## Estimated Revenue Breakdown

Table 5-25 shows estimates of gross revenues by source. Admissions revenues are a combination of tourist and resident ticket pricing and are net of group and other discounts. Based on price levels estimated by ERA, the overall admissions revenue per capita is approximately $12.55.

Other revenues for bookstore, food and beverage, and miscellaneous expenditures are based on per capita expenditures. Total revenues are just over $10 million and per capita revenues are approximately $21.25.

**TABLE 5-25**
**BREAKDOWN OF POTENTIAL REVENUE SOURCES FOR THE GTA**
**1992 Values**

| | | |
|---|---|---|
| Pricing (1) | | US $$ |
| Tourist | | $15 |
| Resident | | $5 |
| | | |
| Revenue | Attendance | |
| Tourist | 425,000 | $6,375,000 |
| Resident | 50,000 | $250,000 |
| TOTAL | 475,000 | $6,625,000 |
| Less: Discounted Admissions ~ | 10% (2) | $662,500 |
| Net Admissions Revenues | | $5,962,500 |
| Per Capita | $12.55 | |
| | | |
| Book Store (~per capita of:) | $4.80 (3) | $2,280,000 |
| Restaurant (~per capita of:) | $2.00 (4) | $950,00 |
| Miscellaneous Revenues (Events, Rentals, etc.) (5) | | $895,000 |
| Subtotal Other Revenues | | $4,125,000 |
| TOTAL REVENUES | | $10,087,500 |
| Total Revenues Per Capita | | $21.25 |

(1) Pricing levels recommended by ERA.
(2) Resident Child ~ 50%; Handicapped ~50%; 1st Monday of every month is free for residents; 10% on group sales.
(3) ERA estimates that 60% of attendees will spend $8 equalling $4.80 per capita.
(4) ERA estimates that 40% of attendees will spend $5 equalling $2.00 per capita.
(5) ERA estimates miscellaneous revenues at 15% of Net Admissions Revenues.

## Estimated Expense Breakdown

Operating expense estimates for the Full facility are shown in Table 5-26. They are predicated on the itemized wage and salary expenses, utility cost estimates from MW, and other expenses from ERA. Labor expense burdens are estimated at 25% of direct salaries.

Based on the experience of comparable aquariums and attractions, it is known that labor expenses typically amount to approximately 55% of total costs. Using this guideline, total operating expenses are estimated at $5.3 million. Operating costs for the Core facility could be 5% to 10% less, but these will be partially offset by startup costs and inefficiencies.

**TABLE 5-26**
**ESTIMATED BREAKDOWN OF EXPENSES FOR THE GTA**
**1992 Values**

| | | | |
|---|---|---|---|
| | | US $$ | |
| Estimated Itemized labor Expense | | $2,353,000 | |
| Less: Allowance for Volunteer Support (~5%) | | $118,000 | |
| Total Salaries Plus Vacation | | $2,235,000 | |
| Add: Related Labor Expenses ~25% | | $560,000 | |
| Total Labor Expenses | | $2,795,000 | |
| Estimated Labor as % of Total Expenses | | 55% | |
| Estimated Total Operating Expenses (1) | | $5,300,000 | |
| | | | |
| Breakdown By Department; (2) | | | |
| Administrative | | 25% | $1,325,000 |
| Marketing & Fundraising | | 15% | $795,000 |
| Curatorial/Plant Operations | | 45% | $2,385,000 |
| Educational Program/Services | | 15% | $795,000 |
| | | | |
| (1) Non-Labor operating expenses include | | | |
| (2) Based on comparable aquariums and visitor attractions. Excluding rent, depreciation, interest and taxes | | | |
| | | | |
| | % of Sales | | |
| Insurance | 3 | $300,000 | |
| Advertising & Promotion | 5 | $500,000 | |
| Supplies | 3 | $300,000 | |
| Utilities/0&M | | $309,000 | |
| G & A | 5 | $500,000 | |
| Other | 4 | $400,000 | |
| SUBTOTAL | | $2,309,000 | |
| | | | |
| Contingency | | $196,000 | |
| | | | |
| | | TOTAL | $2,505,000 |

## Projected Statement of Operations

Table 5-27 presents a projected statement of operations. The analysis first shows the projected attendance. Per capita revenues are then applied. Net bookstore revenues are shown after deducting 40% for cost of goods sold. The GTA will collect a net 5% lease on the gross restaurant revenues which will be operated as a concession. Total operation revenues are the combination of admissions and other net revenues.

The resulting projections of net operating income show that the GTA operates with a profit of approximately $2.6 million.

Appendix B contains a 5-year proforma statement of operations based on Table 5-27.

## ANCILLARY REVENUES

The master plan designates certain areas of the site for a restaurant and possible future recreation

and/or accommodations development. These could provide sources of direct lease revenue to the GTA of up to $200,000/year. Until these uses are more well decreed, we have not included these revenues in the financial analysis.

## FUNDING ANALYSIS

The funding situation in Guam continues to be uncertain with many competing uses for bonding capacity. These include education, infrastructure, life support systems, and street lighting and safety in the hotel zone, which are felt to have higher priority. The island wide property reappraisal has not been completed so there are no accurate numbers as to potential bonding capacity. Considering the uncertainty in bonding capacity, the suggested approach is to use the developer solicitation process to solicit an experienced developer/operator in the marine attraction business. As shown above, projected operating revenue is $2.6 million. At an Earnings Multiplier of 7.0, this leads to a warranted investment by the private sector of $18.2 million. This would leave a gap of $12 million to $18 million to be filled from federal or state grants, sponsorships, ancillary land value, revenue bonds, the Tourist Attraction fund, Airport funds, or other means. The Tourist Attraction fund is used to underwrite bonds, support the GVB, and the Community College Training program. It is currently at 13%, but that is supposed to be "temporary" and the industry is proposing a reduction of 1% per year back to 10%. Thus, this source of funds will be under pressure for some time. We also understand that the airport tax is committed to pay down the facility expansion bonds.

**TABLE 5-27**
**PROJECTED OPERATING RESULTS FOR THE GTA 1992 Values**

| | |
|---|---|
| Attendance | 475,000 |
| OPERATING REVENUES | |
| **Admissions** | |
| Per Capita Admissions Revenues (net) | $12.55 |
| Total (net) Admissions Revenues | $5,962,500 |
| Other Revenues | |
| Book Store | $2,280,000 |
| Less: Cost of Goods Sold ~40% | ($912,000) |
| Net Book Store Revenues | $1,368,000 |
| Food Service Concession Gross | $950,000 |
| Net Concession Lease Revenues ~5% | $50,000 |
| Miscellaneous Revenues (15% of Admissions) | $895,000 |
| Less: Cost of Goods Sold ~40% | 358000 |
| Net Miscellaneous Revenues | $537,000 |
| Total Other Revenues | $1,955,000 |
| Total Operating Revenues | $7,917,500 |
| | |
| OPERATING EXPENSES | |
| Administration | $1,325,000 |
| Marketing & Fundraising | $795,000 |
| Curatorial/Plant Operations | $2,385,000 |
| Educational Program/Services | $795,000 |
| Total Operating Expenses | $5,300,000 |
| Net Operating Income (Shortfall) | $2,617,500 |

Regarding the aquarium development program, it is our experience that the supportable investment

level for a range of commercial visitor attractions generally runs from $50 to $75 per attendee (that is, if you have a million attendees, you can afford a $50 million to $75 million investment). This holds at an even lower level for aquariums. For example:

| Facility | Capital Cost Per Attendee |
|---|---|
| Seattle | $ 33 |
| Chicago | 44 |
| Monterey-Phase I | 33 |
| Baltimore-Phase I | 37 |
| Texas | 77 |
| New Orleans | 30 |
| Underwater World/Singapore | 17 |

We expect Guam to support a higher capital cost per attendee due to high construction costs and the high spending levels of Japanese tourists. ERA suggests a target figure close to $60 to $70 per annual attendee. This would drive an initial budget of $25 million to $30 million for the Core facility with expansion to $35 million to $40 million for the Full facility as attendance increases and operating revenues become available. Costs would get to the top end of this range if there are some reasonably high technology requirements for interpreting The Deep. ERA is very supportive of this approach.

In other new aquarium and visitor attraction developments, most projects are looking to combined public and private sources for development funding or financing. To summarize the funding structure of recent projects in North America:

- Most projects include a significant fund raising campaign among local private donors and corporations. Guam may not have the corporate business base to rely as extensively on this source.
- Local and state governments have used their general bonding capacity to guarantee bonds,
- Construction companies can provide sources of direct financing and bond guarantees during construction.
- Dedicated revenue sources enhance the availability of private credit.
- Research and education (NSF) grants are sources of exhibit support.

Market grade bonds can be used for financing if credit enhancement can be secured from public or private source. As a rule of thumb, private lenders (Fuji Bank, Mitsubishi Bank, Prudential, etc.) are looking to the sponsors for about 50% equity. They also look to limit the attendance based risk by packaging as many guaranteed revenue components as possible (advertising, sponsorships, tour operator contracts). An interesting example of these developments and their complexity is the current offering for the relocation of the Elitch Gardens theme park in Denver.

At Elitch Gardens, the project is a public-private partnership being funded by $14 million in general obligation bonds of the City and County of Denver; $9 million in tax increment bonds issued by the Denver Urban Renewal Agency; $38 million in fixed rate bonds secured by the facility; $3 million limited partnership contribution by lead Contractor; $17 million from additional limited partners, and $13 million from the current owner.

## Implementation

The recommended implementation program is outlined below. It consists of parallel tracks of management/organization, fund raising, and design.

In terms of organization, the first step is for GEDA to create the Guam Territorial Aquarium Foundation (GTAF). We understand that this can be done independently. The Board of the GTAF should be diverse and incorporate important public and private sector constituencies. We recommend at least an eleven person Board including the following representations:

- Airline industry representative (Continental)
- Business Leader (ex Chamber of Commerce President
- Chairman of GEDA (currently President, Bank of Guam)
- Chamorro Leader (respected Guam family)
- Department of Agriculture
- Department of Education (Curriculum Development Officer)
- Hotel industry representative
- Mayor of Yona or member of Municipal Planning Council.
- Municipal finance/investment banker
- Tour operator representative
- University of Guam

It will be the responsibility of the Board, with the assistance of GEDA staff, to guide the fund raising and development process. It would involve other elements of the Community such as the Chamorro Museum Foundation in joint fund raising programs.

The overall fund raising goals reflect a combination of public and private market sources. A general breakdown is as follows:

Guam government

| | |
|---|---|
| • General obligation bonds, depending on bonding capacity | $0-$5 million |
| • Revenue bonds based on Tourist Attraction Fund | $5-$10 million |
| • Federal Government (EDA, NSF, etc.) | $2-$5 million |

Private Market

| | |
|---|---|
| • Revenue bonds based on aquarium performance, including credit enhancements. | $20 million + |
| • Contractor participation | $1-$2 million |
| • Private fund raising and sponsorship | $5 million + |

Total funds to be raised are estimated at $40 million for the Full facility and $32 million for the Core facility necessary to open. As shown, this program calls for approximately 40% of the funds from public source and 60% from private sources and aquarium revenues.

The GTA management team will be a critical element in developing public and investor confidence

in the project. They will also have a critical role in reviewing the design for cost efficient operations, market appeal, and revenue enhancement. To this extent, we recommend bringing on an experienced contract operator as soon as possible in the process. During this assignment, we talked with Associates 4 (Operators of Sea Life Park, Hawaii) and Marine World Africa USA (Vallejo, CA) who both expressed interest in assisting in development management and operations. These and other suitable operators should be considered.

## SUMMARY

As a summary to the market, economic, management, and financial analysis of the GTA there are several significant conclusions:

- There is a strong market need to improve Guam's tourism attractions. The Guam Territorial Aquarium meets this need and is an appropriate industry investment.
- The project is fundamentally sound in terms of the development of a unique and marketable concept in an appropriate site to meet available market support.
- The facility is designed and sized to provide a strong entertainment package and still be cost effective.
- A Guam Territorial Aquarium Foundation (GTAF) should be formed immediately to act as the governing agency to oversee further design development and manage fund raising.
- The GTAF should solicit an experienced operating contractor to assist the design process, manage construction, and operate the aquarium.

# SECTION 6

# SITE EVALUATIONS

## INTRODUCTION

This section summarizes the site evaluations of the six potential aquarium sites that led to the selection of the preferred and alternative sites for conceptual design. Site screening was initially conducted by developing site evaluation criteria that would describe existing information for each site and allow a determination of the potential for aquarium development at each site. Following this, each site was then examined more closely for environmental features, site engineering, water supply characteristics, and archaeological features. A preferred site and alternative sites were selected based on these evaluations.

Finally, this section contains a discussion of regulatory issues and agency coordination requirements that apply to the development of an aquarium at any of the potential sites.

## SITE EVALUATION CRITERIA

Site evaluation criteria were developed to describe the various sites. The criteria were grouped into several broad categories pertaining to site development:

- Access,
- Environmental Concerns,
- Site Development, and
- Program Development Potential.

Within each broad category specific attributes were described for each site for the purposes of initial site screening. The following sections present this information for each site. General site locations are shown on Figure 18 with more detailed maps of each site on Figure 19.

### Fadian Point

Existing access to the Fadian Pt. site is generally good (Table 6-1). Unimproved dirt roads meander through the site and would require substantial improvement. There appears to be adequate land available for parking as well as the capacity to expand parking in the future. Water access is difficult, the primary site investigated was relatively high in elevation and a steep bluff would need to be traversed to provide access to the ocean. An alternative route to the ocean would be along a road leading to the Fadian Pt. mariculture facility.

The site has sparse limestone forest vegetation and has been severely disturbed in the past from commercial activities. Much of the likely site development would occur in these disturbed upland areas. The upland areas appear to have no major associated environmental hazards.

Site development would entail reshaping of the abandoned coral pits and could require considerable earthwork. Water supply would entail a relatively deep seawater well.

This site has good potential for aquarium development. Diverse landforms and views would lend to a very dramatic facility. The site's main disadvantage is its height above the ocean, which would make access to water somewhat difficult. It is also surrounded by industrial uses which would need to be screened from view to avoid detracting from visitor enjoyment.

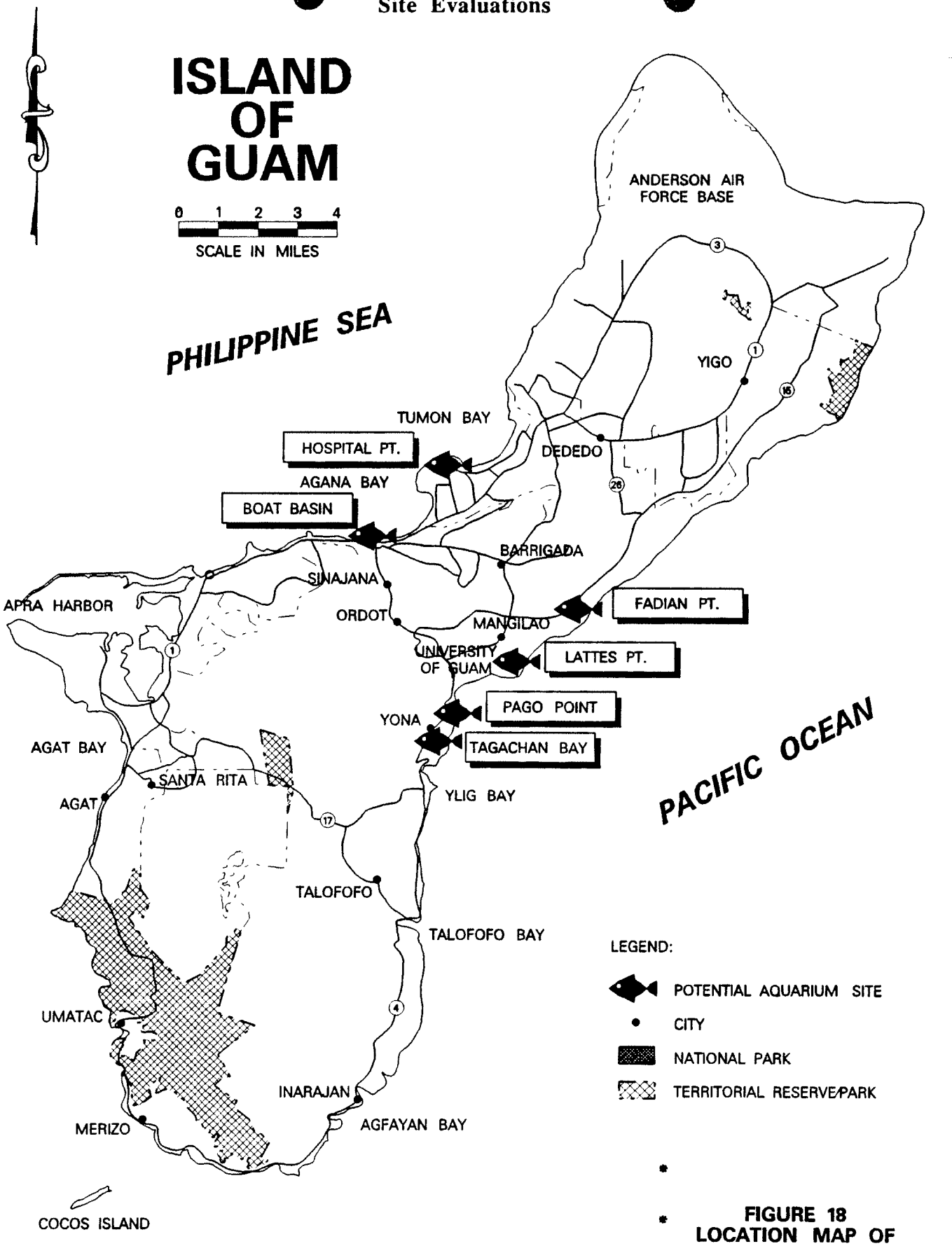
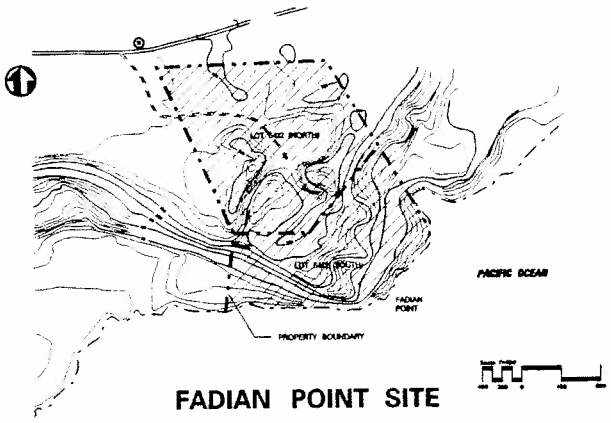
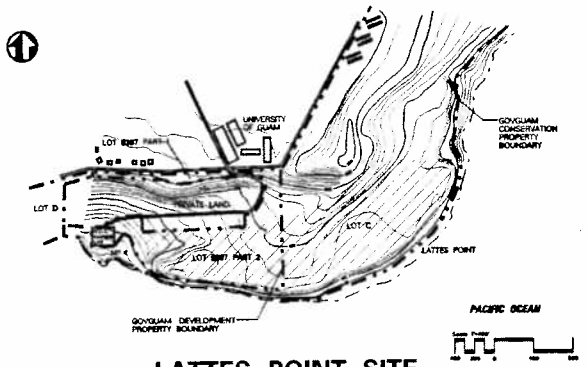


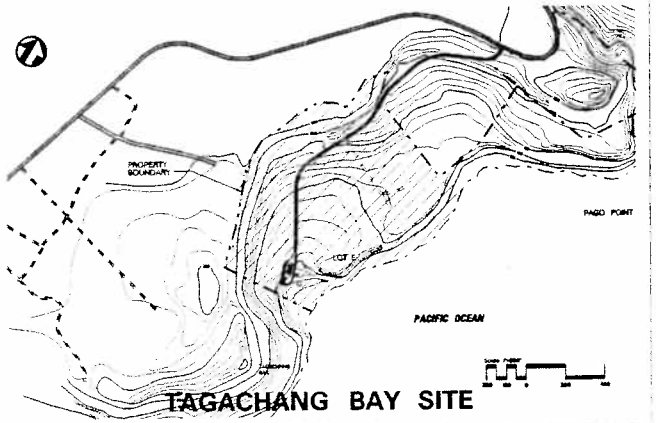

**FIGURE 18**
**LOCATION MAP OF**
**POTENTIAL AQUARIUM SITES**



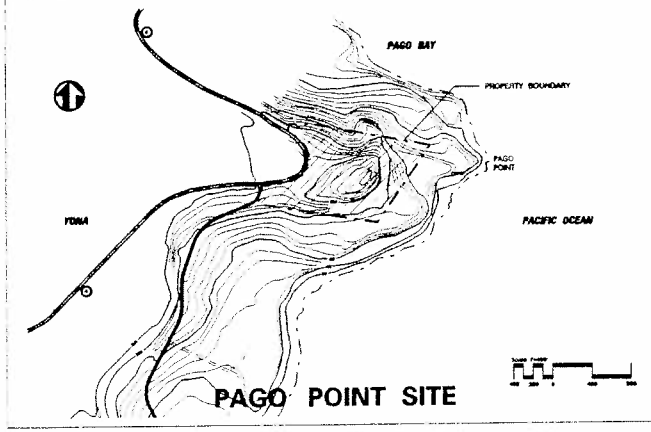

FADIAN POINT SITE



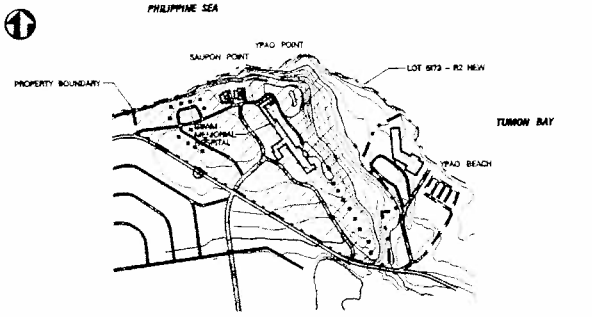

LATTES POINT SITE



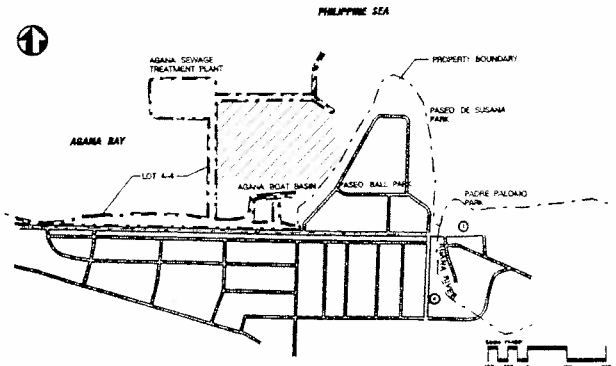

TAGACHANG BAY SITE




PAGO POINT SITE




HOSPITAL POINT SITE




AGANA BOAT BASIN SITE


MONTGOMERY WATSON
PROJECT MANAGERS & ENGINEERS
BELLEVUE, WASHINGTON

JONES & JONES
Architects and Landscape Architects
Seattle, Washington

ERA Economics Research Associates
SAN FRANCISCO, CALIFORNIA

**ALTERNATIVE SITE LOCATIONS**

## TABLE 6-1

## FADIAN POINT SITE EVALUATION

| CRITERIA | ATTRIBUTES |
|---|---|
| ACCESS | |
| Existing Roads | Access via Ignacio Road off Highway 15 |
| Ease of Auto Access | Ignacio Rd. is unpaved, narrow, unimproved road. Requires improvement and landscaping (200' corridor). |
| Ease of Pedestrian Access | Poor, site is remote. |
| Proximity to Public Transit | Transit route on Highway 15 runs by access road. |
| Access to Water | Good if cove at N end is acquired and developed. |
| Potential Parking Capacity | Good, adequate space available. |
| Access Expansion Needs or Potential | Expansion potential is good. |
| ENVIRONMENTAL CONCERNS | |
| Terrestrial Wildlife Habitats | Limestone Forest on S. Fadian Pt. parcel, contains pandanus, breadfruit, hibiscus. Much of central portion of site (N. Fadian Pt. parcel) disturbed from previous activity, has sparse limestone vegetation, tangantangan, shrubs. |
| Natural Hazards (seismic, flooding, waves, typhoon) | Upland portion protected, shoreline areas subject to storm waves. S. Fadian Pt. parcel has slide and erosion zones. |
| SITE DEVELOPMENT | |
| Topography | Mixed: steep bluffs, ravine, promontories, and flat areas. N. Fadian Pt. parcel has numerous abandoned coral pits and exposed limestone boulders. |
| Soils / Geology | Limestone rock soils, Mariana limestone formation, N. Fadian Pt. parcel also has thin layer of Guam clay soil. |
| Existing Utilities | None at site. |
| New Utilities Needs | Water and power. |
| Ownership/Acquisition Needs | GovGuam owned. Acquisition of areas to N along Highway 15 and to E along ridge desirable to control views and/or allow for expansion potential. |
| PROGRAM DEVELOPMENT POTENTIAL | |
| Available Land Area | 98.5 acres (59 acres at N. Fadian Pt., 39.5 acres at S. Fadian Pt.) |
| Proximity to Ocean | Primarily views, steep bluffs on shoreline. |
| Landform Diversity | Good: ravine, cliffs, protected bowl. |
| Geological Diversity | Good |
| Botanical Diversity | Several different habitats |
| View Quality | Good with view control |
| Phased Development Potential | Good with land acquisition as noted above. |

## Lattes Point

Existing access to the Lattes Pt. site is good (Table 6-2). The access road passes by the main entrance to the University of Guam and it may be necessary to widen or otherwise improve the access road to accommodate aquarium traffic and avoid traffic impacts on the University. There appears to be adequate land available for parking as well as the capacity to expand parking in the future. Water access is difficult, the site was relatively high in elevation and a steep bluff would need to be traversed to provide access to the ocean. An alternative route to the ocean would be along the access road passing by the site and continuing down to the University Marine Lab. While acceptable, this would not facilitate a close connection between aquarium exhibits and the ocean.

The site has limestone forest vegetation that has seen some past disturbance. Much of the likely site development would occur in these disturbed areas. The upland areas do contain identified zones of slide and erosion hazards that would need to be delineated prior to development and careful planning to avoid impacts.

Site development would be relatively straightforward. The site is gently sloping to a steep headland. All required utilities are available nearby. Water supply would entail a relatively deep seawater well. There is one private parcel within the area owned by the Government that could affect the layout of the facility and subsequent site development.

This site has good potential for aquarium development. The landforms are generally not diverse but the distant views are good of Pago Bay and the surrounding ocean.. The site's main disadvantage is its height above the ocean, which would make access to water somewhat difficult.

## Pago Point

Existing access to the Pago Pt. site is good (Highway 4) but entry and exit from the site is difficult (Table 6-3). The site is located at the top of a steep hill with a curve and sight lines are limited. Substantial improvements would be required to accommodate the anticipated bus traffic. Land available for parking as well as the capacity to expand parking in the future is somewhat limited. Water access is difficult, the site is on a promontory well above the ocean.

The site vegetation in the flat areas has seen some past disturbance, sloping areas are less disturbed. Much of the likely site development would occur in these disturbed areas. The facility would be directly exposed to typhoons at this site with little natural protection.

Site development would occupy most of the available land. All required utilities are available nearby. Water supply would entail a very deep seawater well.

This site has limited potential for aquarium development. The distant views of Pago Bay, the surrounding ocean and the interior of the island are good. The site's main disadvantage is its height above the ocean, and relatively small size.

## TABLE 6-2

## LATTES POINT SITE EVALUATION

| CRITERIA | ATTRIBUTES |
|---|---|
| ACCESS | |
| Existing Roads | Access via Highway 32 (University Drive) through UOG, then 2 lane asphalt road to, and along, site. No direct vehicle access onto site. Road also accesses UOG Marine Lab. |
| Ease of Auto Access | Access is good but potential for traffic congestion exists through the UOG campus. |
| Ease of Pedestrian Access | Good |
| Proximity to Public Transit | Good public transit to UOG. |
| Access to Water | Poor. Must access water through UOG Marine Lab. |
| Potential Parking Capacity | Limited space for parking. |
| Access Expansion Needs or Potential | Access road needs widening, space is limited. |
| ENVIRONMENTAL CONCERNS | |
| Terrestrial Wildlife Habitats | Moderate to dense growths of limestone forest vegetation: banyan trees, pandanus, breadfruit, shrubs. Also areas of dense tangantangan, coconut, and hibiscus. |
| Natural Hazards (seismic, flooding, waves, typhoon) | All parcels include Slide and Erosion Zones. Exposed to typhoon winds. |
| SITE DEVELOPMENT | |
| Topography | Sloping to steep headland, small ravine. |
| Soils / Geology | Limestone rock land with negligible to thin layers of clay soils; Mariana limestone formation. |
| Existing Utilities | Surrounding development has utility service. |
| New Utilities Needs | Water and power extended to site. |
| Ownership/Acquisition Needs | GovGuam owned except for private property along access road.. Acquisition of areas to E and W desirable to control views. |
| PROGRAM DEVELOPMENT POTENTIAL | |
| Available Land Area | Total 193.4 acres. Parcel 5397 Part 1 is 6.9 acres; Parcel 5307 Part 2 is 47.5 acres; Parcel C is 114 acres; and Parcel D is 25 acres. |
| Proximity to Ocean | Primarily views, steep bluffs on shoreline. |
| Landform Diversity | Sloping bench and headland.. |
| Geological Diversity | Limited. |
| Botanical Diversity | Limited. |
| View Quality | Good |
| Phased Development Potential | Adequate land available |

## TABLE 6-3

## PAGO POINT SITE EVALUATION

| CRITERIA | ATTRIBUTES |
|---|---|
| ACCESS | |
| Existing Roads | Access via Highway 4 which runs along boundary. No direct vehicle access onto site. |
| Ease of Auto Access | Access is poor. Highway 4 has limited sight lines for turning or parking adjacent to the site. |
| Ease of Pedestrian Access | Poor. |
| Proximity to Public Transit | Good public transit route along Highway 4. |
| Access to Water | No water access |
| Potential Parking Capacity | Limited space for parking on site. |
| Access Expansion Needs or Potential | Construct access road, improve access/egress to Highway 4. Limited potential on site for improvements. |
| ENVIRONMENTAL CONCERNS | |
| Terrestrial Wildlife Habitats | Tangantangan, coconut, shrubs |
| Natural Hazards (seismic, flooding, waves, typhoon) | No natural protection from typhoon winds. |
| SITE DEVELOPMENT | |
| Topography | Promontory with steep slope to sloping bench surrounding Pago Point. |
| Soils / Geology | Shallow Guam clay, Mariana limestone formation |
| Existing Utilities | |
| New Utilities Needs | |
| Ownership/Acquisition Needs | GovGuam owned. Could incorporate GovGuam Conservation lands below site around Pago Point.. |
| PROGRAM DEVELOPMENT POTENTIAL | |
| Available Land Area | Approx. 21 acres, |
| Proximity to Ocean | Close to ocean but for views only, limited access potential. |
| Landform Diversity | Limited, sloping bench and headland.. |
| Geological Diversity | Limited: promontory and shelf. |
| Botanical Diversity | Limited: promontory and shelf. |
| View Quality | Very diverse; commanding territorial views of island. Quality is mixed; largely developed areas, Pago Bay distant ocean. |
| Phased Development Potential | Limited due to space constraints. |
| | |

### Tagachang Bay

Existing access to the Tagachang Bay site is good (Table 6-4). The current access road to the park branches off Highway 4 and continues down to the ocean's edge. There appears to be adequate land available for parking as well as the capacity to expand parking in the future. Water access is very good and could be incorporated into aquarium exhibits while still maintaining public access for non-aquarium visitors.

The site vegetation has been disturbed in the past. Much of the likely site development would occur in these disturbed areas. The upland areas do contain identified zones of slide and erosion hazards that would need to be delineated prior to development and careful planning to avoid impacts. The lower beach area would be exposed to wave runup and flooding during storms.

Site development would be relatively straightforward with most of the development occurring on an upland area protected by a bluff. All required utilities are available nearby. Water supply would entail a seawater well. There is one private parcel that extends out to Tagachang Pt. that would be desirable to obtain or control to protect the views and water access.

This site has good potential for aquarium development. The landforms and views are diverse. The site would allow good access to the ocean and this access could easily be incorporated into the facility exhibits.

### Hospital Point

Existing access to the Hospital Point site is good with major arterials approaching from 2 directions (Table 6-5). Pedestrian access and public transit availability is also good. There appears to be adequate land available for parking as well as the capacity to expand parking in the future. Water access is limited with the closest point being Ypao Beach Park on Tumon Bay. The site itself is on a headland with steep cliffs down to the ocean.

The site vegetation has been disturbed in the past and virtually no native vegetation currently exists on the developable area. The upland area is in an identified seismic fault zone. The lower beach area would be exposed to wave runup and flooding during storms.

Site development would be relatively straightforward with most of the development occurring on the upland previously developed area. Demolition and removal of the existing structures would be required. All required utilities are available nearby. Water supply would entail a relatively deep seawater well.

This site has potential for aquarium development. The landform diversity is low but the views are good. The site would allow phased expansion and is very close to the Tumon Bay tourist areas. The site would not be able to incorporate ocean access into any of the exhibits.

## TABLE 6-4

## TAGACHANG BAY SITE EVALUATION

| CRITERIA | ATTRIBUTES |
|---|---|
| ACCESS | |
| Existing Roads | Access via paved road off Highway 4 to Tagachang Beach Park. |
| Ease of Auto Access | Access is good. Highway 4 has limited sight lines for site access and egress. |
| Ease of Pedestrian Access | Poor to limited. |
| Proximity to Public Transit | Good; public transit route along Highway 4. Need improvements for bus stop near access road. |
| Access to Water | Excellent. |
| Potential Parking Capacity | Good; adequate space. |
| Access Expansion Needs or Potential | Acquire 200-foot corridor along access road, acquire private lands to N and S to protect views. |
| ENVIRONMENTAL CONCERNS | |
| Terrestrial Wildlife Habitats | Ironwood, coconut, tangantangan, shrubs |
| Natural Hazards (seismic, flooding, waves, typhoon) | Beach area exposed to wind and waves, flood hazard area. Steep slopes may be landslide hazard, slide and erosion zone. |
| SITE DEVELOPMENT | |
| Topography | Wide, sloping shelf surrounded by steep bluff. Shelf opens to beach cove. |
| Soils / Geology | Limestone rock with shallow Guam clay soils, Mariana limestone formation. |
| Existing Utilities | |
| New Utilities Needs | |
| Ownership/Acquisition Needs | Site is partially GovGuam owned. Need to acquire or get conservation easement on private parcel to N, and extend ownership/protection to Tagachang Point at S end of site. |
| PROGRAM DEVELOPMENT POTENTIAL | |
| Available Land Area | 104 acres. |
| Proximity to Ocean | Excellent proximity for both views and use. |
| Landform Diversity | Excellent diversity: beach, cliff, upper shelf, lower shelf. |
| Geological Diversity | Good geological diversity. |
| Botanical Diversity | Excellent; can create multiple habitats. |
| View Diversity/Quality | Excellent quality and diversity. |
| Phased Development Potential | Excellent. |

## TABLE 6-5

## HOSPITAL POINT SITE EVALUATION

| CRITERIA | ATTRIBUTES |
|---|---|
| ACCESS | |
| Existing Roads | Access via Highway 14 and Duenas Street as well as from Highway 30. |
| Ease of Auto Access | Access is good from 2 directions along urban boulevards. |
| Ease of Pedestrian Access | Excellent. |
| Proximity to Public Transit | Excellent. |
| Access to Water | Closest water access is Ypao Beach Park on Tumon Bay. |
| Potential Parking Capacity | Excellent, also adequate space for off-site shared parking. |
| Access Expansion Needs or Potential | Adequate space for expansion. |
| ENVIRONMENTAL CONCERNS | |
| Terrestrial Wildlife Habitats | Landscaped site, sparse limestone vegetation. |
| Natural Hazards (seismic, flooding, waves, typhoon) | Seismic fault zone, slide and erosion zones. Exposed to typhoons. |
| SITE DEVELOPMENT | |
| Topography | Wide, flat bench with promontory rock outcrop. |
| Soils / Geology | Limestone rock and Guam clays, Mariana limestone formation |
| Existing Utilities | Site has all required utilities. |
| New Utilities Needs | Upgrading, repair may be required |
| Ownership/Acquisition Needs | Site is GovGuam owned. No apparent acquisition needs. |
| PROGRAM DEVELOPMENT POTENTIAL | |
| Available Land Area | 53 acres |
| Proximity to Ocean | Views only, no access. |
| Landform Diversity | Low diversity; uniform landforms. |
| Geological Diversity | Low diversity; uniform landforms. |
| Botanical Diversity | Limited diversity. |
| View Diversity/Quality | View diversity and quality are good. |
| Phased Development Potential | Excellent. |

## Boat Basin

Existing access to the Boat Basin site is good along Highway 1 through downtown Agana (Table 6-6). Pedestrian access and public transit availability is also good. Parking is limited due to the small land area available and expansion is also limited. Water access is good but of generally low quality and variety.

The site is a shallow marine embayment within the Agana boat basin and would require filling to create developable land, resulting in the loss of this habitat. The site would be exposed to wave runup and flooding during storms.

Site development would require filling to create buildable land. All required utilities are available nearby. Water supply would entail a seawater well.

This site has limited potential for aquarium development due to its small size. The aquarium at this site would tend to be more building oriented than outdoor gardens. The landform diversity is low. The site would not allow phased expansion but is very close to the Tumon Bay tourist areas. The site could possibly incorporate ocean access into any of the exhibits.

**TABLE 6-6**
**BOAT BASIN SITE EVALUATION**

| CRITERIA | ATTRIBUTES |
|---|---|
| ACCESS | |
| Existing Roads | Access via Highway 1 through downtown Agana. |
| Ease of Auto Access | Access is good from all directions along urban boulevards. Downtown traffic congestion a factor. |
| Ease of Pedestrian Access | Good. |
| Proximity to Public Transit | Excellent. |
| Access to Water | Water access is good, quality is low. |
| Potential Parking Capacity | Poor, fairly restricted area. |
| Access Expansion Needs or Potential | Limited |
| ENVIRONMENTAL CONCERNS | |
| Terrestrial Wildlife Habitats | Coconut, tangantangan, shrubs |
| Natural Hazards (seismic, flooding, waves, typhoon) | Low elevation site on the water; flood hazard area.. |
| SITE DEVELOPMENT | |
| Topography | Site would be flat fill on sandy beach area. |
| Soils / Geology | Shioya soils, beach deposits. |
| Existing Utilities | Required services present. |
| New Utilities Needs | Service connections to site required. |
| Ownership/Acquisition Needs | Site is GovGuam owned. No apparent acquisition needs. |
| PROGRAM DEVELOPMENT POTENTIAL | |
| Available Land Area | 8 acres, Marginal for intensely developed facility. |
| Proximity to Ocean | Located on the ocean. |
| Landform Diversity | Low diversity; uniform landforms. |
| Geological Diversity | Low diversity; uniform landforms. |
| Botanical Diversity | None. |
| View Diversity/Quality | View diversity and quality are poor, surrounding development. |
| Phased Development Potential | Probably not feasible. |

## ENVIRONMENTAL EVALUATION

### Water Quality

Development of an aquarium will involve use of and releases to surface and marine waters at and adjacent to the potential sites. This section summarizes the regulatory classification of these waters as it concerns the potential sites.

**Surface Water.**

Surface waters of Guam are currently classified into three categories (GEPA 1992):

- S-1 - High
- S-2 - Medium
- S-3 - Low

The sites on the west side of the island, Boat Basin and Hospital Point, lie within category S-2. Fadian Pt. and Lattes Pt., on the east side of the island, also lie within category S-2. Pago Pt. and Tagachang lie within category S-3 (GEPA 1992).

Category S-2 surface waters are used for recreational purposes including water contact recreation, for use as potable water supply after adequate treatment, and propagation and preservation of aquatic wildlife and aesthetic enjoyment (GEPA 1992).

Category S-3 surface waters are primarily used for commercial, agricultural and industrial activities. Aesthetic enjoyment and compatible recreation are acceptable in this zone, as well as maintenance of aquatic life. Compatible recreation may included limited body contact activities (GEPA 1992).

**Marine Water.** Discharge of aquarium process water will likely be to the shallow, nearshore marine environment at the eventual site selected. This has the potential to affect the water quality of the marine receiving water environment. Marine waters surrounding Guam are currently classified into three categories (GEPA 1992):

- M-1 - Excellent
- M-2 - Good
- M-3 - Fair.

All 6 potential aquarium sites lie adjacent to Category M-2 waters with the exception of the Fadian Point site. Fadian Point is at a boundary between Category M-1 waters (to the north of the point) and Category M-2 waters (to the south of the point) (GEPA 1992).

Category M-1 waters must have high enough water quality to ensure preservation and protection of marine life, including corals and reef dwelling organisms, fish and related fisheries resources, and enable the pursuit of marine scientific research as well as aesthetic enjoyment. This category of water shall remain substantially free from pollution attributed to domestic, commercial and industrial discharges, shipping and boating, or agriculture, construction and other activities that can reduce water quality. Mixing zones are not permitted in this category (GEPA 1992).

Category M-2 waters must be of sufficient quality to allow for the propagation and survival of marine organisms, particularly shellfish, corals and other reef related resources. Other important and intended uses include mariculture activities, aesthetic enjoyment and compatible recreation inclusive of whole body contact and related activities (GEPA 1992).

## Wetlands

A summary of identified wetlands at each of the potential aquarium sites is presented in Table 6-7. None of the sites contain any freshwater wetland areas that have been mapped by the National Wetlands Inventory. All sites contain one or more types of marine wetlands along the coastal boundary of the site property lines. These marine wetland types range from intertidal exposed bedrock to submerged coral reef flats. Aquarium development would probably not have any adverse affects on marine wetland areas. Provision of shoreline access is desirable for aquarium development and this should be accomplished with minor disruption of natural shoreline features.

**TABLE 6-7**

**SUMMARY OF MAPPED WETLAND AREAS AT POTENTIAL AQUARIUM SITES (a)**

| Site | Freshwater Wetlands | Marine Wetlands |
|---|---|---|
| Agana Boat Basin | None Mapped | Entire site area is mapped wetlands: primarily subtidal coral reef, but also including intertidal shoreline areas. |
| Hospital Point | None Mapped | Shoreline areas include intertidal bedrock substrate. |
| Fadian Point | None Mapped | Shoreline areas include intertidal bedrock substrate and subtidal coral reef along shore to north of the cove. |
| Lattes Point | None Mapped | Shoreline areas include intertidal bedrock substrate fronted by subtidal coral reef. |
| Pago Point | None Mapped | Shoreline areas include intertidal bedrock substrate fronted by subtidal coral reef. |
| Tagachang Bay | None Mapped | Shoreline areas include intertidal bedrock substrate fronted by subtidal coral reef. |

(a) Source: U.S. Fish and Wildlife Service, National Wetlands Inventory.

One exception to the statement concerning no adverse effects on marine wetlands is at the Agana Boat Basin site. This site consists entirely of submerged lands classified as subtidal coral reef. Site development would entail placing fill over these lands to create buildable space and the subsequent loss of wetland habitat.

Even though no freshwater wetland areas were identified at any of the sites on the National Wetlands Inventory Maps, small areas of freshwater wetlands may exist on one or more of the sites. It is not probable that any large, unidentified wetlands would be found that were not included on the maps. Rather, the likely areas to be found would probably be relatively small and isolated features such as *Phragmites carca* (kariso, or elephant grass) marshes that could occur in spring areas, seeps, poorly draining bowls that collect these seeps, and streams and floodplains. *Phragmites* marshes are a typical inland freshwater wetland found on Guam and provide important habitat for a variety of species.

Mangrove swamps are another typical freshwater wetland type on Guam. Mangrove swamps are associated with mud-bottom estuarine areas where freshwater mixes with saltwater. Mangrove swamps support a variety of fish and shellfish and provide important feeding areas for shorebirds. No mangrove swamps are apparent along the shoreline at any of the sites.

Even though no mapped freshwater wetland areas are identified at the sites, site surveys aimed specifically at locating and delineating the boundaries of any such features would be required as part of the environmental review process under guidelines followed by the Guam Environmental Protection Agency.

### Threatened or Endangered Species

In general, no site specific surveys have been conducted to evaluate the occurrence of any threatened or endangered species at any of the proposed aquarium sites. Several of the potential sites may contain habitat types associated with one or more of these species or be located within a known distribution. Evaluation of the probability that a site may or may not see some degree of use by a threatened or endangered animal species must be based on habitat characteristics at the site. For example, if a certain type of habitat is associated with a particular species, the habitat type is found at one of the sites, and the site is close to or within the known distribution of the species on Guam then this fact is noted. It does not mean the site supports a particular species but identifies an area that needs to be addressed further during the environmental review and permitting process.

Sites on the eastern side of the island that may be in areas frequented by these species or may contain habitat suitable for their use include the Fadian Pt. and Lattes Point sites. Both these sites have considerable bluff area that may have caves or crevices. These site areas also contain some limestone forest vegetation which may offer suitable understory habitat for some of the bird species. Pago Point and Tagachang Bay have both been subject to past development and primarily contain vegetation typical of disturbed sites in the area most likely developed for an aquarium. Thus it is less likely that these sites would provide habitat suitable to terrestrial threatened or endangered species.

Neither site on the western side of the island appears to contain habitat in their developable portions that would appear to be important for any terrestrial threatened or endangered species. The Boat Basin site, as noted previously in the discussion of wetlands, is primarily shallow subtidal reef flat and may see some occasional use by marine species such as the turtles.

To determine the nature and extent of these habitat types would require surveys of the site areas proposed for development at each site.

### Habitat Types and Environmental Features

Prior to development activities occurring since World War II the potential aquarium sites, with the exception of the Boat Basin, probably consisted of limestone forest vegetation and secondary plant communities in areas where the limestone forest had been disturbed by natural phenomena such as fire or typhoons. Currently, the majority of the sites have experienced a wide array of development activities that have changed the nature of the vegetation and habitat types. These include hospital development at Hospital Point, quarrying at Fadian Point, house building at Pago Point, and park development at Tagachang Bay. Tangantangan (*Leucaena leucocephala*) is currently dominant at several of the sites with limestone forest vegetation relegated to relatively small areas.

### Summary of Environmental Features

In summary, all sites currently under consideration have been subject to some sort of past disturbance, either natural, human, or both, and thus are not pristine areas with resulting important habitat values. However, differences do exist among the sites which allow a screening of those areas based on degree of environmental value for water quality, wetlands, threatened and

endangered species, and habitat types in the site area most likely to be used for aquarium development. This is summarized in Table 6-8.

**TABLE 6-8**

**SUMMARY OF SITE ENVIRONMENTAL FEATURES IN SITE AREA LIKELY TO BE DEVELOPED**

| Site | Water Quality Designation | Wetlands | T&E Species | Habitat |
|---|---|---|---|---|
| Fadian Pt. | Surface - S-2<br>Marine - M-1,M-2 | Shoreline marine wetlands only | Little use potential, possibly within feeding range of fruit bats | Aquarium development area is primarily disturbed; abandoned quarry |
| Lattes Pt. | Surface - S-2<br>Marine - M-2 | Shoreline marine wetlands only | Little use potential, possibly within feeding range of fruit bats | Aquarium development area is primarily disturbed; dense secondary vegetation |
| Pago Pt. | Surface - S-3<br>Marine - M-2 | Shoreline marine wetlands only | Little use potential | Aquarium development area is primarily disturbed; abandoned house |
| Tagachang Bay | Surface - S-2<br>Marine - M-2 | Shoreline marine wetlands only | Little use potential | Aquarium development area is primarily disturbed; park development |
| Hospital Pt. | Surface - S-2<br>Marine - M-2 | Shoreline marine wetlands only | Little use potential | Aquarium development area is primarily disturbed; abandoned hospital |
| Boat Basin | Surface - S-2<br>Marine - M-2 | Entire site a marine wetland | May be available to marine T&E species | Aquarium development area is shallow subtidal reef flat |

It appears that the least environmental impact would result from development at either Pago Point, Tagachang Bay, or Hospital Pt. All these sites were highly disturbed in the past. In addition, Pago Point and Tagachang Bay are in surface water category S-3. Somewhat greater environmental impacts would result from development at Fadian Point and Lattes Point. The aquarium site at Fadian Pt. is primarily represented by an abandoned quarry but the adjoining area has limestone forest habitat or relatively undisturbed bluff vegetation. This site is also at a boundary between marine water categories M-1 and M-2. The Lattes Pt. site contains a mix of dense, secondary vegetation as well as some limestone forest vegetation which would be disturbed during development. The highest potential impacts would appear to be present at the Boat Basin site since this would involve the filling and subsequent loss of subtidal marine wetlands.

## SITE ENGINEERING EVALUATION

Site engineering includes such things as access roads, power, utilities, excavation and fill, and seawater supply. These items have different costs associated with each site and are important in determining differences among the sites in terms of engineering feasibility.

Fixed costs that are assumed to be similar at each site include:

- Interior exhibits
- Exterior exhibits
- Life support
- Theater
- Gift shop
- Service area
- Parking
- Civil work (paving, grading, yard piping)
- Site electrical

Cost estimating is sensitive to site specific conditions and local bidding climate. Existing site information for estimating quantities is preliminary and is appropriate for planning level cost estimates and gross screening comparisons among sites. More accurate estimates will require detailed mapping and detailed drawings for the proposed development.

Of the six aquarium sites, Fadian Point is the most remote site to populated areas of the island. Access to the site by Route 15 is excellent and water and power utilities located on Route 15 appear to be adequate. There are some development costs, however, that are significant. These include: the access road into the site, site grading to allow the southeasterly view shed to be exploited, pressure sewer line and gravity line from the site to an existing interceptor (1.5 miles), power to the site from Route 15, and cleanup of the entire north and central portion of the site of debris and trash.

Lattes Point is perhaps the most readily developable site in comparison to the others. Access is excellent and the site is adjacent to the University of Guam where sufficient water, power, and sewer utilities are available. Because of the increased traffic associated with the aquarium and the high pedestrian traffic around the University, it would appear to be necessary to add sidewalks along the westerly front of the University for a distance of approximately 2,800 feet with associated road paving.

Pago Point is a headland site that is confined by steep terrain on three sides and Route 4 on the west side. In order to develop the site for an aquarium, it will be necessary to move a considerable amount of earth and rock. The promontory point on the site would have to be cut roughly 20 feet, with that material filled to the east and west sides of the point to provide areas for outdoor exhibits and parking. The existing residence on the site would have to be demolished and the waste material, mostly reinforced concrete, would have to be hauled offsite. Utilities and access to the site are quite close and adequate to serve the facility. Care would have to be taken in providing access to the site from Route 4. The best access is probably from the west edge of the site through a common road to Tagachang Bay. Traffic improvements would be needed along Route 4 for safe access and egress.

Tagachang Bay site is an extensive property with a relatively long entrance road and development at three topographic levels. These levels include a heavily forested area at the base of a north-south trending bluff, a moderate gradient bench at the base of the bluff, and a beach area. Important site development costs will include improvement to the access road over its 3,000 foot length; providing water, power, and sewer to the site; and demolition of the existing beach structures and beach parking area. While the site has a great deal of topographic relief, it does not appear to require an unusual amount of grading to accommodate the aquarium development.

The Hospital Point site lies within the most intensely developed part of the island. Access is excellent and all utilities are on site. The topography of the developable portions of the site is

moderate and suggests that it was substantially regraded when the hospital and adjacent housing was constructed. The most significant development cost at the Hospital site that is not common to other sites is demolition of existing structures. This includes the hospital, multi-family residences, and single family residences. The actual demolition of the hospital structure is not a major undertaking in comparison with the loading and off-haul of the rubble. The reinforcing steel in the concrete structure makes handling difficult and adds to the "swell" of the material. Demolition, removal, and proper disposal of any hazardous materials at the site (such as asbestos) may be required but is not certain at this time. If any hazardous material is present, its removal should be considered an added cost.

The Agana Boat Basin site occupies a shallow subtidal embayment between the existing Boat Basin and the causeway to the Agana Sewage Treatment Plant. It is proposed to develop the area immediately north of the existing marina through filling. The parcel would be bounded by the existing breakwater to the north and the jetty road to the Agana Wastewater Treatment Plant to the west. Access and utilities at the Boat Basin site are considered excellent and present no unusually high development costs. In comparison to other sites, the seawater supply and disposal would be substantially less costly. As currently planned, an area of approximately 10 acres would be filled to provide the site. To fill this area would require on the order of 210,000 cubic yards of material. It would also be necessary to protect the east edge of the fill with a heavy stone breakwater. Because of the massive volume of fill material required for the site, we assumed that it would not be necessary to purchase the fill material. Rather, we assumed that the fill material could be mined from a publicly owned parcel and that it would be necessary to only pay for the excavation, hauling and placement of the fill.

A summary of the development cost differences for the six sites is given on Table 6-9. This analysis shows that, among the alternatives, the Agana Boat Basin site is the most costly to develop. The cost differences among the other sites vary from relatively lowest cost at Lattes Point and Tagachang Bay to relatively higher costs at Fadian Point, Pago Point and Hospital Point.

**TABLE 6-9**

**SUMMARY OF SITE DEVELOPMENT COST DIFFERENCES**

| Site | Differential Cost |
|---|---|
| Fadian Point | $2,658,000 |
| Lattes Point | $361,000 |
| Pago Point | $2,281,000 |
| Tagachang Bay | $733,000 |
| Hospital Point | $2,236,000 |
| Agana Boat Basin | $5,363,000 |

## HYDROGEOLOGY

The geology of Guam consists of a volcanic core often covered (particularly in the northern half of the island) by a veneer of limestone. The volcanic core is exposed at the ground surface in most of the southern portion of the island, and at depths from 0 to in excess of 1,000 feet in areas of the northern portion of the island. Limestone is present near the surface at each of the proposed aquarium sites.

The volcanic rock is typically of very low permeability, although it may contain lenses of permeable water-bearing limestone. Given this low permeability, the volcanic rocks typically

yield very little water to wells and can be considered non-water bearing for the purpose of this project. The limestone lenses within the volcanics have limited storage and are not considered as significant aquifers.

Fresh groundwater (defined as <250 ppm Chloride) in the coastal areas of Guam is generally found in a lense shaped configuration floating on top of saline groundwater. The thickness of the freshwater lense can be estimated from the hydrostatic density contrast between freshwater (density = 1.000) and saltwater (density = 1.025). This density relationship results in 40 feet of freshwater thickness for each foot of hydraulic head above mean sea level. The thickness of the freshwater lense is variable, ranging from more than two hundred feet in upland areas (where hydraulic heads exceed 5 feet) to a few feet or less near the coast (where hydraulic heads approach zero).

The dividing line between the freshwater and saltwater is not sharp, but rather a brackish transition zone typically ranging in thickness from less than 20 feet to more than 100 feet. The thickness of the brackish zone is dependent upon many factors, including permeability, tidal mixing, and pumping effects. In general, transition zone thickness increases (1) as permeability decreases, (2) in the vicinity of pumping wells (particularly if pumping is intermittent), and (3) in the proximity of the coast.

At the proposed aquarium sites, hydraulic heads are probably less than one foot above mean sea level. As a result, the thickness of the freshwater lense at these sites are probably less than forty feet. Moreover, freshwater/saltwater mixing may have essentially eliminated any freshwater at some or all of the sites, leaving just a brackish zone above the salt water. The thickness of the brackish zone probably approaches 100 feet at most of the sites.

The Agana Boat Basin site is located within or near the area underlain by the Agana Argillaceous Member of the Mariana Limestone; permeability within or near the argillaceous member is relatively low compared to other areas of the Mariana Limestone. Steep water table contours nearby tend to confirm relatively low permeability. Estimated depth to the volcanic basement rock is 300 feet. Chloride concentration in local wells exceeds 300 ppm, with chloride concentrations reported in excess of 500 ppm reported for several local wells. Therefore, no significant freshwater layer is anticipated at the site, and the potential for successful freshwater wells is very low. Potential for successful saltwater wells is good, although yield per well may be lower in comparison to other sites. Yields in the 200 to 300 gpm range are probable with acceptable pumping level drawdowns.

The Hospital Point site overlies clean Mariana Limestone, outside of the argillaceous zone. As such, the permeability will be higher than at the Agana Boat Basin site. Estimated depth to volcanic basement rock is in excess of 600 feet. Chloride levels in local wells range from 400 to 700 ppm. As a result, no significant freshwater layer is anticipated at the site, and the potential for successful freshwater wells is very low. Potential for successful saltwater wells is excellent, with probable yields of more than 300 gpm and pumping drawdowns of a few feet or less.

The Fadian Point site is underlain by clean Mariana Limestone. Estimated depth to volcanic basement rock is in excess of 600 feet. Chloride levels in local wells range from 200 to 800 ppm. Hawaiian Rock Company produces an average of 500 gpm of freshwater (200 to 250 ppm Cl) from two wells located near the coast approximately one mile northeast of Fadian Point. Conversely, the Guam Aquaculture and Training Center, located just southwest of the site, draws brackish water (up to 1900 ppm Cl) from the water table in a limestone cave. Thus, some freshwater may be available in the site vicinity, but the potential for successful freshwater wells is rated as low to moderate. Potential for successful saltwater wells is excellent, with probable yields of more than 300 gpm and pumping drawdowns of a few feet or less.

The Lattes Point site is underlain by clean Mariana Limestone. Estimated depth to volcanic basement rock is about 600 feet. Chloride levels in local wells typically exceed 250 ppm, but some lower levels of chloride are reported. As such, some freshwater may be available in the site vicinity, but the potential for successful freshwater wells is considered low. Potential for successful saltwater wells is excellent, with probable yields of more than 300 gpm and pumping drawdowns of a few feet or less.

The Pago Point site is underlain by Mariana Limestone, in the area where the Mariana Limestone forms an apron around the volcanic core of the southern half of the island. Depth to volcanic basement rock is unknown, as the site is located outside of the Northern Lense Study area. Chloride levels in local wells typically exceed 500 ppm, and it is unlikely that significant freshwater production potential is available. Potential for successful saltwater wells is good, as permeable limestone appears to be present. However, as depth to volcanic bedrock is unknown, a test boring is recommended prior to aquarium design to confirm the potential for saltwater wells.

The Tagachang Bay site is underlain by Mariana Limestone, in the area where the Mariana Limestone forms an apron around the volcanic core of the southern half of the island. Depth to volcanic basement rock is unknown, as the site is located outside of the Northern Lense Study area. Chloride levels in local wells typically exceed 500 ppm, and it is unlikely that significant freshwater production potential is available. Thus, the potential for successful freshwater wells is low. Potential for successful saltwater wells is good, as permeable limestone appears to be present. However, the depth to volcanic bedrock is unknown, and a test boring is recommended prior to aquarium design to confirm the potential for saltwater wells. If saltwater wells were not developed, an offshore saltwater intake would be required.

In summary, there is good to excellent potential for saltwater well development at each of the six identified potential aquarium sites. The best potential sites are at Hospital Point, Fadian Point and Lattes Point. Pago Point and Tagachang Bay may also have equal saltwater production well potential but would require test borings for confirmation. The Agana Boat Basin site has good potential for saltwater well development but not as good as the others due to low permeability.

A planning level cost estimate for development of a reliable 1000 gpm saltwater supply at each site, involving development of four production wells, is approximately $640,000.

## ARCHAEOLOGY

### Site Features

The Agana Boat Basin site consists of a shallow subtidal embayment. Mapped historical sites in the vicinity of the Boat Basin site include Agana Pillbox, a World War II bunker (Site numbers 66-01-1211) and the Statue of Liberty (Site numbers 66-01-1018). Both of these sites are within the boundaries of Paseo de Susana Park and would not be affected by development of the Boat Basin as an aquarium site.

The Hospital Point site occupies a promontory above Ypao Point at the east end of Tumon Bay. Mapped historical sites in the vicinity of the Hospital Point site include Ypao Pillbox I and II (Site numbers 66-01-1205 and 66-01-1209, respectively) and an anti-aircraft gun located on the shore within the Hilton Hotel complex (Site number 66-01-1210). None of these sites are within the boundaries of the Hospital Point aquarium site.

The Lattes Point site is located on a bench near Lattes Point and the University of Guam campus. A mapped archaeological site exists some distance to the west of the University of Guam Marine Lab. This site is named the Taogam Archaeological Settlement (Site number 66-01-0148). This

site lies outside the area of the Lattes Point aquarium site that would most likely be subject to development.

The Fadian Point site occupies an area formerly used as a coral pit. Several mapped archaeological sites exist in the vicinity of Fadian Point and include the North Fadian Point site (Site number 66-04-0033), the Fadian Point site (Site number 66-04-0034) and the Fadian site (Site number 66-04-0026). The North Fadian Point and Fadian sites lie outside the area of likely aquarium development at this site. The Fadian Point site is situated on the shoreline of the small cove that may be a desirable water access point if this site is developed for an aquarium. Development at the Fadian Point aquarium site and access to this cove area would need to accommodate the presence of this archaeological site in any development plan.

The Pago Point site is located on a promontory above Pago Bay. One mapped historical site exists in the vicinity of Pago Point. This site is Pago Pillbox II, a World War II bunker (Site number 66-09-1216). This site is outside the boundary of the potential development area of the Pago Point aquarium site.

The Tagachang Bay site is located within the area occupied by the existing Tagachang Beach park. One mapped archaeological site exists in the vicinity of the Tagachang Bay site. This site is Tagachang Point (Site number 66-09-0039). Development at the Tagachang Bay aquarium site and potential access to Tagachang Point area would need to accommodate the presence of this archaeological site in any development plan.

### Historic Preservation Requirements

Planning for historic preservation is required by several public laws. Historic preservation requirements on Guam are administered through the Guam Historic Preservation Office which is within the Historic Preservation Division of the Department of Parks and Recreation. Preservation responsibilities are required for several types of proposals or actions. Applicable to this project are those involving:

- applicants requiring approval from the Territorial Land Use Commission or Territorial Seashore Protection Commission,
- applicants for licenses, permits, or other assistance from federal agencies or Government of Guam agencies, and
- all government agencies (Department of Parks and Recreation 1991).

The historic preservation planning process consists of five basic steps which are discussed in the following sections.

**Identification and Evaluation.** Identification of historic features on a site can be accomplished through one or more measures. These include:

- an inquiry with the Guam Historic Preservation Office, a search of archival records at government,
- a search of archival records at government agencies and libraries or other archives,
- interviews with current or past residents of the area who have knowledge of the area and its history,

- a search of existing records of the Registers of Historic Places and of professional searches of nearby areas for historic or archaeological sites,
- a limited reconnaissance survey for archaeological sites or architecturally significant buildings, and
- a detailed archaeological or architectural assessment with subsurface testing at selected locations, measured drawings, or professional historical research in conjunction with the field study.

The degree of survey work required should be planned in consultation with the Guam Historic Preservation Office in order to do only as much as is necessary to make decisions regarding the proposed project.

The evaluation phase consists of reviewing the survey findings in accordance with established criteria for listing in historic registers.

**Assessment of Effects.** An effect is defined as any change in character of use of a historic place which is reasonably foreseeable as a consequence of the project. Following the evaluation of significance of any historical features of the site, one of three decisions would be made as to project effects. These include:

- a finding of No Effect in cases where the project cannot or does not change the character or use of the historic places in and near the project area,
- a finding of No Adverse Effect in cases where the project will have an effect on a historic place but will not diminish their significance, and
- a finding of Adverse Effect in cases where the project will diminish or damage the significance of one or more historic places.

**Consultation.** The consultation stage is a period of negotiations among the project proponent, the Guam Historic Preservation Office, other agencies who may be affected by project decisions, other parties involved with the project and other interested parties. The negotiations are needed whenever there is a finding of Adverse Effect. The primary goal of this stage is to find a way to avoid the adverse effect if possible. If it is not feasible to avoid the adverse effect, means to compensate for the adverse effect or mitigate the adverse effect are developed.

Common mitigation measures for historic preservation include restoration of significant elements; visual screening; detailed recording of historic features through drawings, photographs, or other records if loss of the feature is unavoidable; development of interpretive markers, signs, or exhibits; recovery of information from the site; and monitoring during project construction.

**Avoid/Mitigate Adverse Effects.** The results of the consultation process are set forth in a written document of agreement. This agreement is incorporated into the approvals of the project and the subsequent permits and inspections.

## SELECTION OF PREFERRED SITE

Feasibility of aquarium development appears to be good at 4 of the 6 sites:

- Tagachang Bay
- Fadian Point

- Lattes Point, and
- Hospital Point.

Only the Agana Boat Basin and Pago Point sites have constraints that clearly make them less desirable than the other potential aquarium sites. The required fill of marine wetlands at the Boat Basin site and space constraints at the Pago Point site are the main reasons these 2 sites are eliminated as potential sites.

Based on our evaluations, we recommend Tagachang Bay as the preferred site. The features of the Tagachang Bay site that led to this recommendation (more or less in order of significance) include:

- **The aesthetic quality of the site.** It offers a natural setting that easily accommodates the architectural design criteria and thematic program that has been developed for the facility. The Tagachang Bay site has the closest relationship to the ocean with easy shoreline access from the likely developed area. This feature sets the Tagachang Bay site apart from the others. The other sites generally would offer territorial views of the ocean, with access available some distance from the site proper. Lattes Point has the next best potential for shoreline access. Both Fadian Point and Hospital Point would require construction of trails or other access down steep bluffs or development of an access point some distance from the facility.

- **The size of the site.** The site is large enough to test all of the design concepts that may come into play during conceptual design with a minimum of outside influences. There is some potential to expand the size of the site.

- **The aesthetic quality of the access.** The visitor would be arriving through broad vistas to an access road relatively unimpacted by other development. The access road provides a brief period of decompression that is relatively unique on Guam. It feels like we are arriving at a "special place".

- **Accommodation of phased development.** It is a site that would readily accommodate phased development of ancillary facilities that would add to the value of facility development. Similar potential exists at the other 3 sites. It is our opinion that Hospital Point and Tagachang Bay would readily accommodate phased development due to their topography, probably facility layout, and physical access. Fadian Point and Lattes Point need more access upgrading and Fadian Point has space constraints.

- **Limited impact on vegetation and wildlife habitats.** Upland areas at Tagachang Bay contain previously disturbed vegetation in areas most likely to be developed, limiting impacts on terrestrial wildlife and their habitats. This feature is common to all 4 sites, with the Hospital Point site containing the most disturbed upland area. Both Fadian Point and Lattes Point, though disturbed, apparently have remnant limestone forest vegetation on portions of the site.

- **Costs.** Relatively low differential cost of development compared to the other sites. Lattes Point had the lowest differential cost of development, followed by Tagachang Bay, Hospital Point, and Fadian Point. Though this difference is relatively small among the sites, especially when compared to development costs of the entire facility, it is a factor in evaluating site development potential.

- **Easy access.** Existing developed access that could easily accommodate improvement. Of the other 4 sites, only Hospital Point has an equivalent paved access road through the central portion of the developable area. Fadian Point and Lattes Point have dirt roads and paths requiring major upgrading.

Potential negative aspects of this site concern its current use as a park and the effects that development of the site as an aquarium facility would have on that existing use. Aquarium development at this site does not preempt public use of the site, the existing facilities would be demolished and new facilities would be built that should add to the recreational potential of the site. However, public involvement, ie., a public meeting and an environmental impact analysis, is needed to determine whether or not this would be a major negative factor.

### Further Consideration of Other Sites

Alternative sites that may also prove advantageous for development include the Fadian Point, Hospital Point, and Lattes Point sites. We agree that Lattes Point is a feasible site. It was not included in the stage 2 report list because it was felt that there were enough viable sites on the east side of the island to carry through an EIS and there was no overriding difference between Lattes Point and Fadian Point. It would certainly be more advantageous, though requiring more analysis,.to carry all 4 sites through the EIS process.

Selection of a site for final concept design does not preclude any of the others from further evaluation and development. There is a need to prepare the final concept plan at one particular site in order to develop final economic projections, more detailed engineering and construction cost estimates, and a more detailed exhibit plan. This final plan, though site specific, is equally applicable to the other sites with obvious modifications for site specific features. Having more than one viable site allows more flexibility in the planning process should issues arising in the future limit development potential at one or more of the sites.

## REGULATORY ISSUES, PERMITTING, AND AGENCY COORDINATION

This section discusses applicable regulations and laws. There is a significant array of local and federal laws, regulations, development restrictions, and permits applicable to this project. Some of these are common to all the sites listed above while some may be specific to only one, or several, of the sites. The interpretation of these requirements as to intent, and their direct impact on the project design, programming, operation, and flexibility over the life of the facility is necessary.

### Land Use Designation

This section presents a brief description of each site in terms of its size, lot number, land use designation, and development constraints. This information was extracted from the Guam Public Land Use Plan (GPLUP) (Bureau of Planning 1984). Table 6-10 presents a summary of each site according to these characteristics.

**Fadian Point.** The Government of Guam (GovGuam) owns approximately 98.5 acres at this site (Figure 6-2). It is identified as Lot 5412 in the Guam Public Land Use Plan (GPLUP) and consists of a 59-acre north parcel designated as Development and a 39.5 acre south parcel designated as Conservation (Bureau of Planning 1984). A portion of the south parcel is currently occupied by the Mariculture Center. The north parcel includes numerous abandoned coral pits. This site is under the jurisdiction of the Department of Land Management.

**Lattes Point.** GovGuam owns approximately 193.4 acres comprised by 4 lots at this site (Figure 6-2). Lot 5397 Part 1 is 6.9 acres (Conservation),Lot 5397 Part 2 is 47.5 acres (Development, includes the site of the UOG Marine Laboratory). :Lot D is 25 acres (Conservation), and Lot C is 114 acres (Conservation) (Bureau of Planning 1984).There is also a privately owned parcel in the central portion of the site. The lots at this site are under the jurisdiction of the Department of Land Management (Lot No. 5397 Part 2, Lots C and D) and the University of Guam (Lot No. 5397 Part 1).

## Table 6-10

## Existing Land Use Designations (a)

| Site Name / Lot No. | Existing GPLUP Designation | Existing Zoning | Existing Community Plan Designation | Identified Constraints |
|---|---|---|---|---|
| **Fadian Point** | | | | |
| Lot 5412 (South) | Conservation | Agriculture | Open Space | Slide and Erosion Zones, Seashore Reserve, Limestone Forest |
| Lot 5412 (North) | Development | Agriculture | Open Space | None Identified |
| **Lattes Point** | | | | |
| Lot 5397 Part 1 | Conservation | Agriculture | Open Space | Slide and Erosion Zones |
| Lot 5397 Part 2 | Development | Agriculture | Open Space | Slide and Erosion Zones, Limestone Forest |
| Lot C | Conservation | Agriculture | Open Space | Slide and Erosion Zones, Limestone Forest, Seashore Reserve |
| Lot D | Conservation | Agriculture | Open Space | Slide and Erosion Zones, Limestone Forest, Seashore Reserve |
| **Pago Point** | Unsurveyed | Unsurveyed | Unsurveyed | Unsurveyed |
| **Tagachang Bay** Lot E | Conservation | Agriculture | Open Space, Recreation | Slide and Erosion Zones, Flood Hazard, Seashore Reserve |
| **Hospital Point** | | | | |
| Lot 5173-1-R2 New | Development | Multi-family residential | Public Institution | Slide and Erosion Zones, Seismic Fault Zone |
| **Boat Basin** | | | | |
| Lot No. A-4 | Conservation | Agriculture | Open Space, Recreation | Flood Hazard Area, Seashore Reserve |

(a) Source: Bureau of Planning (1984)

**Pago Point.** GovGuam owns approximately 21 acres at this site (Figure 6-2). The site has no current designation in the GPLUP (Bureau of Planning 1984). The site includes a promontory above Pago Point and adjacent to Highway 4 that has commanding views of the surrounding ocean, Pago Bay, and the island interior. An abandoned house currently occupies this promontory.

**Tagachang Bay.** GovGuam owns approximately 104 acres at this site (Figure 6-2). The site is Lot E with Conservation designation in the GPLUP (Bureau of Planning 1984). The site includes Tagachang Beach Park on the shoreline as well as some upland areas. A private parcel is adjacent to the site on the N along the access road. This site is under the jurisdiction of the Department of Parks and Recreation.

**Hospital Point.** GovGuam owns approximately 53 acres at this site (Figure 6-2). The site is Lot 5173-1-R2 with Development designation in the GPLUP (Bureau of Planning 1984. The site includes the abandoned Guam Memorial Hospital as well as some housing. This site is under the jurisdiction of the Department of Land Management.

**Boat Basin.** GovGuam owns approximately 8 acres at this site (Figure 6-2). The site is Lot A-4 with Conservation designation in the GPLUP (Bureau of Planning 1984. The site includes the Wastewater Treatment Plant and the Agana Boat Basin. Land for the aquarium would be created through filling. This site is under the jurisdiction of the Department of Parks and Recreation.

### Land Use Designations

The GPLUP classifies public lands into three land-use categories: Development, Agriculture, and Conservation. The sites under consideration for the aquarium includes lands designated as Development and Conservation (Table 6-10). Lands designated as Development include those parcels that may be required for the siting of public facilities (Bureau of Planning 1984). Lands included under this category generally are not environmentally sensitive and possess characteristics that are suitable for development such as level topography, soil stability, and availability or feasibility of providing suitable infrastructure.

Lands designated as Conservation include those unique, environmentally sensitive lands that should be protected from development pressures (Bureau of Planning 1984). These areas possess valuable, fragile natural resources and geologic constraints or hazards that render the land unsuitable for development. Lands included in the category are those necessary for protecting watersheds and water resources, preserving scenic vistas and historic areas, protecting critical habitats for endangered or threatened plant and animal species, providing park areas, beaches and other non-intensive recreational sites, and preventing floods, soil erosion, and other hazards. Areas designated Conservation are usually open space areas whose existing openness, natural conditions, or present state of use provide areas for nature observation, scientific study, and preservation of the aesthetic appearance of the island. They enhance the quality of life for residents and provide important tourist attractions.

### Identified Constraints

Five different categories of constraints are listed for the 6 sites, including; slide and erosion zones, seismic fault zones, flood hazard area, seashore reserve, and limestone forest Table 6-10). These constraints do not preclude a particular land use designation, but may affect the development potential. A brief description of these constraints follows.

Seismic fault zones include areas that subdivide the island's geologic structure and are potentially hazardous during an earthquake (Bureau of Planning 1984).

Slide and erosion zones include areas with topographic characteristics with the potential to threaten life and/or property if improperly developed or maintained. These areas generally include areas with slopes in excess of 15% and/or areas with unstable soil (Bureau of Planning 1984).

Flood hazard areas include low-lying areas which retain runoff from natural and developed drainage systems during periods of persistent rainfall (Bureau of Planning 1984)

Limestone forests characteristically grow on minimal soil over limestone and are characterized by large trees which form a canopy over lower vegetation. These limited resource areas serve as important habitat for wildlife and are valuable for educational and passive recreational uses (Bureau of Planning 1984).

Seashore reserve includes land and water areas extending seaward by 60 feet and extending inland to the nearer of:

- the mean high water line to 33 feet, or
- the mean higher water line to the inland edge of the nearest public right of way (Bureau of Planning 1984).

As stated above, these constraints do not preclude development at a site. They do identify areas that may differentiate between sites during site selection, may need to be addressed in future environmental analyses or permitting actions, or considerations for facility planning and design.

## LOCAL AND FEDERAL REGULATORY ISSUES

Local and federal regulatory issues include laws, zoning, consistency review requirements, environmental evaluations or permit requirements that must be considered during aquarium planning and site evaluation. In general, the feasibility planning stage for a facility is the time to identify the major requirements and whether or not they may place a constraint on site or facility development. With the exception of environmental laws or requirements, site-specific facility information (as would be developed during the design phase) is required for a number of permit decisions.

This section presents a more detailed consideration of these issues than was presented in the Phase 1 report. The information will be finalized during Phase 3 of this study.

### Local Regulatory Issues

Local agencies that may have jurisdiction or consistency review obligations over some part of aquarium development (depending on the site) include:

- Bureau of Land Management
- Bureau of Planning
- Department of Agriculture
- Department of Parks and Recreation
- Guam Environmental Protection Agency
- Department of Public Works
- Public Utility Agency of Guam
- Guam Power Authority
- Guam Housing and Urban Renewal Authority

In addition, the Guam Territorial Land Use Commission, Development Review Committee, and the Territorial Seashore Protection Commission have review and approval jurisdiction for development projects under their purview.

### Local Permits and Approvals

A number of permits issued by both Government of Guam and federal agencies would be required prior to aquarium development. A complete list of these permits is not possible without designating the site to be developed and a development plan. This will be done as the first permitting task of the Predesign Phase and scheduling of this task is discussed in Section 4. In general, permit submittal, review, and approval will be a critical path item for Aquarium development that will require close coordination with Government of Guam and federal agencies and timely preparation and submittal of permit applications.

The following permits or approvals are applicable to all of the potential aquarium sites.

- Land use permit
- Seashore Reserve Permit
- Guam Coastal Management Program consistency review
- Grading and clearing permit
- Building and occupancy permit
- Construction and sanitary permit
- Sewer connection permit
- Sign permit
- Environmental Protection Plan
- Erosion Control Plan
- Well drilling and operating permit
- Pollution discharge permit
- Permit to import and hold exotic or endangered species

In addition, depending on the site chosen as the preferred location of aquarium development, a wetlands permit (see discussion below under Corps of Engineers permit) may be required for placement of fill in tidal waters or freshwater wetlands. Zoning changes or conditional use permits may also be required at one or more of the potential sites. The permits to import and hold exotic animals will require close coordination with the Department of Agriculture, Division of Aquatic and Wildlife Resources as well as the U.S. Fish and Wildlife Service and must be evaluated on a case by case basis for the particular animal (or plant) species involved.

A discussion of the submittal requirements and review process for many of these permits is presented in the Bureau of Planning's Guidebook to Development Requirements on Guam (Bureau of Planning 1986a).

### Environmental Impact Assessment

The federal National Environmental Policy Act (NEPA, see discussion below) lays out requirements for an assessment of potential environmental effects for carrying out an action sponsored by a federal agency or occurring on federally-managed lands (see discussion below) through development of either an Environmental Impact Assessment (EIA) or an Environmental Impact Statement (EIS). The Guam Environmental Protection Agency administers this program on the island for development actions,.including those proposed by the Government of Guam and acts as the clearinghouse for government agency review of all EIAs and EISs.

Basic elements required in an EIA or EIS include a description of the project, description of the project's setting, description of the existing environment, estimate of the nature and magnitude of

environmental changes caused by activities of the project, evaluation of impacts relevant to site sensitivity, and mitigation measures. The description of the existing environment usually must include, as a minimum, the following topics:

- existing land use
- population
- natural resources
- air and water quality
- traffic
- historical and archaeological resources, and
- general climatic conditions.

The main difference between an EIA or EIS is in the level of data analysis presented in the document. Both cover the same topics mentioned above. The decision on which type of environmental document to prepare depends on the complexity of the project and should be decided upon in consultation with the major government agencies having review obligations.

The approval process of an EIA or EIS allows for review and comment on the proposal by regulatory agencies, other affected agencies, public interest groups, and the general public. This procedure must typically be complete prior to the issuance of any federal permit required for the project (discussed below). Its phasing with respect to local permits is still being evaluated.

Attachment 2 to this working paper consists of a guide to the preparation of these documents prepared by the Guam Environmental Protection Agency (Guam EPA 1980).

## FEDERAL REGULATORY ISSUES

### Corps of Engineers Permits/Wetlands permits

The U.S. Army Corps of Engineers has jurisdiction over development projects in waters of the United States (including U.S. Territories) through Section 404 of the Clean Water Act and Section 10 of the River and Harbor Act.. Section 404 provides for government and public review and comment on projects that alter or destroy water of the United States by filling or disposal of dredge spoils (including any soil movement). The Corps issues or denies permits and permit approval must comply with guidelines developed by the Environmental Protection Agency under Section 404(b)(1).

The River and Harbor Act was enacted in 1899 to preserve the navigability of the nation's waterways. Section 10 of this Act prohibits the unauthorized obstruction or alteration of any navigable water of the United States. The provisions apply to all structures or work below the mean high water mark of navigable tidal waters, including wetlands. Provisions of Section 10 are implemented through a permit process that includes consideration of navigational, flood control, fish and wildlife management, and environmental impacts. NEPA compliance is required. Section 10 reviews often occur simultaneously with Section 404 permit processing. The Corps does not use the 404 (b)(1) guidelines in the review process.

A Government of Guam wetlands permit must be obtained prior to development in any area containing wetlands. This permit must be reviewed and approved by the Territorial Planning Commission. Upon approval by the Planning Commission, appropriate federal wetlands permits should be obtained.

## Endangered Species Act

The Guam Department of Agriculture, Division of Wildlife and Aquatic Resources can provide guidance and advice on threatened and endangered species on Guam. The U.S. Fish and Wildlife Service administers the provisions of this act for terrestrial species and the National Marine Fisheries Service administers the provisions of this act for marine species at the federal level. These agencies would review any development proposal for potential impacts to threatened or endangered species and provide consultation to determine whether or not the proposal may have any adverse environmental effects on any listed species.

Consultation with these agencies should be conducted during the environmental review process for the potential for occurrence of threatened or endangered species at any of the alternative aquarium sites. Table 6-11 lists threatened and endangered animal species of Guam.

**TABLE 6-11**

**ENDANGERED OR THREATENED ANIMAL SPECIES OF GUAM**

| Common Name | U.S. List | Guam List | Comments |
|---|---|---|---|
| **Reptiles** | | | |
| Green Sea Turtle | T | | |
| Hawksbill Sea Turtle | E | | |
| **Birds** | | | |
| Mariana Mallard | E | | May be extinct |
| LaPerouse's Megapode | E | | May no longer be found on Guam |
| Guam Rail | E | | May no longer be found on Guam |
| Mariana Gallinule (Common Moorhen) | E | | |
| Mariana Fruit Dove | | E | |
| White-throated Ground Dove | | E | |
| Mariana (Vanikoro) Swiftlet | E | | |
| Guam Micronesian Kingfisher | E | | |
| Mariana Crow | E | | |
| Reed Warbler | E | | May no longer be found on Guam |
| Rufous-fronted Fantail | | E | Proposed for U.S. List |
| Guam Broadbill | E | | May no longer be found on Guam |
| Micronesian Starling | | E | |
| Cardinal Honeyeater | | E | |
| Bridled Whiteye | E | | May no longer be found on Guam |
| **Mammals** | | | |
| Mariana Fruit Bat | E | | May be extinct |
| Little Mariana Fruit Bat | E | | May no longer be found on Guam |
| Sheath-tailed Bat | | E | Occasional unverified sightings |
| Dugong | E | | |

T = Threatened, E = Endangered

### Marine Mammals

It is uncertain at this time whether or not the taking and holding of any marine mammals is under consideration for the aquarium. Should this change however, both the National Marine Fisheries Service (NMFS) and the U.S. Department of Agriculture (USDA) would need to be consulted and permits obtained. NMFS would issue or deny a permit to take any marine mammals for display purposes. Conditions for the holding, transport and display of marine mammals are regulated by the USDA.

### National Environmental Policy Act

The National Environmental Policy Act (NEPA) established a process requiring federal agencies to consider the environmental impacts of agency-sponsored development projects and of agency decisions on permits and approvals required for privately-sponsored development projects. The NEPA process emphasizes the full-disclosure of environmental impacts and their consideration, along with technical and economic considerations, prior to an agency decision.

Guidance for the implementation of NEPA is provided by the Council on Environmental Quality (CEQ). The CEQ Regulations (40 CFR 1500-1508) place a great deal of emphasis upon the consideration of alternatives, including ways to mitigate (avoid or reduce) harmful environmental effects. Generally, the NEPA process occurs concurrently with Section 404 reviews by the Corps of Engineers. Most federal agencies have adopted their own regulations for implementing NEPA requirements.

NEPA requires that an environmental impact statement (EIS) be prepared for any major federal action that would have significant adverse environmental impacts. The EIS must thoroughly evaluate any adverse environmental impacts of the proposed action and its alternatives. Permits issued by a federal agency (such as Section 404 permits) are considered to be federal actions that may require an EIS. Anyone can recommend to the permitting federal agency that an EIS be prepared. However, any such recommendation should be based on evidence indicating that a proposed action would result in significant adverse environmental impacts.

To determine if a proposal would have significant adverse environmental impacts, the agency may prepare an environmental assessment (EA). A permit applicant often provides much of the information and analysis used to prepare the EA. The EA contains sufficient evidence and analysis to determine if an EIS is required. If an EIS is not required, a finding of no significant impact (FONSI) document is prepared by the federal agency that explains why an EIS is not required for a particular proposal.

## COASTAL ZONE MANAGEMENT ACT

The federal Coastal Zone Management Act (CZMA) of 1972 and subsequent amendments established a voluntary program through which states and territories could receive financial and technical assistance to formulate a plan for the efficient use of coastal zone areas within its boundaries. Through the CZMA, each state or territory is encouraged to develop a coastal zone management plan for coastal resources. Once the plan is approved by the federal government, additional federal financial assistance becomes available to implement the plan. On Guam, this program is administered through the Guam Coastal Management Program.

If a proposed action does not comply with the CZMA an applicant for a federal license or permit to conduct an activity in the coastal zone must certify that the project is consistent with the approved program.

## References

GEPA. 1992. Revised Guam Water Quality Standards. Guam Environmental Protection Agency. Harmon, Guam. January 22, 1992. 84 p.

Bureau of Planning 1984

# SECTION 7

# PROJECT ROLES THAT MAY IMPACT PUBLIC FUNDING

## Relevant Mission

Section 5 discusses the economic feasibility of this project and includes certain assumptions as to the possibility of public funding for this work. This section discusses, in a general way, how some public funding might be justified and how it might be sought. As a starting point, we can return to the Mission Statement contained in Section 2:

- Bring together the peoples of Micronesia through an appreciation of their individual cultures and their historic and current relationships with the sea and
- To provide opportunities for visitors to become better acquainted with Micronesia and its natural beauty.

It is the first element of the mission that provides the strongest underlying justification for this facility, to bring together the people of Micronesia. This is done by educating them as to their culture and resources, providing economic stability, and by providing a focus for community activities.

## Education

It is easy to assume that Micronesians are well versed in the nature of their marine resources and with the remainder of Micronesia from an institutional and cultural standpoint. On examination however, it is not generally true. For this reason, the educational message is directed at Micronesians so they can have a better understanding of their world. If successful we believe there is a strong possibility of an improved sense of common mission. This then can help insure that the well informed voices of Micronesia will be heard where decisions are being made that effect Micronesia.

At a more basic level, the education program can help families and individuals understand why certain practices are not appropriate to their long-term well being. Examples might be bad fishing methods, pollution, reef destruction at even the smallest scale, and uncontrolled pesticide use.

## Stabilizing Tourism on Guam

A stable tourism industry on Guam is the key to a stable economy. Historically the fortunes of the island have risen and fallen with military expenditures and legislative whims. The cry of "No Jobs, No Money, No Family" has produced an exodus of the educated young (and many of their parents) to the mainland that has only been stemmed in the last decade with the advent of the tourism industry. Tourism has taken Guam from the status of high unemployment and few entry-level jobs to relative prosperity and a relatively low unemployment rate. In fact, it has in many ways become a magnet for people from the rest of Micronesia where the unemployment rates are often approaching 50% or more. However, the tourism industry can be fickle and competition is intense. Studies described in Section 5 demonstrate that while there is much that tourists find of value on Guam the quality of the tourist attractions do not appear to be adequate to draw return visitors and as other tourist areas evolve and develop the lack of a major visitor attraction might actually cause Guam to drop back as a tourist attraction. Everywhere we have heard the same concern. "We need to improve the tourist's opportunities for a quality experiences. Especially unique ones."

Part of the focus of this project is to make Guam a better destination. By doing this, we believe that this project will have a significant impact on the stabilization of tourism to Guam.

### Expanding Tourism to Micronesia.

Tourism in the rest of Micronesia, excepting Saipan and, perhaps, Tinian, is at a very low level of development with visitors for the most part coming for such recreational activities as scuba diving and exploration. These attractions are not really suited to all of the visitor market and to some degree they are self limiting. We believe that the development of this aquarium will provide a new focus on the outer islands of Micronesia to encourage visitors to make a second trip to the area in the future, stopping at Guam, and then going on to other islands. As is noted several times earlier, the aquarium is planned not simply to show off tropical fish but also to introduce the visitors to the cultural activities and scenic beauties of other islands in Micronesia. We believe that this will have a positive impact on maintaining tourism on Guam but it will also improve the opportunities for expanding tourism to the rest of Micronesia. Further, we feel that the type of tourist that will be attracted are those most interested in the natural features of these islands, thus, those that are most likely to appreciate the need for low impact type of activities, i.e., eco-tourism.

### Employment Opportunities for Other Micronesians

With the end of WWII the United States took control of Micronesia from the Japanese and administered the area through an organization known as the Trust Territories of Micronesia. While the record of this government body is not universally applauded, the basic services were provided including education, health and justice. In more recent times, the former Trust Territories has become a series of separate political bodies; specifically the Commonwealth of the Northern Marianas, the Federated States of Micronesia, the Republic of the Marshalls, and perhaps soon the Republic of Belau. The United States maintains a residual interest in these areas and through treaties and other agreements participate, often through funding, in many of the activities of these islands.

Notwithstanding U.S. participation, the various island nations have taken political control of their own destiny in many ways of their own destiny and with some signs of success. However, the nature of the economic underpinnings of these areas has led to high unemployment and a certain amount of social unrest. In response, institutional decisions have been made that are not always in the best long-term interest of the inhabitants of the area. Some of these would include construction that impacts the water quality, the poor maintenance of sewer facilities again impacting water quality, the use of fishing methods unsuited to the area such as dynamiting and poisoning the fish, and others. While the development of an aquarium can educate the people as to why they should improve how their resources are utilized, this still leaves the unemployment.

The aquarium can provide help in three ways.

- Expanding tourism to the rest of Micronesia.
- Providing jobs to Micronesians directly in the aquarium. Projections in Section 5 suggest a staff of 80. Some of these jobs are in cultural displays and some are in technical and service areas. It would appropriate for an aquarium focusing on Micronesia to provide jobs (and related training) to a defined number of Micronesians.
- Stabilizing tourism on Guam which in turn improves job opportunities for Micronesians from other areas. Currently, tourism is a major source of jobs on Guam for people from the outer islands.

In the longer term, there is the benefit of having people return to their islands with the new conservation ethic that they could learn in a job in the aquarium and what alternatives are available. Perhaps more than any other region in the world such an education is needed and in the context of these specific locations. This aquarium would provide these things.

### The Public Benefits

We believe that the public benefits discussed above are adequate to suggest that there should be participation by the U.S. Government in the funding of this project. We have discussed this with a number of different agencies including the Economic Development Administration, Sea Grant, the National Science Foundation, and believe that there is adequate interest to justify federal assistance.

### Funding Strategy

We have reviewed a number of federal programs. By and large, this project is a good fit in several. Unfortunately, to seek funding through each would become a nightmare of application timing and fund availability. For this reason we suggest a single approach through a single legislative package as follows:

Congressman Underwood would introduce an amendment to the Federal Appropriations Bill asking for some amount of dollars for the aquarium. The net amount to be requested would be based on the programs to be included. For example:

*A total of $12 million is requested, in addition to other programs, to be apportioned as follows:*

- *$6 million for infrastructure[1] construction to be administered by the Economic Development Administration in addition to their regular programs.*
- *$1 million to EDA for the administration of the construction funds. This is in addition to their regular programs.*

*In addition, assistance by other federal agencies could be funded through the same appropriation as follows:*

- *$1 million to Sea Grant through the University of Guam Marine Laboratory to train aquarium workers including a specific number of Micronesians from outside of Guam.*
- *$1 million to the Department of Interior through the Guam Department of Agriculture to set up exhibits and programs within the aquarium to teach preservation of endangered species and threatened environments.*
- *$1 million to the Department of the Interior through the Guam Department of Parks and Recreation for a program to educate on the preservation of conservation areas.*
- *$1 million to the National Science Foundation's Informal Science Education Program through the University of Guam Micronesian Research Center*
- *$1 million to the Department of the Interior (or HEW) through the University of Guam Micronesian Research Center to assist in the development of cross-cultural educational exhibits and programs within the aquarium.*

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[1] Infrastructure construction is often a target for EDA's programs.

It is likely that other programs may suggest themselves.

The specifics of these programs and the funding requirements should be evolved early in the predesign stage in consultation with the affected federal and territorial agencies in order that they can be fit into a single appropriations bill.

## FEDERAL PROGRAMS

As a starting point for discussions with the federal agencies, we have collected and summarized information for various programs that may be of interest.

### Economic Development Administration (EDA)

While the EDA has long been involved in funding various public programs the current funding level is only about $150 million to be distributed throughout the country. While recent initiatives by President Clinton have attempted to increase funding, Congress has not approved. Based on present funds, EDA is unlikely to grant any one new project more than $1-2 million. It is on this basis that we have suggested approaching the Congress with a separate appropriations request that is in addition to current programs.

EDA has two programs that would seem to fit this situation if funds were available. They are:

### EDA Public Works and Development Program

Program Goals

Grants are provided to help distressed communities attract new industry, encourage business expansion, diversify their economies, and generate long-term, private sector jobs.

Project Types/Eligible Applicants

Among the types of projects funded are water and sewer facilities primarily serving industry and commerce; access roads to industrial sites or parks; port improvements; and business incubator buildings. Proposed projects must be located within an EDA-designated redevelopment area (RA) or economic development center (EDC). Projects in other areas of an EDA-designated Economic Development District are also eligible if they will benefit an RA within the District. Projects must be consistent with an approved overall economic development program. An applicant may be a State, subdivision of a State, Indian tribe, special-purpose unit of government, or public or private nonprofit organization or association representing an RA or EDC.

### EDA Planning Program for Economic Development Districts, Indian Tribes and Redevelopment Areas

Program Goals

Grants and cooperative agreements provided under this program support the formulation and implementation of economic development programs designed to create or retain full-time permanent jobs and income for the unemployed and underemployed in distressed areas.

Project Types/Eligible Applicants

Eligible activities under this program include administrative expenses for the organization; preparation and continuation of an overall economic development program; and planning, implementation and technical assistance services to communities and local governments within the

organization's jurisdiction. Assistance is normally awarded for a period of 12 months, and can be provided for up to 75 percent of the total project cost. Indian tribes can be provided assistance up to 100 percent of the total project cost.

Eligible applicants are economic development districts, Indian tribes, redevelopment areas (RAs), organizations representing multiple Indian tribes or RAs (or parts of such areas), and Commonwealths, Territories and Freely Associated States.

### University of Hawaii/University of Guam Sea Grant Program

Sea Grant has a number of programs that involve studies and educational activities that may be available through the relationship between the Universities of Hawaii and Guam. Typically the grant amounts ar small (under $100,00) but the goals of the program and its long history could fit into this project. Following is a description of the program:

The formal association which led to the formation of the University of Hawaii/University of Guam Sea Grant Program began in 1979 with the placement of a University of Hawaii Sea Grant extension agent at the University of Guam's Marine Laboratory. The first UH/UG research projects were proposed in 1980 and initiated the following year by faculty of the University of Guam Marine Laboratory.

Challenges facing the program include coastal pollution, introduction of alien species, overharvesting, and destructive harvesting practices. Additionally, ocean-related conflicts are often a result of the differing opinions by Guam's multiethnic population about the use of marine resources.

The program has met these challenges by focusing on fisheries and coastal resource issues unique to Guam and the western Pacific. For example, recruitment rates and resource assessments on the stocks of herbivorous reef fishes at different depths, latitudes, and habitats were made in conjunction with research on historical and current fishing methods in Guam. The stock assessments provide a basis for reasonable prediction of the effects on benthic communities of overfishing of these fish populations. Correspondingly, the study of fishing methods resulted in a guidebook which documented traditional and alternative harvesting methods and encouraged appropriate fishery development. It now serves as a guide for coastal resource managers.

Furthermore, the extension agent has instituted a fishery training program for Guam teenagers to foster greater understanding of the value of fishery resources and to increase responsible participation in reef fisheries. Emphasis was placed on basic biological interrelationships of mangroves, coral reefs, and the open ocean and the damage caused by destructive fishing methods, pollution, and overharvesting. Additionally, elderly fishermen presented information on traditional fishing methods.

The Guam program has also included studies of alternative fisheries such as the culture of the seaweed *Gracilaria* and the farming of sea cucumbers. Studies on the effects of various coral transplant methods and the role of seagrass communities in the biology of coral reef fishes have also been carried out to provide resource managers with additional knowledge.

### National Science Foundation - Informal Science Education Program

This NSF program could have special applicability to the Guam Aquarium Project. The Program Goals and a "Sample" description of a project recently funded (one of perhaps a 100 in 1987-1990) follows.