

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, moving from left to right. The reef is composed of various coral species, including some with feathery, fan-like structures. The water is a deep, clear blue, and the overall scene is brightly lit, suggesting a shallow depth.

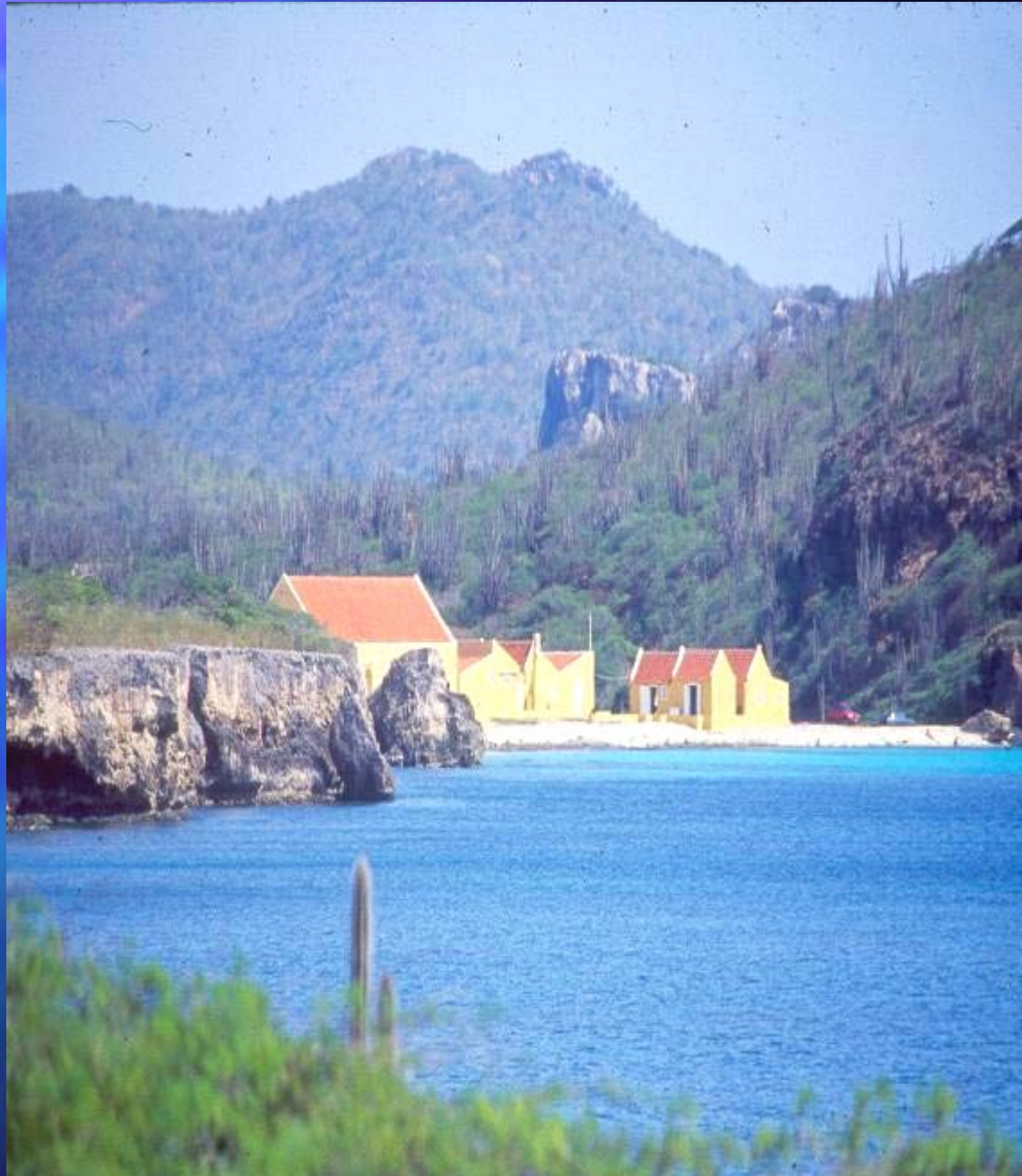
June 2007

Bonaire

Frank van Slobbe

Overview

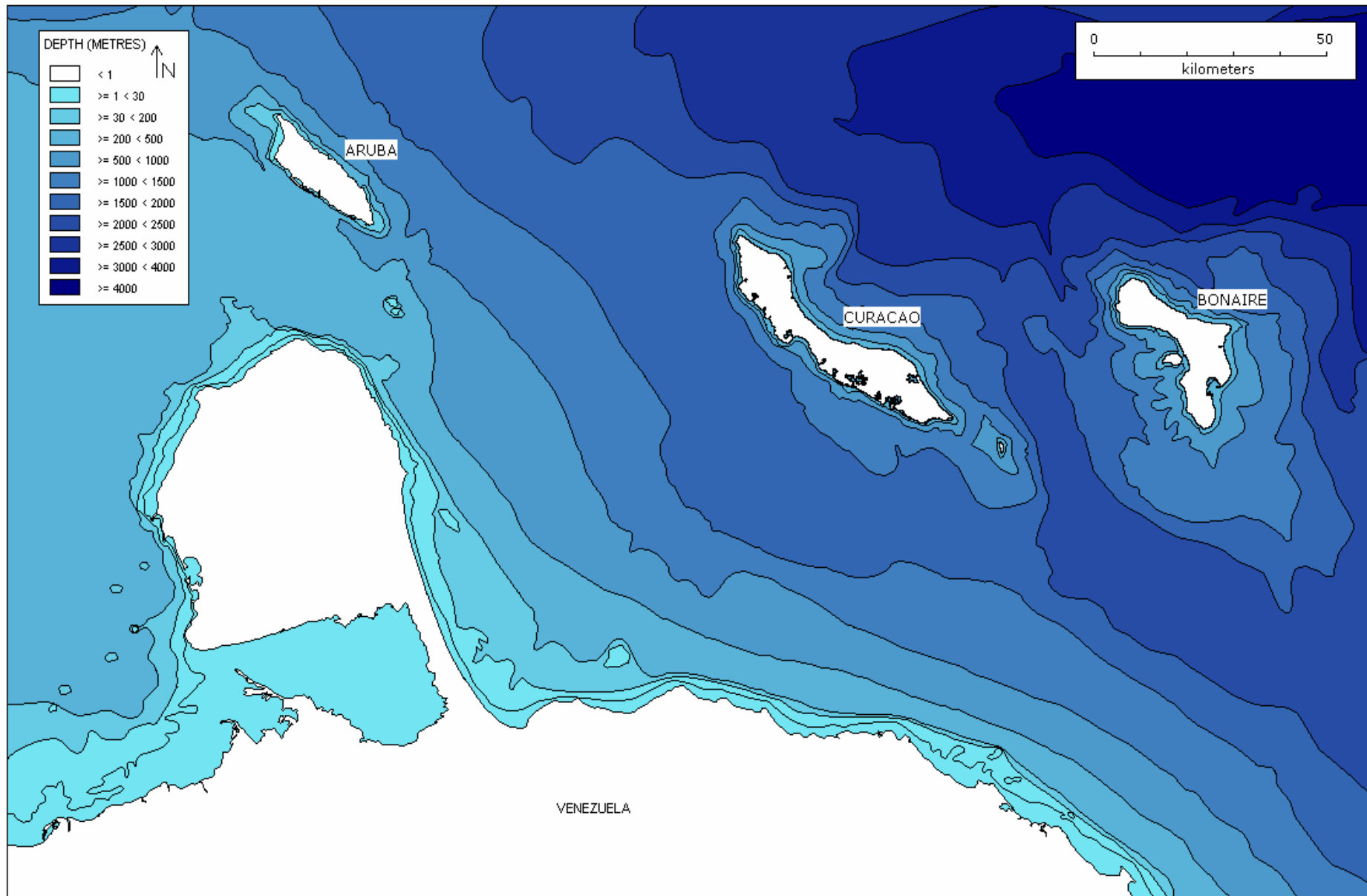
- Background of Bonaire & BNMP
- Potential Nutrient Sources
- Justification of Sampling Locations
- Bonaire Sewage Project
- Discussion



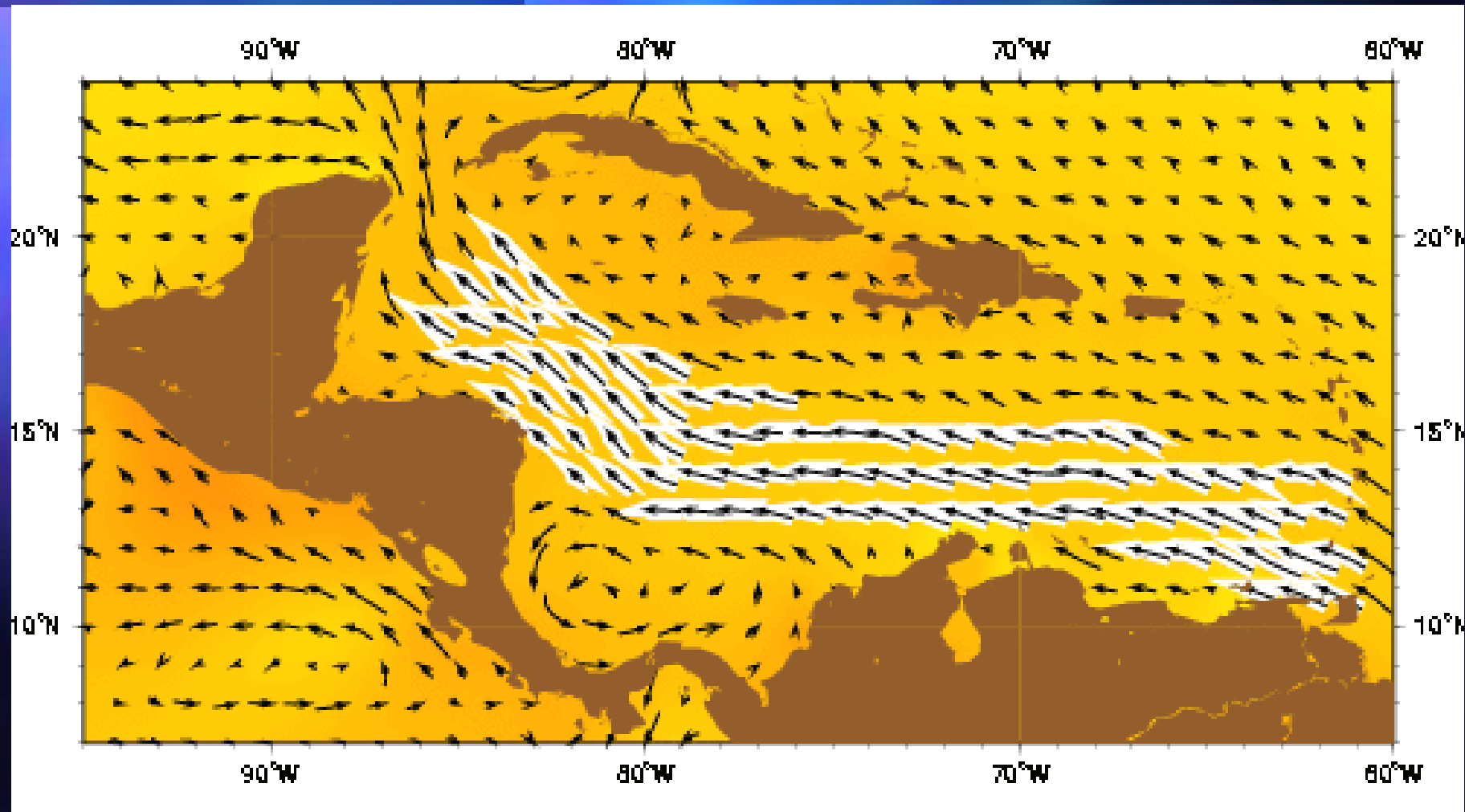
Preview of Bonaire and the National Marine Park

- 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

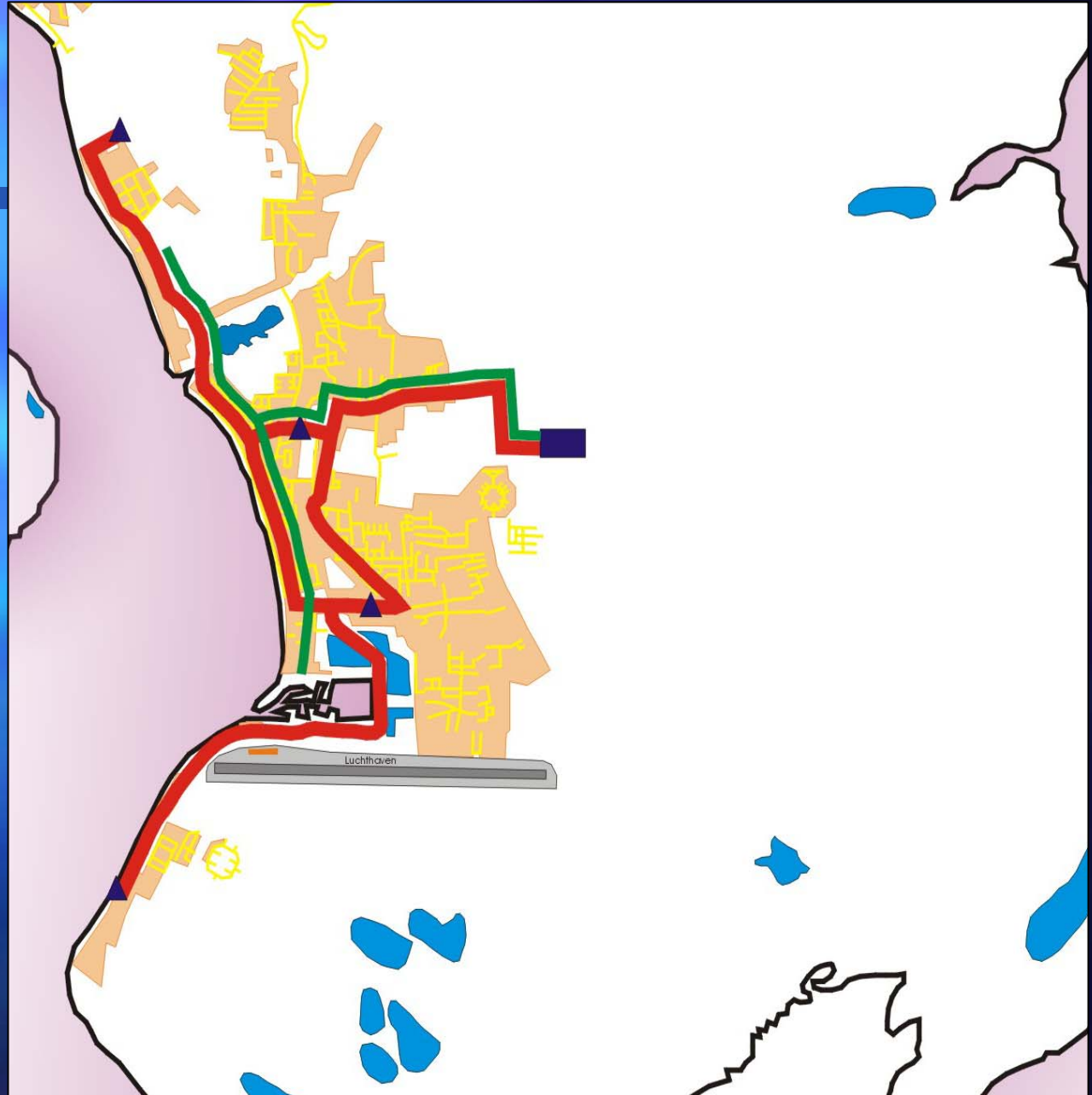
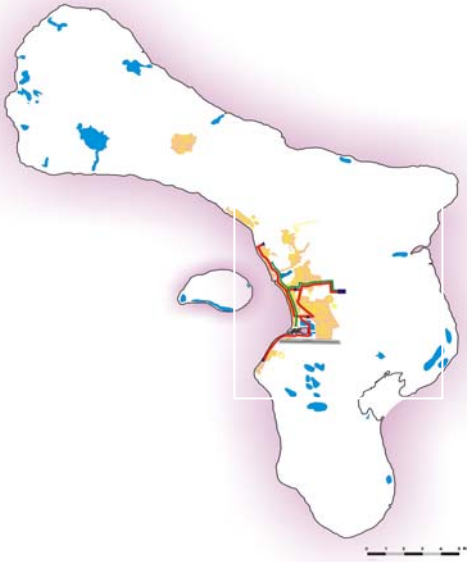


Project Elements

- 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