subject of discussion in one of the regular meetings with the Reforestation Advisory Group and it was the consensus that the construction of a wall would significantly minimize the impact on trees and thus was the selected alternative.
- The wall covers approximately one third of the total project length, about 1.75 kilometers.
- In addition to the highly effective method for avoiding the impact on trees, it was not necessary to acquire additional lands for the development of the project in those particular areas.

Improvements to PR-18 and PR-22, San Juan



- This project is located in one of the principal expressways in the San Juan Metropolitan Area.
- As part of the project it might be necessary to impact a loop where there are 296 Mahogany Trees.
- The consultant provided several alternatives for the consideration of the Reforestation Advisory Group. Among these, there were the typical fill in a 2:1 grade, a conventional wall and a mechanically stabilized earth wall.
- The last mentioned alternative has the lesser impact to trees; even so it is necessary to cut 70 trees. With the typical grade the net loss of trees would be 109 trees.
- Until now there is not a consensus between the Reforestation Advisory Group and our Agency and both are continuing evaluating others alternatives

Design Modification in Drainage

Improvements to the Buchanan Toll Station at PR-22, Guaynabo



- This project is in the design phase and consists of the constructions of six additional tollgate lanes to improve traffic circulation.
- The original design included a drainage structure on the north side of the project, which could adversely affect a row of trees.
- Through the initiative of the Design Area a modification in the drainage design was made. It consists in the construction of a box culvert under the paved roadway which requires less terrain and it significantly minimizes the tree cut on the project.
- This is a good example of the implementation of Resolution Number 97-03

Tree Impact Minimization

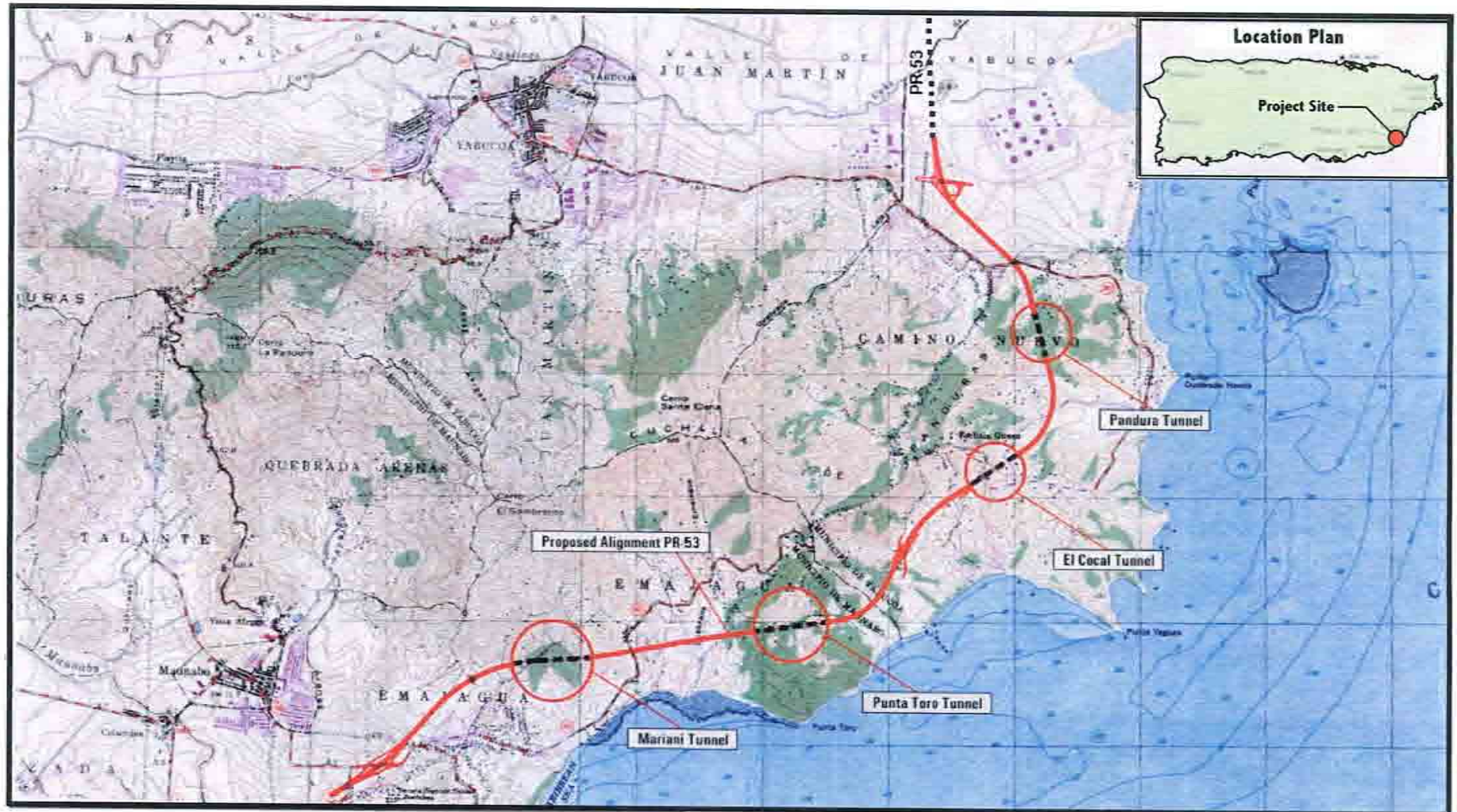
Piñones Trail by PR-187, Loíza



- This is a pedestrian project developed on lands of the Piñones Public Forest as well on lands near the beach in Loiza.
- Extensive coordination with different agencies like USFWS, Forest Service and the DNER was undertaken.
- To minimize tree impact the following measures were undertaken:
 - ▶ Utilization of existing trails and areas without trees.
 - ▶ Creation of split route in which existing trees stayed in the middle of the path.
 - ▶ Lifted boardwalk on wetland areas.



PR-53, Maunabo - Yabucoa



0.5 5 0.5 10 KM
Scale 1:30,000

PR-53, Maunabo - Yabucoa



- The alignment of this proposed project cross the eastern side of the Central Mountain Range known as Cordillera Central where Sierra Cuchilla de Panduras is found.
- This is a high steep mountain formation dominated by secondary forest in which several endangered and threatened species are found. Among these a small Puerto Rican toad called “Guajón” is found in the area.
- An alternative analysis was carried out with a strong coordination with the Maunabo Development Committee.
- After these meetings a route was selected which included four tunnels of almost 2 kilometers in length that minimize the environmental impact and will also preserve a significant amount of natural resources found in the area.

Tree Impact Avoidance

PR-149 to PR-6685 Connector , Manatí



- This was a construction request by the Municipality and evaluated by personnel of the Design Area and the Environmental Studies Office.
- During the field evaluation two very old Oxhorn Bucida, locally known as Ucar, were identified at the site. One of them was later identified as the Champion Tree for this species.
- For this reason the proposed alignment was discarded.

Improvements and Relocation of the Driving Test Area on PR-187, Carolina



- This project is located on lands of the Luis Muñoz Marín Airport at the front of Isla Verde Public Beach.
- During the tree inventory made for compliance of Regulation Number 25, it revealed that it was necessary to cut 538 trees for the development of the project.
- Because of the magnitude of the number of trees to be removed, it was decided to postpone the project until a lesser impact alternative project is developed.

Other Related Initiatives

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- **An Agronomist was recruited in the Construction Area to supervise the planting plans for the Agency. This is a certified arborist by the International Society of Arboriculture and has vast experience in the field.**
- **Revisions of the contract specifications and the standard drawings related to planting plans have been made and may be subjected to additional changes when necessary.**

Conclusions

Conclusions

- **Under the leadership of our Agency several initiatives has been undertaken to avoid and minimize tree impact on proposed projects. Among these the following are the most significant:**
- **A new policy to avoid, minimize or mitigate the impact on trees on proposed projects has been implemented by Resolution Number 97-03. This resolution reinforces the Tree Regulation for Planting, Cutting, and Reforestation for Puerto Rico.**
- **The creation of the Urban Reforestation Advisory Group is another effective mechanism in the evaluation of different project alternatives and the development of new ideas to avoid and minimize impacts to trees.**

Conclusions

- **Community involvement, especially by environmental groups, in the design phase of the projects, is also another proven effort, which is instrumental in the reduction of the tree impacts on projects.**
- **The examples given in this presentation support the willingness of our Agency to comply with the public policy established to avoid, and minimize the tree impacts on proposed projects.**
- **Besides the great effort put on this matter, it has to be considered that this is a new field for us and we are on the way on learning how to deal with these issues.**