

Nutrient Monitoring Program Bonaire

A photograph of a sea turtle swimming over a coral reef in clear blue water. The turtle is the central focus, swimming towards the right. The reef is composed of various coral species, including some with feathery or branching structures. The water is a deep, clear blue, and the overall scene is well-lit, suggesting a healthy marine environment.

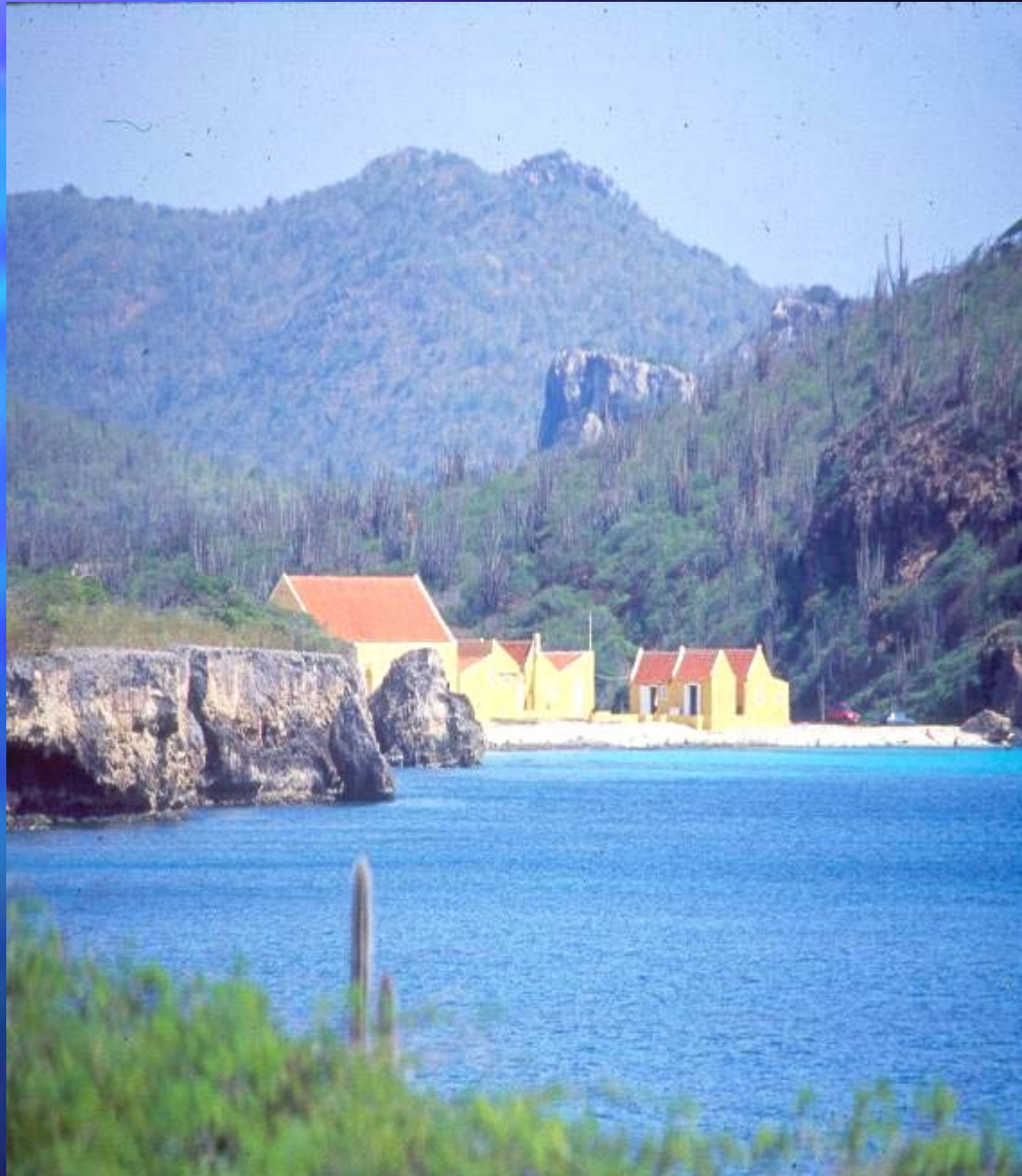
June 2007

Bonaire

Frank van Slobbe

Overview

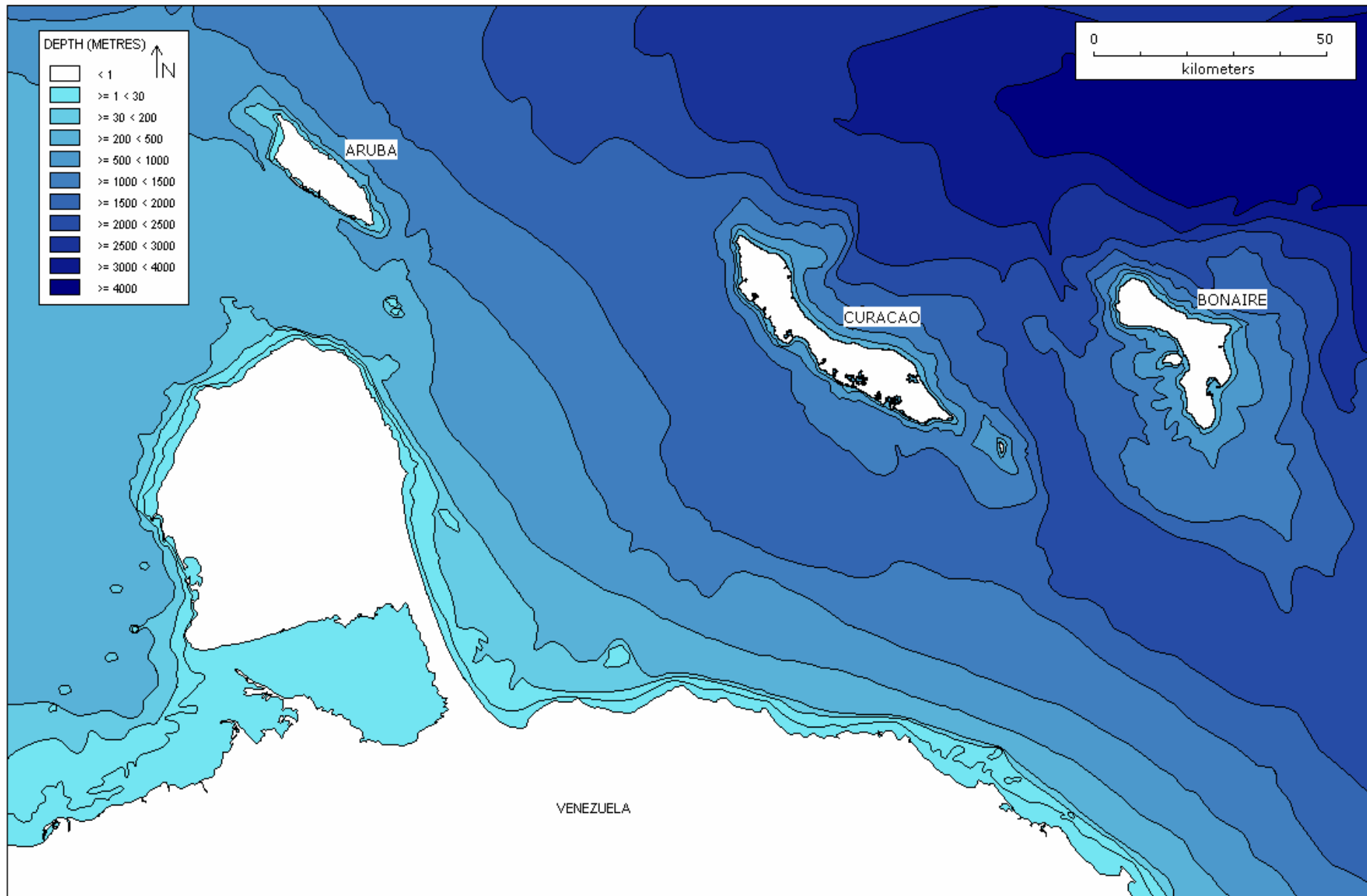
- Background of Bonaire & BNMP
- Potential Nutrient Sources
- Justification of Sampling Locations
- Bonaire Sewage Project
- Discussion



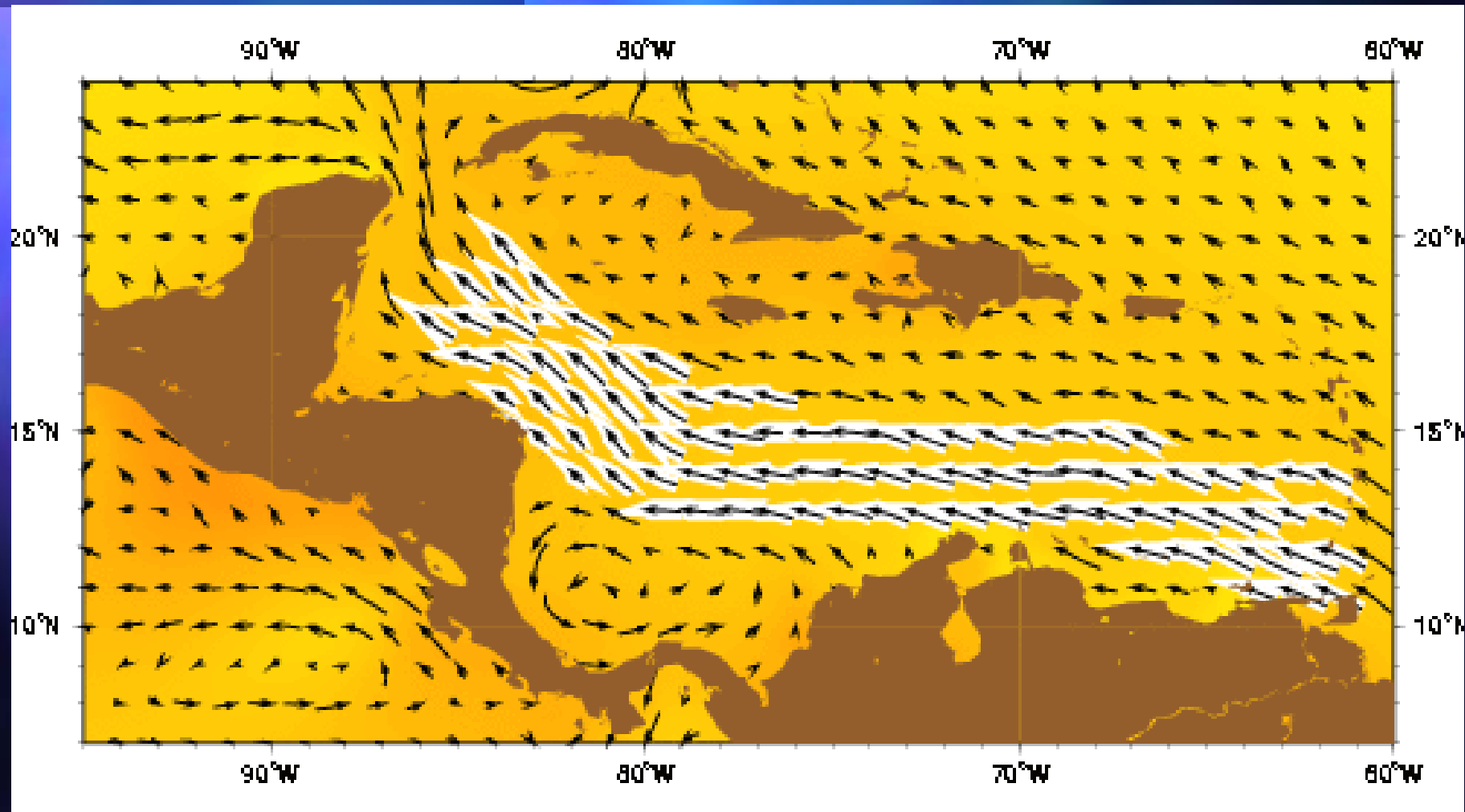
Preview of Bonaire and the National Marine Park

- Seamount which rises abruptly from a 3000m depth
- Land area of 28,100 ha
- Arid – average rainfall 490 mm/year (most falls north)
- No standing/running fresh water (outside rainy season)
- Coastline; Salinas, Rocky Shores, Dunes & Beaches, Lac (mangroves), fringing reefs
- 28,000 visiting divers annually

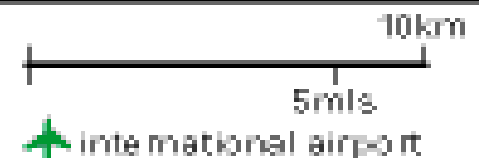
Bonaire Bathymetry Chart



Atlantic waters flushing westerly into Caribbean Basin



Bonaire



Preview of Bonaire and the National Marine Park

- BNMP Established in 1979
- 2,700 hectares coral reef, sea grass, mangrove
- 50 species of stony coral, 360 species of reef fish
- Protected Area: high water mark – 60m depth contour
- Windward has high wave energy (cliffs/iron-shore coast)
- Leeward has very low wave energy
- Predominant current is toward the north on leeward side
- Max. annual tidal range is approx. 1m
- Rapid drop off from shoreline & fringing reefs
- Five Ramsar sites

Bonaire



Potential Nutrient Sources

- Offshore
- Irrigation
- Cesspits/Septic Tanks
- Salinas/Channel System
- Stormwater
- Industry
- Yaughts
- Artificial Fertilizers

Salinas/stormwater



Salinas/Stormwater



Justification of Sampling Locations

- Sample Locations
 - Currents
 - Nutrient sources
 - “Natural Background Conc.”
- Sampling Depths - 5m/20m
- Lagoon - Landfill
- Cargill Salt company - Effluent



Playa Funchi



Karpata



Lagun

Habitat



Front Porch

Ebo's Special



Playa Lechi



Kralendijk

South Bay



Eighteenth Palm

Angel City



Red Slave

Objectives Sewerage Project

Improve Quality of Live

- Protection of the Reefs
- Protection of Public Health
- Reuse Waste Water

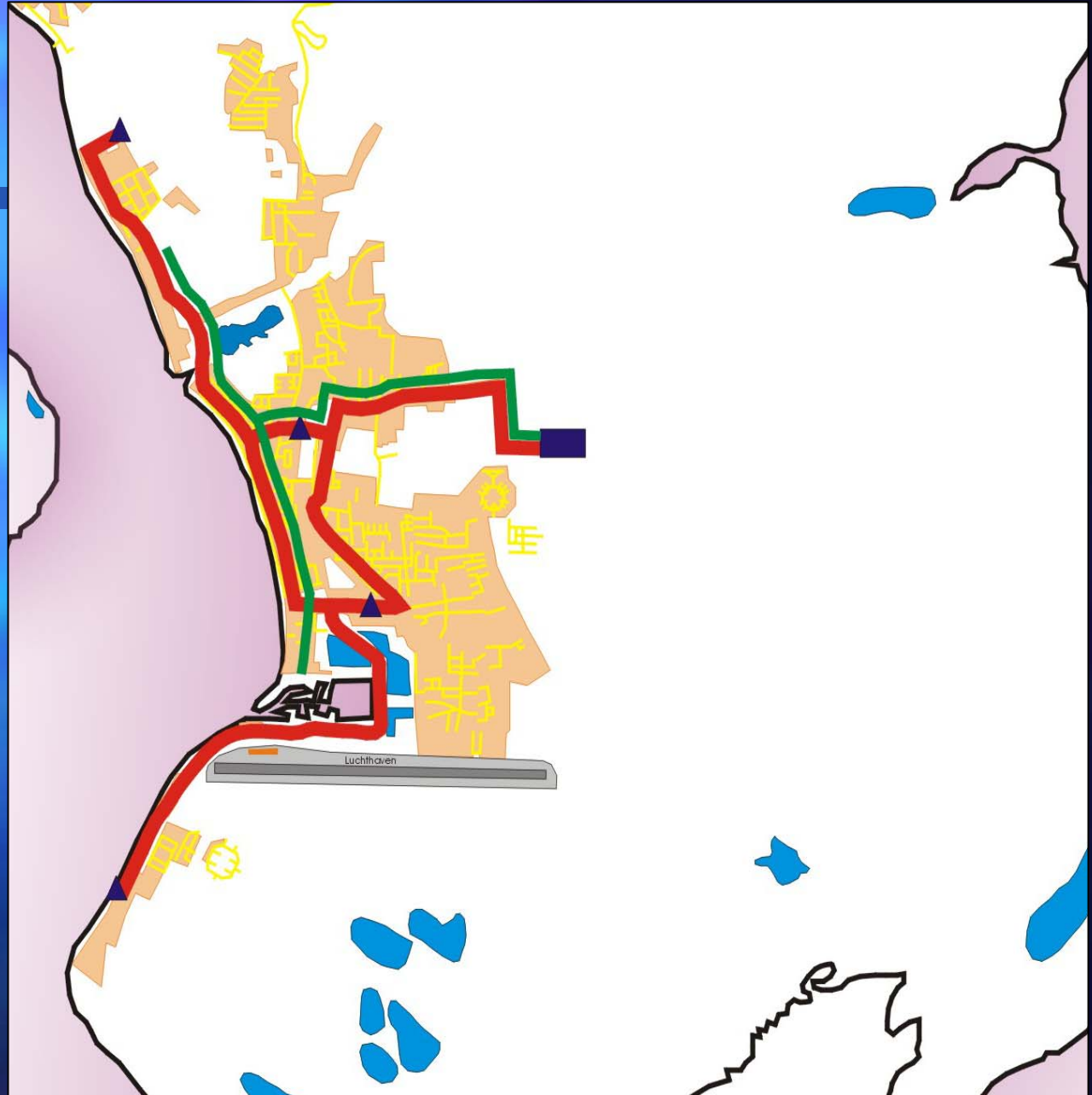
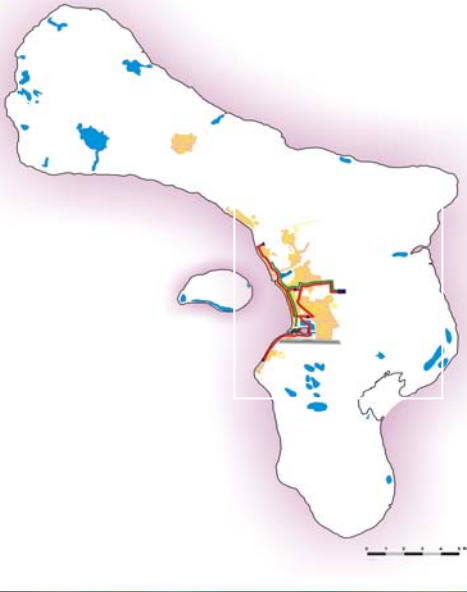


Project Elements

- Vacuum network
- Central treatment plant
- De-nitrification (third Stage)
- Sludge treatment
- UV-post treatment
- Irrigation pipe – 5mg/l N



Sewerage Project Bonaire



Reduction of Nutrients

- Total Phosphorous 5mg/L
- Total Nitrogen irr. – 5mg/L sensitive zone (hotel gardens)
- Total Nitrogen irr. – 28mg/L agriculture inland
- Within 10m of the BNMP no irrigation
- Within 200m of the BNMP no irrigation with fertilizers
- Within 500m of the BNMP no Nitrogen load above 79kg/ha/yr
- Within sensitive zone connection obligation
- Use of adequate septic tanks



Results

- Protection of Aquatic & Marine Ecosystems
- Reduced Health Risks Population
- New Agriculture Possibilities
- Preservation of Groundwater Resources
- Sustainable Divers Tourism



DISCUSSION