

PREFACE

The construction guidelines for Bonaire are a comprehensive guide intended to offer advice to those interested in building on Bonaire. People who use this document will include property owners, construction companies, developers and any other interested parties. These guidelines have been produced in conjunction with Department of Physical Planning (DROB), SELIBON NV, Fundashon Tene Boneiru Limpi, L.V.V, Amigu di tera, construction companies, land owners and developers and put together by STINAPA/Bonaire National Marine Park. These guidelines offer the opportunity to save money through the construction process as well as help to protect the natural environment.

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CONGRATULATIONS ON YOUR DECISION TO INVEST ON BONAIRE.

BEFORE YOU BUILD REMEMBER...



As a property owner / developer you are obliged by law to ensure that:

- ✓ no damage is caused to the marine environment
- ✓ the impact of building and landscaping is minimized
- ✓ all waste is dealt with correctly.

These guidelines have been developed to help you minimize building and living expenses and to protect your investment. While following these guidelines you will also help to protect and preserve the natural environment.



You can achieve this by:

- ✓ careful pre-construction planning of the site
- ✓ keeping the site clean during construction
- ✓ designing a hygienic septic tank system
- ✓ careful landscaping and the preservation of natural vegetation

The owner signs on receipt of a copy of the construction guidelines at the time the owner obtains the permit at the Department of Physical Planning (Dienst Ruimtelijke Ordening en Beheer: D.R.O.B.) or at the notary at the time of closing on land or property.



It is recommended that you include some guideline information in your contracts with all the companies who will be working for you.

Construction on land

You will need a permit from the island government if you intend building or renovating a property. This process needs to be followed in order to obtain permission to build/renovate:

- i. Contact the Department for Physical Planning (D.R.O.B.) to ask for an application form.
- ii. The completed form with additional documents must be handed in to the Department. With it you must submit:
 - the building plan
 - the building site plan, including the standards for the building site plan mentioned in chapter "Planning your Building Site".
- iii. D.R.O.B. reviews the application and will determine the legal fees to be paid.
- iv. Pay the legal fees at the Department of Finance (Ontvangerskantoor).
- v. Send a copy of the payment to D.R.O.B.
- vi. D.R.O.B. will forward the application for approval by the government.
- vii. You will receive a letter from D.R.O.B. informing you about the outcome

For more information contact D.R.O.B. at 717-5130 or 717-8130.

Construction on / over water

You will need a permit from the island Government if:

- ✓ Any structure is to be placed in or over water: stairs, ladders, piers, overhanging piers, moorings and swim platforms

- ✓ Any material is to be removed from or placed in the water, such as riprap, sea defences, rocks, sand etc.
- ✓ Any water is to be taken from the sea or any material to be discharged into the sea, such as water from a pool or storm water
- ✓ Any modification is to be made to the shore line, such as cliff rock removal, beach creation or enhancement

To obtain a permit follow the process outlined below:

- i. Get an application form at the Bonaire National Marine Park.
- ii. The form requires a stamp and an additional payment for legal fees. You can obtain these at the Department of Finance (Ontvangerskantoor).
- iii. Send the form and a copy of your payment to the Island Government Office (Bestuurskantoor)
- iv. You will receive a letter from DROB informing you of about the outcome of your application.

Special guidelines apply for construction on or over water. See chapter "Specific Guidelines for Shoreline Modification".

For information contact the Bonaire National Marine Park at 7178444.

BECAUSE YOU CARE ABOUT BONAIRE...



By planning correctly and following these construction guidelines, you can:

- ✓ help protect your investment
- ✓ save a lot of money
- ✓ help preserve nature when you build.

Before you start building, it is good to inform yourself about the environment that you are planning to build and live in. It is important to have an understanding of Bonaire's geology, the surrounding marine life and local vegetation to help you with your planning.

The economy of Bonaire is primarily based on our natural resources, including the dive and tourism industry, the salt works and the fishery. It is vital for our whole community to take good care of our delicate environment for our benefit and that of future generations. We also need to care for our island to enhance the pleasure of living in a natural, clean and safe place.

LOOK AFTER OUR NATURAL HERITAGE...

The island of Bonaire is made up off porous limestone (coral skeletons) and a soil of volcanic origin (diabaas/basalt). We have very limited rainfall, but when it rains, it pours. Our climate is considered to be arid; therefore we have virtually no natural supply of fresh water and very little lush vegetation.

Due to this lack of vegetation, the topsoil is very vulnerable to being washed and blown away. Topsoil loss causes two main problems: without topsoil the island becomes infertile and incapable of sustaining plant life, and any topsoil that runs into the ocean will kill the coral reefs.

Bonaire is an island. Due to its small size the almost all the land is considered part of the coastal zone. Our sea, from the coast down to the 60 meter depth contour is protected as the Bonaire National Marine Park. Next to the shore we have the coral reefs (so called fringing reefs). The reefs are very fragile and are rich in sea life, very much like a rainforest.



Photograph by D.R. MacRae

The world famous reefs around Bonaire are rich in sea life.

The sea life of Bonaire is very vulnerable to pollution and sedimentation. Plastic bags, debris, sand, cement, stones and other products washed in the sea can cause serious damage. For instance, if you clear all the vegetation from your site, our high winds will blow topsoil into the sea or our rains will wash it into the sea, which is known as run off. This sediment can kill our world famous corals. Even a small amount will slow their growth as they

use their energy in an effort to clean themselves. Any small area of damage on the coral will set off a reaction that affects the whole coral colony.



Photograph by K. De Meyer

Sediment, from runoff and algae, smother the reef

Wastewater from open septic tanks, cesspits and garden fertilizers that run off into the sea or leak through the porous stone, make algae on the reef grow very fast. This extra algae can suffocate the corals and cause them to die off very rapidly, turning the ocean and your valuable view into an algae covered wasteland. Any damage to the corals affects the fish and other animals that live on the reef too. Fish and turtles may eat or get caught in plastics and litter allowed to fall into the sea.



Remember: damage to the marine environment (or pollution) is nearly always impossible to remedy.

In an effort to minimize erosion and run off, the period of time spent in construction must be as short as possible. That is why you should not clear your location until construction begins. Especially during construction near the shore, erosion control techniques like silt screens and filter cloth, must be employed if fill material is left exposed. Following construction, the shoreline must be immediately stabilized with native vegetation.

ONLY CLEAR THE AREA WHERE THE BUILDING IS PLANNED...



Leave as much natural vegetation on the site as possible.



Photograph by D.R. MacRae

The natural vegetation of Bonaire is well suited to the arid climate.

The limited rainfall means it is difficult and expensive to grow and maintain plants. However, the native vegetation already on your property is very well adapted to the environment of Bonaire and requires no watering, so it is worth looking after.

On our arid island, it is wise to leave as much existing vegetation as possible, using it as the basis of your garden. This saves you money by reducing costs of clearing the site and re-landscaping your garden as well as reducing costs for irrigation. This will also help conserve the islands vegetation and preserve your valuable topsoil. If you remove too much vegetation you will lose your topsoil. It will blow away, creating a dusty, barren yard, or will run off after rainfall. Reducing pollution from runoff is another way you can help the environment and marine life.



Photograph by D.R. MacRae

Removing all the vegetation leaves the topsoil vulnerable to runoff and is expensive to replace.

Plants that are not native to the island require a lot of water, fertilization and pest control, non-native plants can also bring diseases. Water from rain and irrigation washes fertilizers and pesticides, soil and debris from your yard and off the streets into the sea. Therefore, by preserving as much existing vegetation as possible and choosing native and other drought resistant plants and trees this pollution can be reduced. Native plants, once established, do not require much, if any, water, fertilizer or pesticides. This will save you time and money. It also reduces pollution from excess fertilizer and pesticides that could wash off your yard. This is especially important on properties near the sea. Any irrigation with grey or black water, deposits extremely high quantities of nutrients (fertilizers) onto the coral reefs. These nutrients promote algal growth which kills the coral. If you have plants, like palm trees, that require irrigation, locate them as far away from the shore as possible.

If you are not immediately ready to start construction, it is better not to remove any existing vegetation. It can take at least six weeks to get a building permit and numerous months to select a builder. Waiting until the last possible moment will help hold your topsoil in place, prevent erosion, and if you are building near the sea, it will keep the sediment off of the reef.

The vegetation you must remove can be re-used. Wood can be used for wood chips and to produce charcoal. Trees can be transplanted. Topsoil that becomes available after removing the vegetation can be re-used in the landscaping.

KEEP BONAIRE CLEAN AND SCREEN...



The best way to prevent plastics, debris, sand, cement, soil etc. from blowing or washing away is to:

- ✓ dispose of waste materials immediately and properly
- ✓ screen the site.



Screening of construction work prevents sediments and debris from entering the sea

When you start construction, it is most important that you set up the building site in such manner that prevents pollution, erosion and damage to terrestrial and marine environment. Keeping the building site clean during construction is the best way to prevent this. It also saves you time and energy at the end of the construction because you do not have to clean as much and scrape off materials from the building site.

If you are not able to screen the whole site, you should at least screen the leeward side of the site to catch waste that can blow away or runoff. If your plans call for a fence or wall around your final construction, consider building it first. This way you will not have the added expense of a temporary screen.

A vegetation buffer around your entire building site is a very good start for your future garden. It also prevents soil run off and keeps waste materials from littering the streets, nature and the sea.

During construction be careful not to unnecessarily damage the existing vegetation when stacking materials or placing containers or equipment. Cement and concrete are especially harmful to plants and marine life.

Make sure your workers dispose of paints, solvents or other hazardous chemicals properly in the garbage containers. Never dispose of them in the ground or drains. Discarded chemicals contaminate the soil and will eventually reach the ground water. When chemicals are disposed of into the kitchen or toilet drains, they can damage your septic tank.

KEEP IT HEALTHY...

To prevent illness, disease and damage to the environment, special care should be taken when you design your septic tank system.

Septic or black water from toilets contains pathogens and bacteria, which are extremely hazardous to human health. All the clean water you use in the kitchen and shower (grey water) also drains in the septic tank and immediately gets contaminated by the toilet water that is already in the tank. The same is for rainwater if fed into the septic system. Make sure that your septic tank is well closed with a proper serviceable lid and concrete top. This prevents you from having a cockroach or mosquito plague, which can cause dengue and yellow fever.

If the nutrients in the black water or grey water that is used for irrigation are not totally taken up by the plants (or if they get washed out by rainfall) they will leak into the ground and surface water. If you live near the coast, they can leach through the porous limestone into the sea. Algae, like plants, love the high nutrients in wastewater. They start growing quickly, covering the corals, which eventually kills them. This process can be rapid. As you know, if we loose our corals, we will loose the very basis of our economy and an important part of the natural environment.

ENJOY IT IN A NATURAL STATE...

The construction of artificial beaches is prohibited and the construction of pools is not recommended. Enjoy our natural beaches and crystal clear seawaters.



Photograph by S.C. Byham

Soft white sand and clear warm water make Bonaire's natural beaches desirable to visit.

It is prohibited to create artificial beaches on Bonaire and a permit is required to replenish naturally occurring beaches. Sand can wash or be blown into the sea and kill our coral reefs. Bonaire is surrounded by beautiful fringing coral reefs precisely because we only have sandy beaches in a few places! Most of our shoreline is made up of coral rubble beaches or coral cliffs. Corals do not tolerate sand inundation. Large quantities of sand smother and kill them outright by burying them alive. Any sand or other particulate materials washed into the sea can stress and ultimately kill corals.

Artificial beaches require sea sand, not the crushed sand you can buy. Bonaire does not have a supply of natural sea sand that can be used for the purpose of creating artificial beaches. What sea sand the island does have is a scarce commodity, difficult to extract or occurring within protected areas, such as Lac Bay.

Artificially created beaches will wash away gradually with time through natural processes and will be removed immediately during conditions of wind reversal or high waves. You will be left with nothing but a lot of wasted expenses and a ruined reef.

Bonaire has no fresh water supply. Therefore, all fresh water needs to be distilled from seawater through the process of reverse osmoses, which uses an enormous amount of energy, thus making water expensive. Filling and refilling your swimming pool with fresh water will cost you a lot of money. To keep the pool clean and bacteria free, chloral and other chemicals need to be added. However, you are not allowed to dispose of chlorinated water into the sea or on land. You are not allowed to fill the pool with seawater. This is because a pool with seawater needs a through flow to the sea, which may result in chemical or organic (algae) pollution.

PLANNING YOUR BUILDING SITE



Most people take a lot of time to plan their new house: the design, where, when and how to construct it. Few people take time to properly plan the building site. When you plan your building, plan your site too.

Proper planning of the site, of construction and landscaping, in the end will save you a tremendous amount of money on:

- Land clearing
- Water saving
- Digging
- Cleaning the site
- Scraping off materials
- Landscaping
- Garden lay out and maintenance

Correct planning before starting construction consists of 3 steps:

- ✓ Designing your building site plan (has to be submitted to D.R.O.B. together with building plan)
- ✓ Getting your site ready for construction whilst preserving vegetation
- ✓ Screening the site

Following the steps outlined here is the first stage in preserving your new environment. You will have to discuss and prepare each step with your contractor. This process will also help the construction workers to adopt careful land clearing as well as construction practices. Please make sure they are well informed about the standards outlined here.

STANDARDS FOR THE DESIGN OF A BUILDING SITE PLAN

- a) Describe the phases of land clearing and building activities (where, when, how).
- b) Mark where vegetation will be removed and where it will remain. In this way the workers who will remove the vegetation by hand or bulldozer should not destroy your trees and plants. This will also prevent the loss of valuable topsoil, having a dusty work site and the expensive replacement of plants.
- c) Clearly mark where digging will occur. This prevents unnecessary ground disturbance.
- d) Show the position of the fences, walls and screens, and clearly mark the areas where vehicles may go. This prevents unnecessarily damaging vegetation on your site.
- e) Mark where the closed septic tank will be constructed. It must be constructed at least 1 meter from the building(s) and 1,5 meters from the property line(s).
- f) Mark out where the building materials, cement, rubbish etc. will be stored.
- g) Mark the position of the sediment screens. Sediment screens are necessary when constructing near the shoreline.

Tips for design

- Take the natural watercourse and the contours of the terrain into consideration. It prevents erosion if you use the natural contours of your site, and avoid cutting new slopes.

- To save energy costs for air-conditioning, consider building your house strategically in relation to the wind direction. Fewer windows on the south side of your house (which gets the most sun) can reduce the amount of energy needed to cool it.
- To save water, consider building a cistern and use this to water the plants.
- Have the fill of your foundation sprayed with pesticide by the Hygienic Department to get rid of termites. Do this after you have laid the foundation and before you build the rest of the construction. Contact the Hygienic Department. (See contacts and Appendices).

STANDARDS FOR PREPARING YOUR SITE AND PRESERVING VEGETATION

- a) You as the owner should specify clearly which vegetation should be removed and which should stay. One possibility is to use flagging e.g. make markings or flags on vegetation (high enough to be visible for equipment operators to see them).
- b) When the property is being surveyed, only clear the vegetation for access if it is absolutely necessary.
- c) Only remove vegetation when construction is about to start, to avoid losing any topsoil. Make sure building starts within 1 month after clearing.
- d) Leave as much vegetation as possible untouched. Only use heavy machinery for clearing the areas for buildings and roads. Remove other vegetation carefully by hand. Where possible leave the roots in place to help hold the soil together.



Photograph by D. R. MacRae

Leaving as much natural vegetation as possible on site preserves the topsoil and reduces landscaping costs.

- e) Only excavate where the actual construction is going to take place and mark the places to be dug out clearly. If possible limit any ground disturbance to the dry season (to prevent loss of topsoil and run-off during rainfall). Most rain falls from October through January.
- f) Care should be taken to avoid leaving debris and rubble within 3 meters of trees, bushes, plants and cacti, so air and water can continue to reach the roots.

Tips to preserve vegetation

- Make sure your requests to preserve vegetation are communicated to all workers and sub contractors, especially the drivers of the heavy equipment.

- Advise those clearing the site not to be too enthusiastic, in particular heavy machinery drivers.
- Try to transplant mature trees that are removed. L.V.V can advise you. Tel. 7178836. This will save money on replacement plants and trees in the long run.
- Discarded trees can be collected to make charcoal and wood chips.

STANDARDS FOR SCREENING THE SITE

- a) Clearly define the main three areas of the building site:
 1. The work area
 2. The material storage area
 3. The garbage and waste material area
- b) Both the material and the garbage storage areas must be screened and have low exposure to the wind.



Photograph by D.R. MacRae

Screens on the leeward side of a site help prevent the loss of building materials and rubbish.

- c) Construct any walls or fences first. If an entire wall cannot be constructed, then construct the part of the wall at leeward side to prevent any loose rubbish from being blown away from the site.
- d) Construction screens should be placed between poles supported by guy-ropes at a maximum of 2,4 meters apart (without support a maximum of 1,8 meters). The screen should be at least 1 meter high and buried to at least 30 cm (with a minimum depth of 20 centimetres).
- g) Care should be taken to avoid leaving debris and rubble within 3 meters of trees, bushes, plants and cacti, so air and water can continue to reach the roots.

KEEPING THE SITE CLEAN DURING CONSTRUCTION



When you start construction, it is most important that you set up the building site in such a manner as to prevent diseases caused by mosquitoes and rodents, pollution, erosion and damage to terrestrial and marine life.

The best way to prevent damage to the environment is to keep the building site clean during construction. It also saves you time and energy at the end of the construction because you do not have to clean as much of the site or spend time scraping material off the building site. Remember that many disposables can be re-used. This saves you money and also is another way to keep our environment clean and healthy.

STANDARDS FOR KEEPING THE SITE CLEAN DURING CONSTRUCTION

Waste

The workplace must be kept clean and litter free at all times. All discarded material and packaging should be immediately put in the covered garbage containers so it does not blow away. This includes:

- ✓ Wrapping materials and containers for all supplies, such as bags, nail boxes etc.
- ✓ Broken or unusable materials, such as bent nails, broken tiles, small pieces of wood, cement etc.
- ✓ All foam and plastic food and beverage containers, plastic and paper bags, bottles, cans and wrappers.

Also remember that:

- ✓ Garbage containers must always be present on the work site.
- ✓ No waste, garbage or other materials may be dumped in the water or anywhere on land. All garbage, small and big, should be taken to the landfill or picked up by Selibon NV.
- ✓ Keep materials and garbage in a central screened storage place where it cannot blow away.
- ✓ Make sure that building materials, sand etc. are always stored on an already cleared piece of terrain to avoid disturbance of vegetation.
- ✓ Bigger pieces of useless building material should be stored in a central place.
- ✓ Leave all the waste in one area and at the end of the construction it should be taken to the landfill and disposed of in a special designated area at the landfill. Use of the landfill does not cost any money.
- ✓ Materials cannot be stacked on a public road.

Sanitary facilities

- ✓ A toilet facility (chemical toilet) and water for washing of hands needs to be present at the site. The toilet should be cleaned at least twice a week.

- ✓ If the chamber for the septic tank is already constructed, a simple structure can be build on top of it to serve as toilet facility.

Concrete

- ✓ Mixing of concrete should be done in only one special designated area.
- ✓ Put the cement mixer in an area with low exposure to the wind.
- ✓ Place the cement mixer on an area that is already designated to be paved, like a driveway, porch, carport etc.
- ✓ Place a garbage container next to the cement mixer to immediately dispose of empty cement bags.
- ✓ Make good and careful use of your left over cement by making it the foundation of e.g. a driveway or carport floor.
- ✓ Do not put any left over cement or concrete (wet or dry) around any of the existing vegetation or in the sea. Cement is very toxic to plants.
- ✓ At regular times and at the end of the project all unused cement and concrete must be removed from the site and taken to the landfill.
- ✓ At the end of construction, the entire property should be cleaned.

Transport of sand

- ✓ Any sand, soil, crushed rocks etc. brought to the site should be covered during transportation and during storage at the site. This prevents it from being blown on the streets, where it can be washed into the sea and on the reef or blown/washed directly into the sea. Since sand and earth are very expensive commodities this will also save you money.

Miscellaneous

- ✓ Make sure that water is not trapped in old tires, bottles and other waste in your yard to prevent mosquitoes breeding. Store water in a closed container.
- ✓ When stacking materials at the site, or positioning a container or other equipment, care must be taken not to disturb the existing vegetation.
- ✓ Care should be taken to avoid leaving debris and rubble within 3 meters of trees, bushes, plants and cacti, so air and water can continue to reach the roots.

Tips for re-use

- Stack reusable materials, like fencing, wood for framing, rubble etc. in a separate place, so they can be easily salvaged. This will save you money.
- Keep your building rubble for re-use for foundation and filling in holes. If you have no need for it, you have to take it to a designated area at the landfill. At Selibon NV you can rent an 8 m³ container. Selibon will place and empty the container.
- Keep extracted materials (like sand), at the storage place, cover it and reuse it for landscaping.

- A container for empty cement bags, other bags and litter can be made from four pallets stacked together. Line it with the big plastic covers that come with your cement bags. For disposal, tie the plastic together and take it to the landfill.
- You can use your empty cement bags (moistened) as ground cover in the wooden frame for the first concrete slab strip, as a replacement for the more expensive plastic foil.



Photograph by D.R. MacRae

Four pallets stacked together make a good container for empty cement bags and litter.

- If you need to dispose of clean, fresh water at the end of the day, encourage the workers to pour it on the existing vegetation.
- Rubble can be used for filling a foundation
- If possible, buy water-based, rather than oil-based paints. Water-based paints contain fewer dangerous chemicals and do not need thinner or chemical brush cleaners.
- Try to avoid buying products made from exotic tropical hardwood; they are the cause of much of the deforestation in tropical rainforests.

Tips for garbage disposal

- Selibon NV will pick up bigger pieces of household waste or small yard waste if they are compact, no longer than 1,50 meter and not heavier than 30 kilos. Bigger and heavier pieces should be taken to the landfill or can be picked up by Selibon NV at charge. Renting an 8 m³ container from Selibon NV is possible.
- It is very important for the owner of the new building and the construction foreman to inspect the site regularly to insure that the guidelines are being followed and the site remains clean.

SPECIFIC GUIDELINES FOR SHORELINE MODIFICATIONS



Since Bonaire has a very delicate coastal environment (which is protected by Bonaire National Marine Park), special rules apply for construction near or in the sea, including the construction of pools, piers and the creation of artificial beaches.

STANDARDS FOR CONSTRUCTION NEAR OR IN THE SEA

A special marine construction permit from the Island Government is required if:

- ✓ any structure is to be placed in or over the water. This includes stairs, piers, moorings and swim platforms.
- ✓ any material is to be removed from or placed in the water. This includes riprap, sea defences, rocks, sand etc.
- ✓ any water is to be taken from the sea or any material to be discarded into the sea. This includes water used for pools, building, kitchen and wastewater.
- ✓ any modification to the shoreline is planned. This includes beach creation and enhancement.

Always remember....



...removal of bedrock is strictly prohibited. This solid compact rock holds back the land you are building on and also helps bring back sand to natural beaches.

...from the vegetation to the shoreline you may not construct anything or modify the shore.



Photograph by D.R. MacRae

Removing vegetation all the way to the shore can seriously damage the environment.

...leave a three-meter vegetation buffer of untouched vegetation along the shore. This slows down run-off and filters sediments

...as the permit requires, the Bonaire National Marine Park must be notified at least 5 days in advance if heavy equipment is to be used within 20 meters of the high water mark. They will supply you with advice for this critical work and supervise the operations if necessary.

In addition to this....

- ✓ a supervisor must always be present at construction work near the shore and/or when working with heavy equipment.
- ✓ any work must include precautionary measures against debris falling or being blown into the water. No waste, garbage or other materials may be dumped in the water.



Photograph by C. Glendinning

Construction sites near water need to be kept tidy to prevent tools and debris from falling into the water and damaging the environment. This site is not tidy.

- ✓ any construction at or near the water edge –or where debris can be washed or blown into the water- requires silt screens, to be placed in the water before the work starts. The screens should also be placed around storage areas, to prevent waste blowing away and sediment run-off into the sea.



Photograph by E. Domacasse

Poor screening can result in the loss of materials and severe damage to the environment



Photograph by K.De Meyer

Screening must be constructed properly. Even good efforts still release some sediment into the water.

- ✓ a permanent wall could be used to replace temporary screens
- ✓ storage areas for sand and soil, and all work areas must be at least 20 meters back (properties are only 30-40 meters!) from the high water mark
- ✓ washing down of construction equipment is not permitted within 50 meters of the high water mark. Cement is toxic to our reefs.

Standards for the construction of piers

- ✓ Private pier dimensions cannot exceed 10m x 2m - or extend seaward more than 15% of the distance to the drop-off. Filled piers (of concrete) are not permitted.



Photograph by D.R. MacRae

Construction of piers on Bonaire requires special permission and care needs to be taken not to damage the marine environment

Standards for the construction of swimming pools

- ✓ Preferably do not construct a swimming pool
- ✓ You need permission from the Bonaire National Marine Park and the government to construct a pool near the sea.
- ✓ Never dispose of chlorinated water in the sea or on land

- ✓ You are not allowed to fill your pool with sea water



Photograph by D. R. MacRae

Swimming pool maintenance is difficult and special permission is required for their construction.

Tips for pools

- Use Ultra Violet lights to kill bacteria/algae and not chlorine
- If chlorine is used to clean a swimming pool, sunlight will eventually break it down. The water can then be used to water plants
- For a new construction: Construct a holding tank for your pool water. If you back wash the pool, pump the water into the holding tank, clean it and put it back in your pool. This also saves you a lot of money on water.

Standards for beach creation

We strongly discourage you to create an artificial beach, because it will kill the coral. A permit from the Island Government is required if any modification to the shoreline is planned, including beach creation and enhancement.

- ✓ Artificial beaches may not be created using locally harvested sea sand. The construction of an artificial beach on a sloping shore is forbidden.
- ✓ Artificial beaches will only be permitted where a continuous retaining wall is designed on the seaward and landward side of the proposed beach, which is of sufficient height to prevent sand from being blown or washed into the water at any time. Where this is not possible a combination of lagooning and retaining wall may be considered. The retaining wall must be above the high water mark.



Photograph by D.R. MacRae

Artificial beach construction is discouraged.

Retaining walls and other structures need to be built to prevent the loss of sand.

- ✓ The retaining wall must be in place prior to any sand being deposited or dumped at the proposed site of the beach
- ✓ A vegetative buffer of at least 3m must be left on the shoreward side of the newly constructed beach.
- ✓ A maximum of 20cm depth of sand may be deposited at the proposed site.

SANITARY WASTE SYSTEMS



To prevent disease and illness as well as damage to the environment, special care should be taken when you design your septic tank system. It is also possible to make use of septic tank water for irrigation. If you maintain your septic tank well, you not only save on the cost of replacement or emptying, but also prevent any damage to the environment.

STANDARDS FOR SANITARY WASTE SYSTEMS

- ✓ Your septic tanks must be enclosed and impervious and should preferably offer the possibility of hooking up to a central sewage disposal system in the future.
- ✓ A septic tank should have at least 3 chambers to make the water suitable for irrigation and to be safe for your health.
- ✓ Septic tanks must be placed at least 1 meter from the building and 1,5 meter from the property line. A septic tank should never be placed under the house for health and safety reasons and to avoid inaccessibility for repair in case of a malfunction.
- ✓ The minimum capacity of the septic tank should be related to the amount of bathrooms in the property.
- ✓ To prevent the build up of marsh gas, which can be explosive, the tank needs an air ventilation tube, covered with a lid with very small holes. The holes should be small enough to prevent pests from entering the tank e.g. mosquitoes.
- ✓ The septic tank should be planned so it is accessible for the sewage truck.
- ✓ The first chamber should have an access pipe, enclosed with a lid, to pump up sewage water if the tank gets full.
- ✓ The enclosed septic tank will not fill up as fast, if you use the water from the third chamber for irrigation. In this case the third chamber will need a pump connected to your drip or sprinkler system.
- ✓ It is better if you do not use a float in the chamber. They are very undependable because they can become stuck easily and are hard to repair without braking open the concrete top of your system.
- ✓ If you use wastewater for irrigation, NEVER connect your sprinkler or drip system to your waterline system! If a valve wears out or the wrong tap is turned open, the wastewater with all the dangerous bacteria can flow back into the waterlines. This does not only put you in danger, but also your whole neighbourhood!
- ✓ You should never use black water (untreated septic waste) for irrigation or spray black water with a hose because of severe hazard to your health if you breathe in the toxic fumes. Furthermore, untreated sewage water that stays behind as little pools in your yard may attract pests.



Photograph by D.R. MacRae

Stagnant pools of water can attract pests and become a health hazard.

Rainwater must not feed into the septic system, to prevent further contamination

Tips for maintaining your sanitary waste system

- ✓ Never pour antibiotics or household chemical products down your toilet or drains. They destroy the bacteria that are needed if septic tank systems are to work. For the same reason, do not use septic tank additives or cleaning compounds, except those that stimulate good bacterial growth. In the back of this handbook you will find a list of products that easily replace the more harsh cleaning materials. Use biodegradable cleaners based on enzymes on positive/good bacteria.
- ✓ Do not flush items that do not decompose into the septic tank, such as diapers, cigarettes, plastic, rubber, nylon etc.
- ✓ Phosphates speed up the growth of algae. Look for alternative products without phosphates and you can help save the environment.
- ✓ Check your system annually and pump out sludge at least every 3 to 5 years.
- ✓ Misused or malfunctioning septic systems can be very harmful to the environment. Watch for the following signs of septic tank system malfunctions:
 - Gurgling sounds in the toilet plumbing
 - Plumbing backups or sluggish flushing in the toilet
 - Soft, spongy sections of ground
 - Puddles of sewage
 - Sewage odour
- ✓ Consider having your toilet and kitchen sink water drain into the first stage of your septic tank system; shower and bathroom sink water can drain into the second chamber of the system.
- ✓ Consider reusing the water from the shower and bathroom sink for flushing of your toilets. A double waterline system makes this possible.

LANDSCAPING AND GARDENING



You can make tremendous savings on water and garden maintenance and still create a beautiful healthy garden if you follow some very simple, but effective standards and tips. Additionally you prevent fertilizer and pesticide pollution and save the marine environment.



Photograph by D.R. MacRae

Natural vegetation, when left in place, can save on landscaping costs.

STANDARDS FOR LANDSCAPING AND GARDENING

- ✓ At the end of the construction you should revegetate the area as quickly as possible, to avoid topsoil run off.



Photograph by S.C. Byham

Clearing all the vegetation during construction leaves the finished house with a barren yard, where the topsoil is likely to be lost through runoff. Revegetation must take place as quickly as possible.

- ✓ Leave a permanent vegetation buffer of at least 3 meters around the site. This slows down run-off, filters sediments and stops wind blown dust. This is particularly important at seashore locations.

- ✓ Place plants that require irrigation and fertilization as far away from the seashore as possible, preventing nutrients from flowing into the ocean.
- ✓ Landscape your yard so that water does not flow directly across it and into the street or sea.
- ✓ If your house has rain gutters, make sure that the downspout are not aimed toward paved surfaces, so that rainwater can soak into the ground and does not just run off.
- ✓ Avoid pesticides and chemical fertilizers wherever possible, and do not use them near the sea, or on bare or eroded ground. Over fertilizing actually encourages certain insects and diseases and can burn the roots of your plants. If you have to fertilize, use it sparingly and even better, use compost or fertilizers made from all natural ingredients (organic).
- ✓ You should never use untreated septic waste (black water) for irrigation drip system or spray black water from a hose. This can cause severe problems for your health.
- ✓ If you use septic tank water for irrigation, your septic tank should have at least 3 stages to make the water suitable for irrigation and to be safe for your health.
- ✓ Never connect your sprinkler- or drip system to your waterline system! If a valve wears out or the wrong tap is turned open, the wastewater with all the dangerous bacteria flows in the drinking waterlines. This does not only put you in danger, but the water supply of the whole neighbourhood!
- ✓ Make sure that you do not give the plants more water than they can take up. Less water encourages the plants take up all the available nutrients, that otherwise may be washed out and become harmful to the environment.

Tips for landscaping and gardening

- Choose native or drought-tolerant plants grouping them according to similar water needs. (See the list in the Appendix)



Photograph by D. R. MacRae

Native plants can be used to create a very attractive landscape.

- Think before you plant. Many plants that are not native to the island are weak in our climate and get diseases, which then need pesticides to treat them. Look for pest resistant varieties or use native plants.

- The local gardening companies and the agriculture department L.V.V. will help you to learn which are the most drought- and pest- resistant species and how to lay out and maintain a drip irrigation system.
- Topsoil that became available during site clearance, should be carefully stored and re-used in landscaping your garden.
- Collect gutter and roof water into cistern or rain barrels and use it for watering plants. Make sure these are well covered to prevent mosquito plagues. If the water becomes stagnant dispose of it onto soil beds to allow the excess nutrients to disperse.
- Recycle garden clippings and debris and turn natural litter into garden compost. Use grass clippings and other yard waste as mulch. Clippings left on the soil in the garden, decompose supplying nutrients to your soil.
- Place mulch around plants in a 2-3 inch layer to retain soil and hold in moisture.
- Try to transplant mature trees that must be removed for construction. L.V.V. can help you with this.
- Use the wood that became available after clearing your site to make into mulch or offer your bigger branches to L.V.V. They will make charcoal or mulch out of it.
- When shopping for fertilizers, look for products that are non-chemical (organic) or contain nutrients in water-insoluble or controlled release form. These fertilizers give plants a chance to absorb nutrients slowly, reducing runoff.
- Insecticides and herbicides are toxic to nature and damage sea life. Only 0.1% of all insects damage plants. The chances are that your yard bugs are not pests at all. They are natural predators and can be very effective against undesirable insects. Unnecessary pesticide spraying can make pest problems worse and can kill the good insects. Ban routine spraying in your yard.
- Try environmentally safe alternatives for pest control. (See list in the Appendices)
- Clean up after your pet. Dog droppings can add unwanted nutrients, bacteria and viruses to the ground and seawater. Put pet waste in the trash or bury it 6 – 8 inches deep, away from surface waters.

APPENDICES

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SAFER SOLUTIONS FOR PEST CONTROL

If the directions on the labels of commercial chemical products are not followed, these chemicals may harm children, pets and even adults through skin contact, inhalation or ingestion. Furthermore, all products are moderately persistent in the environment, which means they do not disappear very fast.

The more common pests can preferably be controlled using one or a combination of the following:

Pest	Product	Solution
Insects	Insecticide soap	For this effective spray, use 2 ½ tablespoons of liquid dish soap in 1 gallon of water. Spray liberally on effected plants and repeat application if necessary.
Insects	Natural bug repellents	Marigolds, chrysanthemums, chives, garlic, basil, mint, thyme and similar plants mixed through your garden will repel insects because of their natural odours and root secretion.
Insects	Horticultural oils	To make your own sprays, mix 2½ tablespoons vegetable oil, 2 ½ tablespoons liquid dish soap and 1 gallon of water.
Mosquitoes	Ground coffee and tea bags	The tannic acid prevents mosquito larvae from hatching. This is particularly useful as a mosquito preventive in bromeliads.
Slugs	Beer	In areas where slugs are a problem, place shallow pans of beer on the ground. Slugs will be attracted and drown in the beer.
Caterpillars	<i>Bacillus thuringiensis</i> (Bt)	This is a bacterium that infects and controls caterpillars. It is commercially available in spray form and dusting powder. In different concentrations it can also be used against other insects.



Spraying with water, handpicking and pruning are effective controls of some insect pests if you catch the damage early. Many insect problems can be reduced or eliminated by removing a few infected leaves or plant parts.

Be careful with products that contain the following active ingredients:

Highly toxic

Chlorpyrifos
Chlorothalonin
Diazinon
Endosulfan
Ethoprop
Trifluralin

Moderately toxic

Acifluorfen
Atrazine
Carbaryl
Disulfoton
Malathion
Vernolate

Slightly toxic

2,4-D

If you have to use something look for Pyrethroides and other similar products that are relatively safe for mammals fish and birds.

ENVIRONMENTALLY SAFE ALTERNATIVES FOR CLEANING PRODUCTS

Cleaning product	Alternative
Dishwasher soap	Mix one part borax and 1 part washing soda
Disinfectant and cleaner	Mix ½ cup borax or washing soda with 1 gallon of hot water.
Bleach alternative	Baking soda or borax
Oven Cleaner	Mix two teaspoons of borax and two tablespoons liquid soap in a spray bottle of water or on scouring pad
Drain cleaner	Pour ½ cup salt down the drain, followed by boiling water. Or pour 1 handful baking soda and ½ cup white vinegar and cover the drain tightly for one minute.
Window cleaner	Add 2 tablespoons white vinegar to 1 quart warm water or add 3 tablespoons of ammonia to the solution.
General surface cleaner	A mixture of white vinegar, salt and water
Floor cleaner	Add ½ cup vinegar to a bucket of hot water. Sprinkle a sponge with borax for tough spots.
Silver polish	Clean with baking soda and warm water.
Carpet deodorizer	Sprinkle carpets with baking soda and vacuum after 30 minutes.

NATIVE AND OTHER DROUGHT RESISTANT TREES

In the following list of the names of the trees are given in Papiamentu. These plants are well adapted to the arid environment of Bonaire. Ask the department of LVV for more information.

Fruit trees

Apeldam
Hoba
Kenepa
Taki
Amandel
Beishi
Kamari
Shimaruku
Tamarein

Shadow trees

Ceder
Hobada
Kibra hacha
Kohara Spaño
Lumbra blanco
Manzaliña macho
Oliba
Palu lora
Siya
Wayaká
Brazia
Flamboyant
Hugo
Kohara
Kwihi
Mangel blanku
Matado piska
Palu Boneiru
Palu stoki
Watakeri