

The Church of Jesus Christ of Latter-Day Saints Kiribati Projects

LDS - BAIRIKI
SEAWALL AND LAND DEVELOPMENT PROJECT
TABONIKABAUEA

Environmental Impact Assessment Report

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For Submittal to:
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Development
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VF 7784

EXECUTIVE SUMMARY

I. Introduction

1. This environmental impact assessment reports on the proposed seawall construction and land development project of the Church of Jesus Christ of Latter Day Saints, which is to be located at Tabonikabauea in Bairiki, and will be implemented by Kramer Group (Vanuatu) Limited, and local contractors.
2. Environment Consultants Kiribati in association with the Project Supervisor prepared this EIA report on behalf of Kramer Group Limited and LDS Church. The study was carried out from December 2004 to February 2005.
3. The environmental impact assessment report was prepared as an Environmental Impact Statement (EIS) as required under the Environment Act 1999 and the Environment Regulations 2000.

II. The Project

4. The proposed project is located at Tabonikabauea Point on LDS Bairiki own land property. An inland road from the main island road provides access to the project area.
5. The project objectives are (i) to reclaim lost land due to erosion and provide security to reclaimed land by constructing a protective seawall, (ii) increase spiritual and family value services to the Bairiki community, and (iii) to improve LDS Church membership at Bairiki.
6. The project will finance the following activities:
 - i) the construction of 112 metres of seawall to the total height of 2.25 metres above the reef flat;
 - ii) the reef extraction of approximately 41,000 cubic metres of aggregate and its associated EIA study;
 - iii) relocating the PUB sewerage outfall pump station, including realignment of connecting pipelines to the existing outfall vent stack;
 - iv) construction of the chapel and community centre complex, the sports facility and parking area.
7. The project is expected to commence implementation in March 2005 and the expected completion date will be in 2007. At present most of the project activities are at their feasibility stage and only a few of components have their engineering designs completed.

III. The Project Environment

8. Except for the excavation component which will be located near the Nippon Causeway, all other components of the project will be located at Tabonikabauea. This EIS reports on the particular environmental conditions of Tabonikabauea which has no known structures or sites that are of historical, archaeological, or architectural significant.
9. Baseline studies have shown that the main air quality issue is the high level of suspended particulate matter (SPM), which is primarily from dust. Much of the dust occurs naturally as a consequence of the scorching sun on dry sandy soil land. It is nevertheless, exacerbated by human activity as a large amount of SPM is generated by vehicles driven on unpaved roads and/or poorly maintained roads.
10. The coastline of Tabonikabauea has shown significant erosion on the southern side and it is likely that the 2005 high water mark will be further eroded in the coming years as sea level rises with climate changes. The marine ecology on the other hand is likely to recover to its pre-disturbance status after a period of time. The only concern is that returned marine communities may harbour toxic species.
11. The socioeconomic environment which is predominant on South Tarawa strongly supports the proposed LDS Bairiki project.

IV. Alternatives

12. Without the project, the objectives of the project will not be achieved. Tabonikabauea Point will continue to be eroded away as sea level rises under climate change conditions. The LDS Church will not have a facility for its followers in Bairiki. Bairiki communities themselves will, not only, be denied the opportunity to enhance their spiritual and social development in the Bairiki location, but they will also miss out on the various training programs proposed, including church and social responsibility and the promotion of Christian family values.

13. The alternative design project would be to build a protective seawall along the beachfront of Tabonikabauea Point thus avoiding reef construction and therefore reef aggregate excavation for landfill. This alternative is probably the best option as it offers the least implications on the environment and most likely to cost less also. The alternative land area however, may not adequately accommodate the proposed chapel and community centre complex.

V. Environmental Impacts and Mitigating measures

14. The main impact-generating activities during construction will be clearing of rights-of-way, cutting and filling, excavating, cement mixing and extraction of reef aggregate. The topography of Tabonikabauea will change to some extent because of the reef reclamation and seawall and the newly built structures. To avoid erosion from rainwater storms, stormwater drains and land stabilisation have been included in the project design. Visual changes to the landscape will have no mitigating measures, but the project design should consider aesthetic concerns. Tree planting throughout the project area should be properly planned.

15. Reef excavation and seawall construction have the potential to cause sedimentation which severely affects the marine animals, including corals and small fisheries. Seawall construction should be carried out during low tide to help restrict sedimentation to the immediate confines of the construction area. All excavated material must be removed from the reef flat before the on-coming tide.

16. The seawall will effectively alter the coastal processes at Tabonikabauea, in particular, the depositional and erosion regimes will change. The seawall design employs a good flushing mechanism that is less obstructive to the longshore currents.

17. Community impacts during construction will be major but temporary. The construction process will take 2-3 years with the result that the construction camp will take on a semipermanent appearance. The construction camp site must be rehabilitated completely before the commissioning of the project. The enterprising Tabonikabauea community will benefit from providing refreshments to the project workers.

18. No significant impact is predicted during the operation other than those resulting from neglected mitigation measures, (identified in this report and should be included in the contractor's environmental management plan), in disposing of spoiled materials, erosion prevention and rehabilitation of construction camp and excavation areas. It is, therefore, necessary to undertake regular monitoring to ensure that all required mitigation measures are implemented.

VI. Environmental Management Plan

19. The Environmental Management Plan (EMP) in the report will serve as a guideline for incorporating environmental measures to be carried out by the Contractors, and other parties concerned for mitigating possible impacts associated with the LDS Bairiki Project. The EMP needs to be updated by the contractor at the beginning of implementation; therefore, detailed locations and frequency of monitoring can be defined in more practical ways. The EMP will also need to be updated if the final engineering design generates significant changes to the project plan.

20. The EMP recommends the conduct of an EIA of the proposed excavation off the Nippon Causeway. Appendix A provides a draft terms of reference for the EIA.

21. The Director of Environment and its staff will be responsible for making sure the EMP is implemented by the contractor.

VII. Conclusions

22. Almost all of the LDS Bairiki Project's predicted adverse significant impacts occur during construction. The impacts are significant, short-term, and reversible. These impacts are manageable. Most of these impacts can be minimised through engineering solutions easily incorporated into project design. However, it is necessary to ensure that the EMP and monitoring plan are well implemented.

23. Since some of the project activities have yet to be completed by the engineering design, continued monitoring needs to be carried out to examine whether remedial actions are required to deal with unforeseen impacts, if any. In addition, the EMP needs to be updated if the final engineering design leads to changes in the existing project plan. In this context the EMP needs to be updated to incorporate the EMP recommendations of the EIA of the proposed Reef Excavation activity.

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A. Introduction

I. General

1. This report is an environmental assessment of the LDS - Bairiki Seawall and Land Development Project at Tabonikabauea on the western end of Bairiki, Tarawa. It is a project of the Church of Jesus Christ of Latter-Day Saints and a component of LDS Kiribati Projects.

2. In 1994, The Church of Jesus Christ of Latter-Day Saints purchased a parcel of land at the East end of Bairiki, called Tabonikabauea with intentions to build Chapel complex. In August 2004, the Kiribati Government approved the reversion of the Tabonikabauea land to the LDS Church as well as the rezoning of the site from Industrial to Civic use.

3. Also in 1994, a topographic survey was conducted on the site to record the high-water mark and all existing plants, Babai pits and structures. It is clear from this survey that during the period between 1994 and the present, there has been a very significant erosion of the coastline.

4. The Church of Jesus Christ of Latter Day Saints is planning to construct a Chapel complex at the Tabonikabauea Site, to support the spiritual and social development of its Bairiki congregation. The Site will contain two buildings, one being the Chapel for spiritual worship and the other is a multi-purpose building housing administration offices, Sunday School classrooms and other meeting facilities. The Site will also include a basketball court, car parking, etc. The total estimated cost of this Project is \$2,000,000.

5. The Centre will be used for various training programmes, including church and social responsibility and leadership, and the promotion of Christian family values. The Centre will also support the activities of the six Church Auxiliary organizations, which are: Priesthood (adult males over 18), Relief Society (adult females over 18), Young Men (youth 12-17), Young Women (youth 12-17), Sunday School (12 years upwards), and Primary (children 3-11). The Tabonikabauea site will be available as a centre of church and youth activities, both socially and spiritually and will be very beneficial to the Bairiki church members in general. These buildings will also be available for Church Education System programs teaching Seminary, for youth, and Institute for adults. These are lessons generally conducted during the week.

6. The project seeks to address the lack of LDS Church facility on Bairiki Village by developing the facility to accommodate unrestricted use by Bairiki followers and new converts to the LDS Church.

II. Stage of Project Preparation

7. This EIA is prepared after consultations with the project engineer and reviewing various drawings for the LDS Bairiki Project: General Notes (K1.0), Survey Site Plan (K1.1) and the Bairiki Site Plan & Seawall General Arrangement (K1.2). The K1.3 Proposed Site Elevations and K1.4 Seawall Details (Types A, B & C) drawings are being completed the same time as this EIA study is undertaken. Both of these reports will provide significant input into the preparation of a detailed engineering design report.

III. Nature of Environmental Assessment

a) Scope

8. This environmental assessment report has been prepared following progressive input from the LDS Church officials and the ECD officials into the project design, in the framework of

- the Kiribati Environmental Regulations 2001

9. This report is categorised an Environmental Impact Statement (EIS) as stated within section 14, sub-section (2)(b) of the Environment Act 2000 because the project has some major physical interventions including a 112 metres seawall construction and ocean reef reclamation, a relocation of the Public Utilities Board (PUB) sewerage outfall pumping station and realignment of sewer lines to the main reticulated system and to the existing outfall. The construction of the chapel complex including the sports facility, car park and site landscaping also involves major physical interventions and would require careful consideration of potential environmental impacts.

10. The implementation of the proposed LDS Church project will require demolition and resettlement of 1 household with 9 occupants. In this report, the EIA consultant was responsible for physical, biological, socio-economic and landuse issues.

11. This report considers the environmental effects, pollution impacts and social bearings of the proposal. In addition controlled sand mining and stabilisation of the sand mining site following removal are issues which need to be addressed.

b) Strategy Concerns and Procedures

12. Due to the size of the proposed development a full range of approvals and permits are required and are being sought or have already been obtained. These include:

Land Acquisition

13. Land plots 807a & 807e belongs to the LDS Church but Government was leasing this property. In 2004, government returned the lands to the owner and approved the rezoning of the area at Tabonikabauea from industrial to civic use. Thus all project activities will be on LDS Church's own land property.

Building Permit

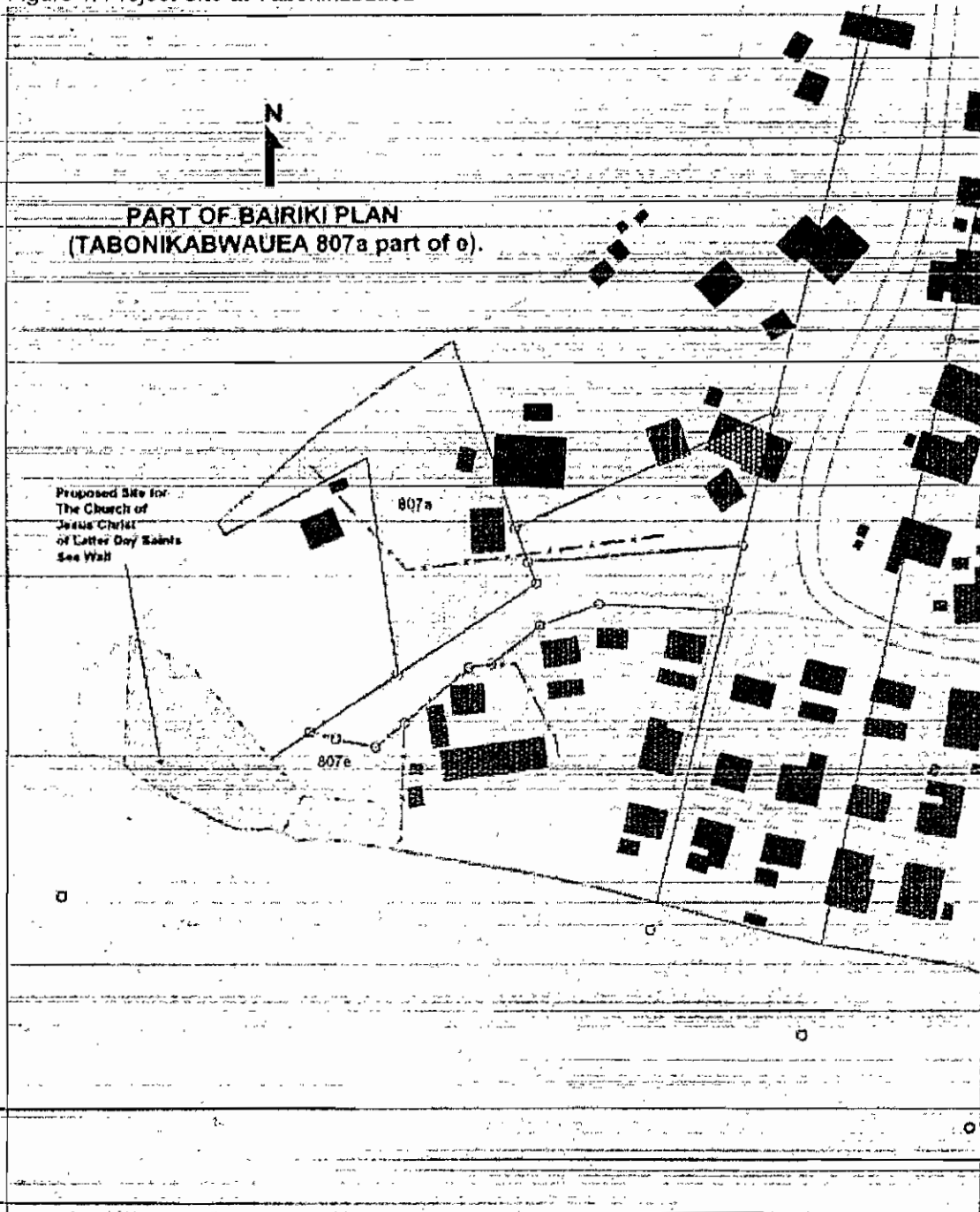
14. Consent in principle to the development has been approved by the Teinainano Urban Council (TUC), and health and sanitation permits from the Ministry of Health need to be sorted out prior to commissioning the project.

The Sand Mining Site

15. The traditional source of aggregate and fill material in Kiribati is from the beachfront and reef flat areas and this has and is being removed without any consideration of environmental impact. Fill material will be removed from a designated sand and gravel extraction site from the either the Ocean or Lagoon Reef platform around the Nippon Causeway.

16. Unrestricted use of large volumes of reef mud and sand for major requirements such as the Nippon Causeway and the SAPHE projects has had serious environmental impacts. Government needs to recognise this and send the correct signals to the public by locating alternative suitable material from a well-managed offshore mining site west of Betio Islet.

Figure 1. Project Site at Tabonikabauea



B. Description of the Project

I. Type of Project

17. This environmental impact statement (EIS) reports on the infrastructure development project for Bairiki LDS Church at Tabonikabauea. It is a project of the LDS Church in Kiribati to be funded by the parent church in the US as a component of the LDS Kiribati Projects.

II. Need for LDS Church Bairiki Facility

18. The collection of circumstances have led LDS Church in Kiribati to identify a need to invest in church infrastructure to service future demands, to improve membership and harness promising LDS Church followers and converts at Bairiki. In the main, the Church of Jesus Christ of Latter Day Saints has decided to build a chapel complex at Tabonikabauea to support the spiritual and social development of its Bairiki congregation.

19. The church complex will be used as a Centre for various training programmes, including church and social responsibility and leadership, and the promotion of Christian family values. The Centre will also support the activities of the six Church Auxiliary organizations, which are: Priesthood (adult males over 18), Relief Society (adult females over 18), Young Men (youth 12-17), Young Women (youth 12-17), Sunday School (12 years upwards), and Primary (children 3-11).

20. The Tabonikabauea site will be available as a centre of church and youth activities, both socially and spiritually and will be very beneficial to the Bairiki church members in general. The buildings will also be available for Church Education System programs teaching Seminary, for youth, and Institute for adults. These are lessons generally conducted during the week programs.

21. The LDS Church is fast becoming one of the main churches in Kiribati with a rapid growth in its confirmed followers and congregations. However, its rapid growth is limited by its lack of church infrastructures placed at strategic main population centres. This project will improve that shortfall at Bairiki, the seat of Kiribati Government.

III. The Proposal

22. The proposal is to construct a Chapel complex at the Tabonikabauea site, see Figure 1, to support the spiritual and social development of its Bairiki congregation. The Site will contain two buildings, one being the Chapel for spiritual worship and the other is a multi-purpose building housing administration offices, Sunday School classrooms and other meeting facilities. The Site will also include a basketball court, car parking, etc. The total estimated cost of this Project is \$2,000,000.

23. The first phase of the project will be the construction of 112 metres of seawall and to reclaim the land that has eroded since 1994 (see Figure 2) and to prevent future erosion. Figure 3 shows the technical details of seawall construction, but basically it will consist of a reinforced concrete footing, apron and 1.5 metres high seawall, topped with cement filled bag wall to an average total height of 2.55 metres above the reef flat. Figure 4 shows the extent of seawall construction. This phase of the Project is estimated to cost \$300,000.

24. The second phase of the project will be the relocation of the PUB sewerage outfall pump station, which is located in the middle of the proposed site. A new pump station will be constructed approximately 60 metres upstream of the existing pump station and a new sewer main will be constructed to rejoin the existing outfall pipeline approximately 3 metres upstream of the existing outfall vent stack. From there sewerage effluent will gravity flow to the reef edge

where it currently drains into the ocean sea bed. This 2nd phase of the Project is currently undergoing engineering design and cost estimation.

25. The third phase of the Project will be the construction of the Chapel complex, the sports facility, parking and site landscaping, as shown at Figure 4. This phase is expected to commence about 3 years into the future. Both buildings will be designed to accommodate future expansions in spiritual and social services to the church members. The Chapel complex is proposed to facilitate the needs of The Church of Jesus Christ of Latter Day Saints members in their spiritual and social development in the Bairiki Area.

Figure 2. Seawall Site Plan

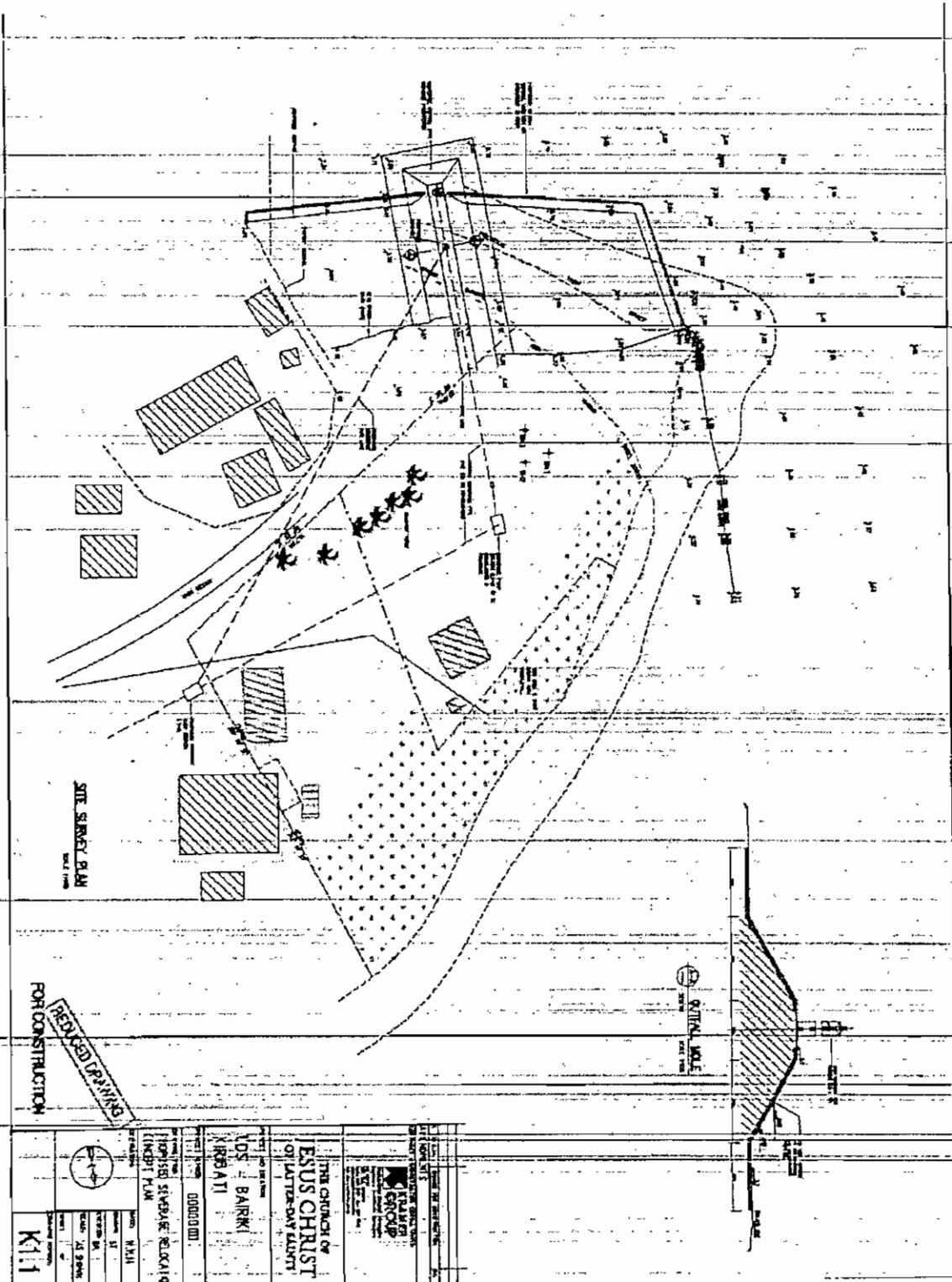


Figure 3. Seawall Specifications

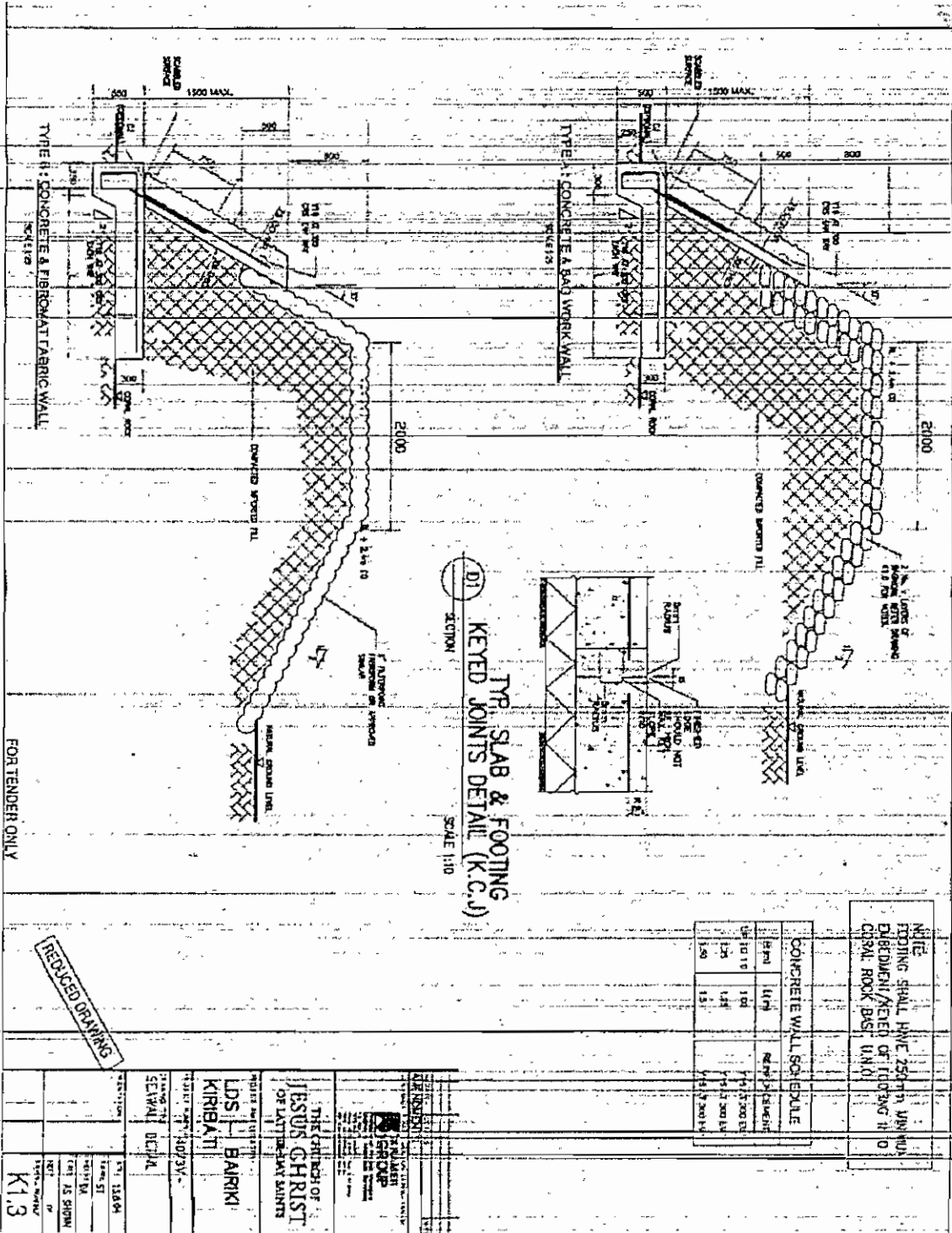
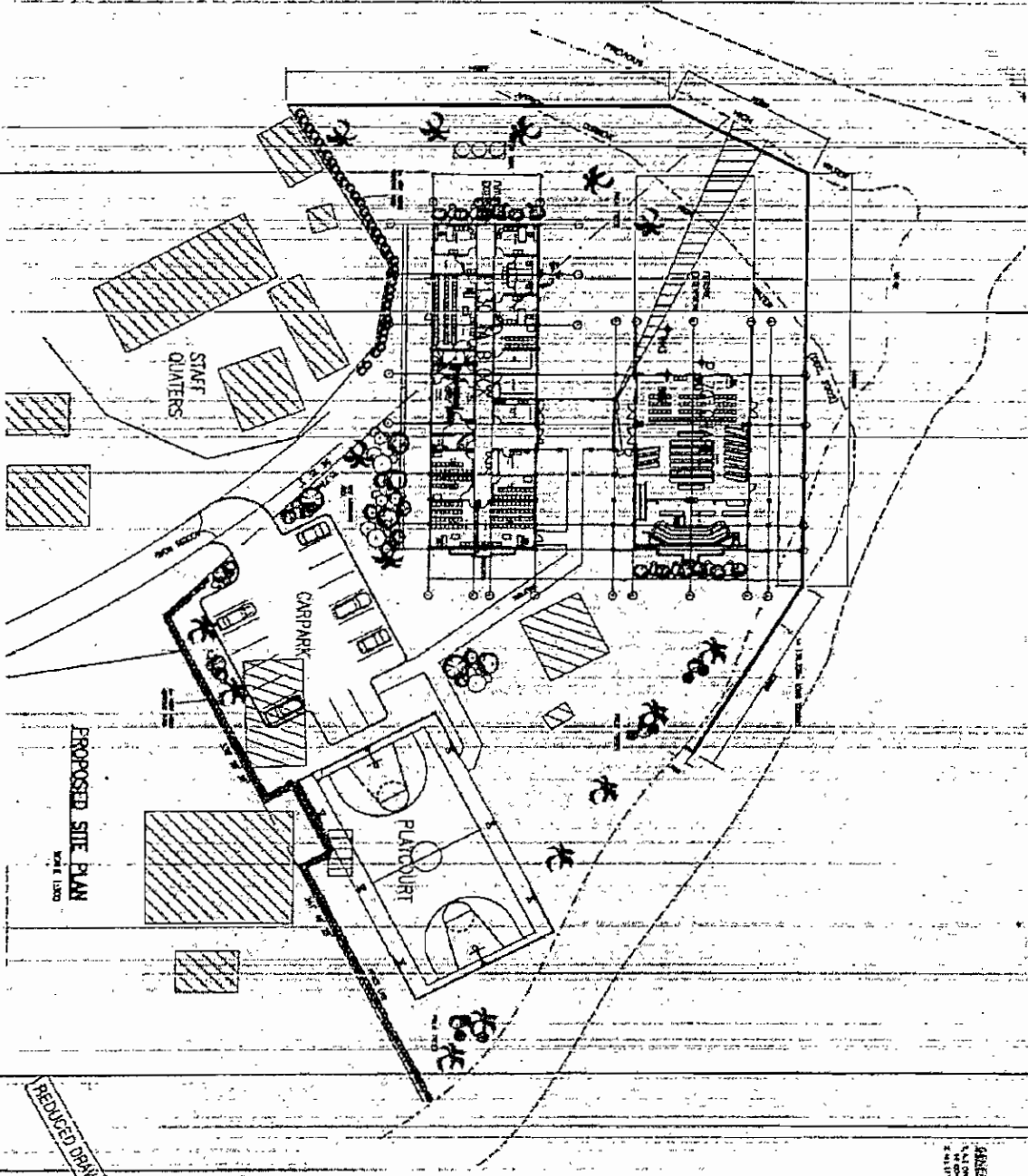


Figure 4. LDS – Bairiki Site Plan



REDUCED DRAWING

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS LDS - BAIRIKI KIRIBATI PROPOSED SITE PLAN OPTION 2 SCALE 1:1000 DATE: 15/05/2014 DRAWN BY: AS/SYK/1 CHECKED BY: J/S/1 PROJECT NO: 14/10	
PREPARED BY: ECK DATE: 15/05/2014 PROJECT NO: 14/10	

REVISIONS:
 1. 15/05/2014: Initial design
 2. 15/05/2014: Final design

C. Existing Environment

I. Site Description

26. Tabonikabauea is situated at the south-western end of Bairiki Islet, on South Tarawa, and was once Teinainano Urban Council's (TUC) allocated site for solid waste disposal and for placement of pig pens for government employees wishing to raise pigs for domestic consumption. It is also the site for the government prison at Bairiki, and the prison being the immediate neighbour east of the proposed LDS Church development. The immediate neighbour to the north of the development is the Catholic maneaba which is used mainly for church meetings and functions by the Bairiki parish but otherwise normally vacated. One household is squatting on the actual development site and has agreed to relocate elsewhere.

27. The project site is accessible through two side roads from the main road of Bairiki. The site will also have easy access to linking up with the national grid regarding public utilities such as water, electricity and sewerage. See figure 1.

28. Most of the landside features of the project area at Tabonikabauea are scantily and sparsely secondary vegetation growth of mainly bushes and coconut trees. All landside features will be demolished to make way for the new buildings and landscaping activities.

29. Various households and shops have sprung up in the area and one squatter household has been established on the actual project site. The informal settlement will be relocated once the construction activities of the project commences.

a) *Geology and Topography Conditions*

30. Tabonikabauea is a typical coastal area on Tarawa Atoll. Tarawa Atoll is a fringing coral reef consisting of dense, hard erosion-resistant limestone overlying a submerged or sinking volcanic mountain that is intermittently covered by tidal seawater. The atoll is triangular-shaped at the surface with a segmented land ridges (islets) surrounded by a fringing reef, which at the western end is submerged. A deep sheltered lagoon exists within the interior of Tarawa Atoll to depths of over 30 metres. The majority of the exposed atoll land mass ranges from 50 to 800 metres wide. Surrounding Tarawa Atoll is a nearly continuous fringing reef which varies from 100 to 800 metres on the ocean side of the land mass. The fringing reef is about 200 metres wide adjacent to the project site.

31. The project site is located at the southwest corner of Bairiki Islet which has a hard high point that may be considered one of the most erosion resistant land formations in the area. This point is the extreme southwest corner of Bairiki Islet which is typically hit with the full force of wave storms and strong nearshore currents simultaneously. The high erosion resistance capacity of Tabonikabauea is evident in the apparent small total erosion of the area over the years.

32. The land area is composed almost entirely of beach sand that has been built up, over the years, to about 3 metres over the beach rock which forms part of ocean reef environment. Because of the sandy and therefore porous land area, surface water will just seep through down to the base rock underneath and drain out into the sea.

b) *Offshore Bathymetry and Shoreline Conditions*

33. Nearshore conditions adjacent to the project site generally consist of variably sloped beach rock, coralline sand and gravel beach. An extensive protection seawall has been constructed on the foreshore east of the project site. The project area is subject to direct wave runoff, overwashing, and erosion due to combinations of high tides and storm wave action. The fringing reef slope is less than 300 metres from the beachfront and thus makes Tabonikabauea Point highly vulnerable to wave action. Presently, there is heavy erosion on southern beachfront but also a significant accretion on southwestern side of Tabonikabauea and Bairiki on the southern side of the Nippon Causeway.

II. Coastal Resources

a) Atmosphere

34. There are no known air quality issues at Tabonikabauea. Noise emissions and dust during construction work are considered insignificant environmental impacts.

35. The climate of the site is similar to that of the whole of Tarawa. Tarawa is located in the dry belt of the equatorial oceanic climate zone, with mean daily temperatures ranging from 26 to 32°C, with recorded highs and lows being 22°C and 37°C. The mean annual rainfall for Tarawa is 1.5 m, most of it falls during October to March. Water temperature does not vary much from a mean of 27°C. Average solar radiation is 390 cal·cm⁻²·d⁻¹.

36. Trade winds blow from the east about 81% of the time. Typhoons are rare, but westerly winds associated with storms occur frequently, particularly in June – November. A study in 1990 established the probability analysis of wind speed indicating that winds in the sector North East to South East are prevailing. Based on study findings, the researchers have assumed the following wind speeds occurring with a return period of 50 years:

330° : 23.3 m/sec 0° : 15.1 m/sec 30° : 15.1 m/sec

37. The LDS Church Bairiki project should use a wind speed of 23.3 m/sec (50 year return period) for calculation of the waves at the south western part of Tarawa lagoon, and factor this into the design of the appropriate strength and height of the seawall.

b) Waves

38. Waves approaching the project area generally break over the fringing reef, reform, and continue towards the shoreline. This is known as a depth limited breaking wave condition. During periods of normal tide and wave activity, the fringing reef protects the shoreline. When high tides and/or large waves are present, the shoreline may undergo direct attack and consequent erosion. Normal high tides in the project area are frequently accompanied by 1-metre waves and a south-westerly longshore current.

39. The occurrence of wave pile-up or double waves is difficult to predict. This occurs when wave speeds are reduced in shallow water (across the reef-flat) and the following wave is unaffected and overtakes the preceding wave. Wave amplitude and apparent set-up are transformed irregularly to form combined waves of significantly higher than the design wave. The shoreline of the project area is exposed to wave action from the southeast to south.

40. Wave setup is the super elevation of mean sea level during the interaction of the seafloor bottom with a developing breaking wave. Wave setup adjacent to the project area is expected to be on the order of below half a metre during high wave events depending on tide conditions and predominant period of approaching waves. In effect, wave setup can increase the relative depth of water at the toe of constructed shoreline protection simply due to energetic wave conditions.

41. Coastal defence activities need to take account of wave characteristics. Calculation of wave height is normally based on the following;

- the effective fetch
- the design wind speed and duration
- the actual water depth

42. For the design of a breakwater in deeper water within Tarawa lagoon, the following parameters have been used

- wind speed 23.3 m/s
- wind direction 330° (NNW)
- fetch 9.8 km

- wind duration >1 hour

43. A design wave height of 1.7 m has been calculated for the Betio Port area as sufficiently high to withstand the westerly ocean waves. Obviously, the design wave height for the LDS Bairiki seawall project should not be lower than 1.7 metres.

44. The PWD standard seawall height is taken from the high spring tide height of 3.2 metres above mean sea level datum. A 1.0 metre height is added to this height to allow for wave overtopping. The standard seawall height recommended is 4.2 metres.

c) Water Resources

45. There are no surface water resources on Tarawa. Saltwater surrounds and underlies the very porous limestone island. Rainwater percolating from the ground surface forms a freshwater lens on the more dense salt water. Groundwater is not withdrawn from the freshwater lens beneath Tabonikabauea, i.e. no well water is extracted in the project area.

46. The project area houses the septic pump and sewerage gravity outfall. The septic pump and tank will be relocated but will still be in easy access for the project's sewer lines to link up to the national grid.

III. Ecological Resources

47. There are no significant issues regarding terrestrial ecological resources in the project area. The tip of Tabonikabauea is a highly unstable beachfront that has seen both severe erosion and accretion over the years. The seawall project aims to stabilise the area and at the same time reclaim the lost land area due to erosion.

a) Marine Environment

48. It is important to note that the coastal habitats at this area are (1) those of around an extensive seawall adjacent to the proposed project, and (2) those of around the 2 kilometre Nippon Causeway that had dramatically changed not only the coastal processes of South Tarawa, but also caused extensive beach build-up on the southwest end of Bairiki and Tabonikabauea. It is conceivable that the current habitats may now show modifications relating to the presence of the built structures.

49. The ocean reef flat in the project area is a solid fairly level pavement-like surface that is exposed at low tide and it has a little coral growth or sediment accumulation. Turf algae covers most of the reef flat becoming more predominant closer to the reef edge. Brittle stars, small gastropods, crabs and sea urchins live on the reef flat. Reef pools are shallow and are home to a host of juvenile fisheries.

50. The proposed excavation of the reef flat to build the seawall on would have a minimal short-term impact on marine environment.

IV. Socioeconomic Development

51. The population of South Tarawa is 36,717, 62% of which is youth population of 23,000 (Census, 2000). The land area for South Tarawa is only 7.2 km², giving a very high population density of 5,100 people per square kilometre.

52. Given extremely high population densities, high fertility rates, declining mortality and resultant youthfulness of the population, coupled with a limited resource endowment and little or no opportunity for outmigration, the future for sustainable development in South Tarawa and Kiribati does not look good. The LDS Bairiki Project is an effort to combat social disintegration whose signs are increasingly common in South Tarawa. The extended family system and wider

kin-based, traditional "social security" systems are weakening, with nuclear, often broken families becoming increasingly common. Similar signs of the declining status of the family figurehead and the family as an "emotional sink", are also prevalent, but not yet widespread.

53. Burglaries and crimes of violence are increasingly widespread on South Tarawa. Much of this has been associated with increasing use of alcohol and drunkenness. Increasing consumption of alcohol and alcoholism, as both a major social problem and a health problem, and the general promotion of Christian Family values have been the major incentives for the establishment of the LDS Bairiki Chapel and Community Centre.

54. Part and parcel of the programme is to combat the entire process of social alienation and disruption and to increase the influence of spirituality and the church, through youth programmes and activities.

55. The LDS Elders have stressed how urbanisation and technological society have been a major factor in the phenomenon of spiritual alienation, and that the majority of the present social problems confronting the congregation stem from alienation, either in alienated youth or adults.

56. The infrastructure development to accommodate the chapel, community centre and a sports facility is one component of the LDS Church Development Programme to foster more closeness and intimacy to the traditional social system, which still respects the many components of the environment, integral to the traditional spirituality and religion, and which can only serve to enhance sustainable use and protection of our natural heritage.

V. Social and Cultural Resources

57. The LDS Bairiki development has involved the LDS Church purchase of land from the traditional landowners and land titles have changed through legal procedures.

58. There is one semi-permanent household on the project site. The family of 9 have squatted on this land for over a decade and they have a well-established garden on the project site. This family will be relocated at its own cost.

59. There are no known structures or sites that are of historical, archaeological, paleontological, or architectural significant around Tabonikabauea.

D. Alternatives

I. Other Reasonably Foreseeable and Environmentally Appropriate Alternatives

a) Alternatives to the LDS Bairiki Project

60. The LDS Bairiki project design is aimed at (i) protecting and fortifying the southern beachfront of Tabonikabauea; (ii) reclaiming 0.300 acres of the reef flat and fill in with 1,200 cubic metres of reef mud and sand to increase the land property to accommodate the LDS Bairiki chapel and community centre complex; (iii) constructing a chapel, community centre complex with sporting facilities.

61. Conceivably, land development could be permitted on any number of locations provided they satisfy the necessary building and environmental criterion, but more importantly is that scarce land is made available. Within Bairiki Islet, however, no other location offers the combination of favourable attributes of the current site. The development is located on the developer's own land.

62. Consideration has been given to have the construction work in phases in accordance with project funding phases. This is considered inefficient project implementation and it will also increase costs due to work stoppages in between phases.

63. The only foreseeable alternative to the LDS Bairiki Project is to build a protective seawall on the beach at the low water mark. This would reduce the area of reef reclaimed and therefore the reduction in the volume of excavated reef mud and sand as land fill required. The LDS Church has not provided specifications for the intended buildings so it is not possible to ascertain whether without the reclamation the existing land area is sufficient for the LDS Church purposes. If the Bikenibeu LDS Complex can be taken as an example, then it is likely the LDS Bairiki Complex can be constructed with a protective seawall and thus avoiding an extensive reef reclamation. This is not considered an alternative at this time given that a protective seawall closely supervised by ECD does not necessarily require an EIA.

b) The No-Action Alternative

64. The No-Action Alternative is the default scenario if the project is not implemented. None of the impacts of the proposed project, positive or negative, would occur. This is not to say, however, that conditions at Tabonikabauea and adjacent areas would not change in the absence of the project. If the seawall project is not permitted LDS Church can still build on its own land.

65. Implementation of the LDS Bairiki Project would stimulate employment as more construction work take place and more employment opportunities become available through new private and public sub-contracted activities. The infrastructure development and services that will rise in response to the increased number of vehicular and foot traffic to Tabonikabauea will stimulate further private sector investment, will in turn reduce hardship and poverty by stimulating localised economic growth and creating employment opportunities for the Bairiki residents.

66. The no-action scenario, where the LDS Bairiki project is not implemented, has potential negative effects. If the seawall, whether for protection or reclamation is not constructed, the beachfront of Tabonikabauea is likely to continue to be eroded away and with the increase in sea level in the coming years more of the land area is likely to be reduced through erosion. The no-action scenario will deprive the Bairiki community of potential income during the construction of the Tabonikabauea complex. The LDS Church will be denied the opportunity to promote its Christian family values to communities who would lose the opportunity to receive training on church and social responsibility and leadership. The no-action alternative may exacerbate more social and environmental problems.

E. Environmental Impacts and Mitigations

I. Expected Environmental Impacts

67. This chapter discusses the possible impacts the LDS seawall and Chapel complex at Tabonikabauea will have on the environment in light of the field surveys of the project site and literature study of the relevant subject matter.

68. The major issues regarding the LDS Bairiki project are due to its location and during construction and commissioning. The project area does encroach on environmentally sensitive coastal areas, and may replace 1 household with 9 family members.

a) Location of Project

69. The site for the LDS Bairiki project is on the church's own land property at Tabonikabauea. The seawall and reef reclamation will be on State Land and the purpose of this EIA was to assist in obtaining the necessary permits to carry out the seawall construction and reclamation. One household (9 family members) has been squatting on this property, and will relocate elsewhere, at its own costs, before the implementation of the project.

70. The Public Utilities Board's sewage pump station is located inside the project site. The pump station will be relocated outside the project's boundary fence and all connecting pipelines realigned to the existing outfall vent stack.

71. A short access road will be required to join onto the main Oceanside road in Bairiki.

b) Demolition and Construction Phase

72. It is expected that once the full contracting and preparatory planning processes are finalised the actual clearing and construction activities will commence and will take approximately 36 months to complete all phases of the LDS Bairiki project.

i) Mobilising Equipment and Workforce Impacts

73. Mobilisation and equipment operation can have impacts on local people and sensitive marine species. The mobilisation of the construction services contract including seawall, relocation of sewage pump and building construction is expected to be minimal and involve a backhoe, an excavator, concrete mixer and plants and vehicles. Once the heavy equipment and construction materials are delivered to the project's construction camp traffic impact should be minimal. The construction of seawall and subsequent landfill, foundations, pathways and underground services will require backfill aggregate material and the supply of pipes, concrete manholes, etc. Bulk delivery of materials is expected as materials are stockpiled on site for use when required.

74. The timing of the service and building phase during the drier months is expected to result in minimal impact on the nearby residences. Building materials are expected to be supplied in bulk orders for the project. Heavy trucks will be delivering reef mud and aggregate for landfill, foundations and slabs as formwork is prepared.

75. Vehicle delivery of materials along the Nippon Causeway and main road on Bairiki should be kept to standard working hours, but certainly outside peak traffic hours. Monitoring of waste from aggregate trucks should be implemented with cleanup initiatives undertaken as required.

Table 1. Issues Relating to Mobilisation

Potential Impacts	Location	Mitigation Measures
Air and noise pollution for any nearby households	General issue for people; Betio and Bairiki West	Control contractors' vehicle speed in sensitive locations. Ensure noise levels and emissions from contractors' vehicles can be controlled on site
Introduction of an outside workforce can have a negative impact on local people		Contractor to employ local people from nearby villages where possible

ii) Construction Camps and Asphalt Plants Impacts

76. Construction Camps need to be well-sited, well-managed and the site completely restored after use.

77. - Construction Camps have the potential for major environmental impacts as a result of their location, their operation and their abandonment. For the LDS Bairiki Project an ideal Construction Camp would be the location of the new carpark which would have good access to the project site, be furthest away from residential areas and could have its surface sealed last as the construction camp is fully demobilised.

Table 2. Issues Relating to the Establishment and Operation of Construction Camps and Concrete Mixing Plants

Potential Impacts	Location	Mitigation Measures
Air and Noise Pollution for nearby households		Locate Construction Camp and concrete mixer away from residential areas.
Pollution caused by domestic sewage and wastes	Major issue at Construction Camp Site and Concrete Mixer Plant	Restrict Contractor to a single, pre-planned construction site. Contractor to install septic tank or mobile toilets; Grey water to be managed according to site conditions; Solid Waste system to be introduced and removed from site - no pit burial or burning.
Ground and water contamination from oil and grease	Significant issue at Construction Camp and Concrete Mixer Site	Ensure contractor has spill contingency plan including drainage/settling pond control, bunds drainage around fuel and storage areas.
Partial demobilisation at Construction Camp and Concrete Mixer site can leave serious impacts. These include temporary buildings; oil or other contaminated ground; erodible surfaces; rubbish, septic tanks etc	Construction Camp Site	Ensure demobilisation is clearly addressed in Contractor's Environmental Management Plan

iii) Soil Erosion

78. The grubbing of top soil, grass areas and service trench material will require stockpiling in a controlled area during construction. The removal of topsoil material should be followed by placement of subgrade and subbase material quickly to prevent soil erosion. This could also be accomplished by use of a berm constructed on the lower side of the stockpile.

79. It is expected that this material would be reused during the landscaping period at the completion of the constructions.

80. All construction spoils, including solid wastes and empty containers from Construction Camp should be removed from site and transported to the public waste disposal area. Disturbed areas should be revegetated immediately after earthworks are completed and/or sealed, for example, when the area would become a new car park.

iv) Drainage Problems

81. The LDS Bairiki project will cover approximately 0.800 acres of land and more than half of that area will be paved. There is therefore potential impact from stormwater drainage during the wet months. It is proposed to minimise the flow of concentrated stormwater from the site by using soft ground surface finishes wherever possible, slightly elevating all paved surfaces from the surrounding grassed or landscaped areas and be graded away from the built structures; and by using the surface contour which encourages slow surface runoff. Drainage flow is to be dispersed over the grassed area and onto the adjacent beach sand. Dispersing drainage flow over a grassed area and beach sand is a positive means of maintaining water quality, as the runoff is filtered prior to entering the sea.

82. The short access road and car park are to be paved and considerations should be made to using grass lined ditches. The use of grass lined ditches is particularly useful to capture and filter out oils and other waste products from vehicles. Vehicular traffic is limited to the car park area and therefore road waste products are insignificant.

83. All buildings should have rainwater catchments with large rainwater tanks installed to help reduce the total surface stormwater entering the drainage system. Rainwater collected can be incorporated in the water supply system for all buildings.

Table 3. Drainage Issues associated with the LDS Bairiki Project

Potential Impacts	Location	Mitigation Measures
Can alter hydrological regimes, affecting flood impacts	Some impact at the southern side of the project area.	Detailed drainage infrastructure; Conservative Flood Design Levels, and design relief in vulnerable areas for very large floods.
Can cause negative impacts by concentrating water and increasing scour and soil erosion.	Significant general issue. Southern end reef reclamation.	Detailed drainage design. Use natural slope and drain into grassed areas.
Can affect water quality - increased turbidity, oil and suspended solids.	Significant issue at all areas of the project	Use slow flowing onto grassed areas and beach sand filter.

c) Other Building Construction Issues

84. Concrete will be required for building the seawall concrete bags and bollards, footings and building slabs and this will be supplied from the concrete mixer at the on-site Construction Camp, but concrete trucks may come also from concrete mixing plants outside the project site. It

is normal practice that as concrete trucks empty their load the truck drivers would want to wash off excess concrete from the drum and the chute. It is important that this is not permitted on site. If washing of concrete trucks is permitted on site then this process should be performed in a controlled environment.

85. Processing and stockpiling of sand and aggregate need also to be performed in a controlled environment. A designated location at the Construction Camp should be established that is to be paved or have concrete applied later, such as a roadway or parking lot.

86. Any solid and liquid waste associated with the building construction should be removed from the site and deposited at the municipal waste dumpsite. Drainage controls must be applied during this stage of construction. Once the pavement, concrete footings and slabs are installed the framing and interior works should have little or no effect on the site.

d) Reef Construction Issues

87. In this section we examine the types of effects which are likely to occur as a result of disturbance to the ocean reef flat. The disturbance is essentially the seawall construction and reef platform reclamation necessary to accommodate the LDS Bairiki project. These findings would be predictions only, based on local knowledge and on published information on the subject available at the time.

i) Initial Losses of Organisms as a direct result of Reef Disturbance

88. Apart from the obvious destruction of marine animals in the immediate area being inundated, very little is known about the effects on reef platform organisms living in the areas surrounding the disturbed site. Sedimentation from the seawall construction and reclamation works is likely to affect organisms within some unknown radius of the construction site, particularly plant forms (algae, sea grass), animals (synaptids, starfish, other halothurians and juvenile fishery) and soft coral and sponge forms.

ii) Short-Term Effects of Sand and Aggregate Excavation

89. The disturbance caused by excavating sand and aggregate from the ocean reef platform is likely to have some similar effects as that produced by severe storm damage. Similar to storm damage, the result of the excavation provide new substrata for colonisation, produce coral fragments, and erode corals to provide a source of rubble and finer sediments.

90. New surfaces for colonisation often undergo a succession of dominance by different marine communities, including algae. Walsh (1983) reported that normally after a storm or excavation, there generally is a succession from green to red to brown algae, which after 9 months resulted in exposed substrata that resembled pre-storm or pre-excavation conditions. This algal succession is usually attributed to nutrient enrichment of waters from surface run-offs or from disturbed sediments. Such successions of algae as a result of reef disturbance could temporarily attract and concentrate large numbers of exploitable reef fish from surrounding areas to feed. (A succession of algae, particularly red algae, could lead to an outbreak of ciguatera fish poisoning (Kaly and Jones, 1990), in ocean reef fish mainly).

91. The production of coral fragments could result in a shift in coral community structure by providing a new habitat for organisms not normally found in an area.

iii) Long-Term or Permanent Effects

a. Alternative Community Structures

92. One of the more obvious biological effects that could occur as a result of the reef platform disturbance at the project site would be for communities not to return to their original conditions after the impact has passed. The present or existing community structure is a result of "who got there first" rather than the results of biological interactions or real differences in requirements of

communities. Shifts in marine community structure are expected to occur if a temporary perturbation allows one of a number of "stable states" to take over.

93. Human impacts as well as natural disturbances are potentially important sources of the kinds of perturbations that might shift the structure of coral communities to alternative forms. There is some evidence that large-scale shifts in community structure can occur as a result of natural disturbance. But the implication is that some forms of pollution and/or disturbance on coral reefs which may apparently have insignificant immediate effects, may have significant long-term effects on community structure by precipitating a shift between alternative stable states.

94. This kind of shift could arise in seawall construction and other disturbed areas along the ocean reef platform. The provision of newly exposed surfaces as a direct result of excavation and erection of a seawall could become colonised by algae, corals or invertebrates not presently dominant, resulting in changes in associated fauna such as fish. Similar effects could occur if the ocean reef slope habitat were affected by short-term sedimentation as a result of seawall construction. Such shifts in habitat structure could have a great impact on the associated fisheries.

95. Kaly and Jones (1990) in their review of literature on long-term and/or permanent effects of reef blasting, excavation and seawall construction reported that several studies have concluded that structural complexity of the habitat as well as proportion of live coral cover were important determinants of the diversity and numbers of fish present. The studies also concluded that the death of corals is likely to cause a significant decrease in the number of species of fish and individuals associated with a reef.

96. The proposed seawall construction and reclamation may provide a new kind of marine habitat, thus increasing the local diversity of fish and invertebrates. A new deeper habitat, created by the burrow pits and channels after construction activities, is essentially intertidal reef pools that could become colonised by fishes that would normally live on the natural reef edge. This new habitat then would be acceptable for ocean reef organisms to colonise.

b. Alteration of Sedimentary Regimes and Current Flow

97. The potential for permanently altering the flow of water across the intertidal reef flat and hence sedimentation requires consideration in relation to the seawall and reef reclamation project. The presence of a seawall and burrow pits might act to facilitate the movements of important food fish over the reef crest and may improve the supply of fresh nutrients to organisms within some area around the disturbed areas.

98. Negative effects of seawall construction and reef flat reclamation could also be expected. The burrow pits and seawall construction could alter present patterns of deposition and erosion to unconsolidated areas of the reef platform, as well as to the coral cays that support the marine communities around the project seaside areas.

99. Figures 5 & 6 illustrate the general areas of erosion and accretion, particularly at Tabonikabauea. The 1969 coastline of Tarawa has been integrated onto IKONOS 2003 satellite imagery showing both severe erosion and accretion at Tabonikabauea Point. The apparent change in coastal processes in this area could have been influenced by the existing adjacent seawall and climate changes over the years.

Figure 5. Comparative Coastline of Tarawa and Bairiki



IKONOS Satellite Imagery

1969 Coastline ———
2003 Coastline - - - - -

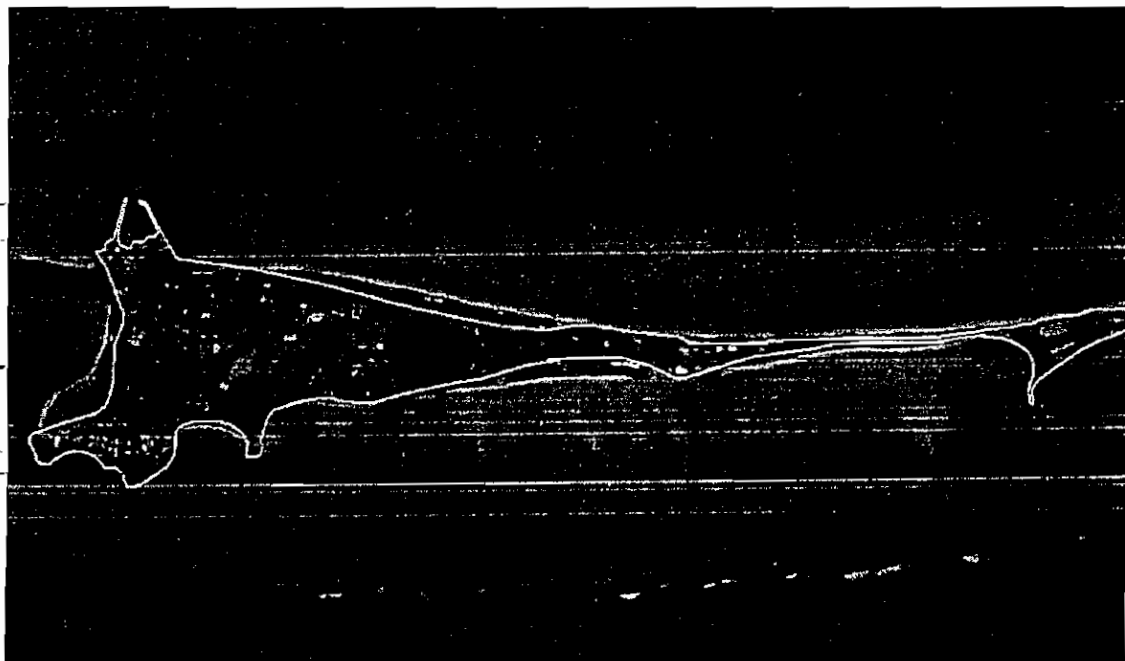


Figure 6. Coastline of Tabonikabauea



IKONOS Satellite Imagery

1969 Coastline ———
2003 Coastline ———

100. Changes in water flow could influence the types of corals that would survive in the altered habitat. Permanent changes in the movement and deposition of sediments could affect coral growth, and therefore fish communities, but also accretion and erosion patterns of the project areas.

Table 4. Long-term Issues associated with Seawall Construction

Potential Impacts	Location	Mitigation Measures
Can alter sedimentary Regimes and current flow.	Major impact at the reef flat south of the project site.	Seawall design modified to enhance the transport of fine sediments and the natural process of erosion and accretion.
Can alter marine community structures.	Potential significant impacts on marine communities close to the reef flat.	Seawall design modified to have complex topography with good flushing abilities thus creating more sediment-free diverse habitat where corals can begin to colonise.
Can cause negative impacts by concentrating water and increasing scour and soil erosion.	Significant general issue. Southern end reef reclamation.	Detailed longitudinal drainage design. Drain into grassed areas.
Can affect seawater quality – increased turbidity, suspended solids or bed-load movements.	Significant issue at the southern end of the reef reclamation	Use of sediment traps and slow flowing onto grassed areas.

iv) Expected Direct Effects of Seawall Construction

101. While the most important environmental effects of most marine related development projects are in the long-term, the short-term effects during the seawall construction must also be carefully considered.

a. Sedimentation Issues

102. Construction work on the seawall and reclamation will result in formation of plumes of suspended sediment in the waters around the project site and the adjacent reef platform. The adjacent reef flat south and west of the project site has already shown areas of some siltation, although not widespread.

103. The vicinity of the seawall construction will be affected sufficiently by increased turbidity and deposited sediments that affect marine biota and productivity, in most cases causing loss of photosynthetic activity. The lack of photosynthetic activity has further implications in the food chain of the reef platform marine environment.

104. The impact in the context of biotic and fishery resources within the reef flat adjacent to the project site, is not considered significant, as already there is very little, if any at all, fishing in the area except for close to the reef edge.

105. All seawall construction and reclamation work should be carried out during low tide to help restrict the spreading of sediment plumes to the immediate vicinity of construction. The reclamation and seawall construction should only be allowed on the hardpan reef, and no holes should be excavated on the shoreline or on sandy areas on the tidal zone. This is to avoid beach erosion from areas in close proximity to the project site.

106. All construction debris should be removed from the reef flat and deposited at a designated area on shore. This should ensure the natural flow of current and sedimentation is not impeded throughout the adjacent reef flat during in-coming and high tide.

d) Operational Issues

i) Water Quality Issues

107. The project when completed will create a large runoff area from the paved areas and building roofs when it rains. The stormwater drainage need to be properly designed to allow stormwater to be dispersed over the grassed and landscaped areas using the natural gentle slope of the area, before it eventually drains into beach sand. The use of grassed areas and sediment traps throughout the drainage system will help prevent soil erosion and maintain surface water quality flowing into the sea.

ii) Waste Management Issues

108. The Community Centre septic tanks need to be checked to make sure they do not leak and contaminate the soil and ground water. Other Centre activities, including vehicles and solid waste management need to be monitored to gauge their potential to cause soil pollution. The Centre must connect to the sewerage system.

iii) Air Quality Issues

109. Noise emissions are considered insignificant environmental impacts at the LDS Bairiki project. The nature of activities carried out at the Chapel and Community Centre (generally church service and church related), and within its community setting limits the potential to generate unacceptable noise levels to the adjacent residential houses.

iv) Social Impacts

110. Social impacts are not considered a major issue once the LDS Bairiki project has been fully commissioned. There will be an increase in vehicle and foot traffic at the Chapel and Community Centre and at Tabonikabauea which will improve the trade sales of the small shops nearby but will have little physical impacts in the area because of the improved facilities at the Centre complex.

111. Positive impacts to the local economy will accrue due to increased public utilities use by LDS Bairiki members, new income-earning opportunities generated by demand for labour during construction and Centre staffing and management arrangements, and through the creation of new non-religious business opportunities in the Centre facilities and surrounding areas.

e) Quarry and Crusher Operations

i) Location

112. The traditional source of construction material such as sand and aggregate in South Tarawa has been from the coastline beaches and gravel and the excavation of the lagoon reef, and this has and is being removed without any consideration of environmental impact.

113. The Environment and Conservation Division has now required that all sand and reef excavation activities will be licensed. Potential quarry sites have been located for the LDS Bairiki seawall/ reclamation activity but the exact location needs to be determined.

114. The potential environmental impact of sand and quarry extraction in any location is great and must be considered properly to avoid the potential impact of destroying the marine ecology and exacerbating coastal erosion. An environmental impact assessment needs to be commissioned to identify a suitable site and to include operational and environmental management needs. Draft Terms of Reference for this EIA are appended at Appendix A.

ii) Reef Quarry Operation

115. There is good legislation and potential for supervision of quarries in Kiribati. The reef extraction as proposed for the LDS Church project is not considered to pose major environmental risk. However, it is important that the project proponent clearly demonstrates: (i) the total project requirements of the reef aggregate resource; (ii) that the resource can safely yield this requirement; (iii) the locations where it will be extracted; and (iv) the mitigation and operational management measures to be adopted to minimise environmental impact. This will enable the contractor (who will prepare the EIA) to plan the relative contribution of the source to the LDS Bairiki project.

F. Socioeconomic Assessment

116. The population of South Tarawa is 36,717, 62% of which is youth population of 23,000 (Census, 2000). The land area for South Tarawa is only 7.2 km², giving a very high population density of 5,100 people per square kilometre.

117. Given extremely high population densities, high fertility rates, declining mortality and resultant youthfulness of the population, coupled with a limited resource endowment and little or no opportunity for outmigration, the future for sustainable development in South Tarawa and Kiribati does not look good. The LDS Bairiki Project is an effort to combat social disintegration whose signs are increasingly common in South Tarawa. The extended family system and wider kin-based traditional social security systems are weakening, with nuclear, often broken families becoming increasingly common. Similar signs of the declining status of the family figurehead and the family as an "emotional sink", are also prevalent, but not yet widespread.

118. Burglaries and crimes of violence are increasingly widespread on South Tarawa. Much of this has been associated with increasing use of alcohol and drunkenness. Increasing consumption of alcohol and alcoholism, as both a major social problem and a health problem, and the general promotion of Christian Family values have been the major incentives for the establishment of the LDS Bairiki Chapel and Community Centre.

119. Part and parcel of the programme is to combat the entire process of social alienation and disruption and to increase the influence of spirituality and the church, through youth programmes and activities.

120. The LDS Elders have stressed how urbanisation and technological society have been a major factor in the phenomenon of spiritual alienation, and that the majority of the present social problems confronting the congregation stem from alienation, either in alienated youth or adults.

121. The infrastructure development to accommodate the chapel, community centre and a sports facility is one component of the LDS Church Development Programme to foster more closeness and intimacy to the traditional social system which still respects the many components of the environment, integral to the traditional spirituality and religion, and which can only serve to enhance sustainable use and protection of our natural heritage.

122. Implementation of the LDS Bairiki Project would stimulate employment as more construction work take place and more employment opportunities become available through new private and public sub-contracted activities. The infrastructure development and services that will rise in response to the increased number of vehicular and foot traffic to Tabonikabauea will stimulate further private sector investment, will in turn help reduce hardship and poverty by stimulating localised economic growth and creating employment opportunities for the Bairiki residents.

G. Environmental Management Plan

I. Summary of Impacts

123. The major environmental concern for the project is the long-term effect of the seawall on coastal processes and the potential irreversible impact of losing what used to be public domain and family land to the LDS Church development project.

124. The temporary social impacts include noise, air, surface water pollution during construction, and visual impacts which will stop once the project has been completed. The Construction Camp would normally cause significant temporary impacts but will pose serious implications to the social environment if the camps are partially demobilised creating abandoned derelict buildings, oil or other contaminated ground, erodable surfaces, rubbish, septic tanks, etc.

125. Minor noise pollution would be the more permanent impact of the commissioned project as the buss of activity increases as more LDS Church members and converts flock the Chapel and Community Centre. The permanent impact of the seawall in changing the longshore currents would be to change the hydrological systems in the area, in effect, altering the depositional and erosional patterns around Tabonikabauea coastline.

II. Proposed Mitigating Measures

126. Extensive explanation and discussion with nearby landowners and tenants is crucial to make them understand the need and rationale for the land use change of the former public land to a semi-public use by the LDS Church.

127. Temporary air and noise pollution can be controlled by insisting the contractor's vehicles travel at a reduced speed along the Tabonikabauea Road and vehicles on site are turned off when not in use. The Construction Camp and Concrete Mixing Plant must be located away from residential areas.

128. To foster goodwill with nearby residents, the contractor must employ local people from the Bairiki residents.

129. The issues relating to the establishment and operation of the Construction Camp should be mitigated through the following actions:

- ✓ Locate the construction camp and asphalt plant away from residential areas
- ✓ Restrict contractor to a single, pre-planned construction site
- ✓ Contractor to install septic tank or mobile toilets
- ✓ Grey water to be managed according to site conditions
- ✓ Solid waste system to be introduced and removed from site -- no burial or burning
- ✓ Collect and recycle lubricants
- ✓ Ensure contractor has spill contingency plan including drainage/settling pond control, bunds drainage around fuel and storage areas
- ✓ Ensure demobilisation is clearly addressed in Contractor's Environmental Management Plan

130. For drainage issues and erosion control the following measures are recommended:

- ✓ Contractor must have a detailed drainage infrastructure, conservative flood design levels, and design relief in vulnerable areas for very large floods.
- ✓ Minimise needs to modify natural drainage and design conservative flood design levels
- ✓ Detailed drainage design
- ✓ Discuss with nearby residents how best to improve water quality flows
- ✓ Use of berms along the lower slope of the stockpiled excavation material

- ✓ Use oil and sediment traps and gentle flows onto grassed areas

131. The long-term impacts associated with seawall construction on the reef platform, can be mitigated by modifying the seawall design to enhance the transport of fine sediments and the natural process of erosion and accretion. The ecological long-term impacts can be mitigated by building the seawall, thus leaving the reef flat, to have complex topography with good flushing abilities thus creating more sediment-free diverse habitat where corals can begin to colonise.

132. Issues relating to the extraction of sand and aggregate should be addressed through the independent conduct of EIA for the quarry. The quarry EIA should locate suitable sites away from sensitive areas, and must produce a Quarry Management Plan and Restoration Provisions that ensures the contractor has specific responsibilities for restoration of the excavated area

III. Monitoring Programs and Parameters

133. This environmental study will provide the necessary environmental guidelines to be incorporated into the detailed LDS Bairiki project design. As such appropriate mitigating strategies have been integrated with the engineering feasibility and incorporated into the detailed design. These mitigating strategies have no direct monitoring programme requirement other than review of recommended mitigation measures in conjunction with on-ground implementing activities.

IV. Public Consultation Activities

134. The contractor will foster much good will among nearby residents by fully discussing the LDS Bairiki project with them before mobilising onto the project site. Most people around the project area are supportive of the LDS Church project but they need to be advised of the details of the project activities at that first public meeting or at individual residents' meetings.

135. The consultation meetings should encourage public comments on drainage designs and other mitigating measures proposed by the project. Recruitment of local labour should form part of the consultation process.

V. Responsibilities for Mitigation and Monitoring Requirements

136. This EIA identifies and assesses environmental impacts, identifies suitable mitigation measures and makes recommendations on monitoring requirements. Making these effective requires an institutional setting and framework which can be viewed in relation to three principal phases of the project:

- Design and Engineering;
- Contracting and Mobilisation; and,
- Construction

a) *Environmental Management*

137. It is the LDS Church project manager's responsibility for overseeing the environmental management guidelines as provided in this EIA and/or provided by the Environment and Conservation Division, are complied with by the contractor.

b) *Design and Engineering*

138. The environmental study which this document reports has been undertaken in conjunction with preliminary engineering designs. As such appropriate mitigation strategies have been integrated with the engineering feasibility and incorporated into the detailed design. These have no direct institutional or programme requirement, other than review of this assessment in conjunction with the detailed design.

139. The design principles are in accordance with PWD specifications. All materials and workmanship will be in accordance with the Kiribati, New Zealand or Australian Building Code.

c) Contracting and Mobilisation

140. The contractor(s) needs to be completely responsible for the actions of company personnel and subcontractors (if any), while carrying out the works, as per the design brief.

141. This is to be accomplished by three means:

- Incorporating environmental safeguards in the technical specifications.
- Provision for the contractor's Environmental Management Plan to be appropriately reviewed before construction commences. In Tables 1-4 this report provides recommendations and issues which need to be addressed in the EMP in addition to those covered by the recommendations of this report and,
- Monitoring to be undertaken and reported during the course of the works.

i) Technical Specifications

142. The contract between the proponent and the contractor must clearly bind the contractor to ensure that environmental values are safeguarded in accordance with the approved submitted Environmental Management Plan and agreed standards by PWD. Other environmental safeguards and mitigation methods, as listed in Tables 1 - 4, can also be incorporated as technical design directives or alternative contractual obligations.

ii) Contractor's Environmental Management Plans

143. The Contractor must prepare an Environmental Management Plan (EMP). This needs to be established in the contract as a component of Technical Specifications above. The minimum scope of the EMP is as detailed by PWD, in line with provisions of the Environmental Regulations. An additional EMP will be required for the Quarry Site, this should be considered as a component of the overall EMP even if it is submitted separately and at a different time.

144. The EMP is to be reviewed by the LDS Church Project Manager. In this it may be assisted, as appropriate, by the Environment and Conservation Division or a consultant to LDS Church. No equipment shall be moved onto a site, or works undertaken, prior to the completion of the EMP established by the contract documents.

d) Construction

145. The principle activity in respect of ensuring environmental safeguards are being implemented during the construction period is monitoring.

i) Monitoring and Reporting

146. Monitoring that the activities of the contractor are in compliance with the EMP's is the responsibility of LDS Church Project Manager and the procedures to be followed should have been agreed upon by both the proponent and the contractor. For the current project a visual inspection once a week by the Project Manager should be sufficient to ensure compliance of the EMPs and the issues indicated in.

VI. Preliminary Cost Estimates

147. The local cost for the conduct of EIA of the quarry site could be around USD16,000.

H. Public Involvement and Disclosure

148. The recommendation to build the Chapel and Community Centre at Tabonikabauea came from several Stakeholders' Meetings that were held in the early 1980s and culminated in Kiribati Cabinet decision of 12 August 2004 to surrender its lease of the Church of Jesus Christ of the Latter-day Saints land at Tabonikabauea plot 807 (a) and 807 (e), and to rezone the area from industrial to civic use.

149. To date, a meeting has been held with occupants of the only household that has been squatting on this land property since it was leased by Government. This household has 9 family members and they have agreed to relocate elsewhere, at their own costs. The family has agreed to vacate the private property by March 2005.

150. A public meeting was held at the Catholic Church Maneaba next door, mainly to discuss with Catholic Church leaders at Tabonikabauea the proposed project and boundary areas. The meeting was invited for comments and advised that should they wish to appeal or make comments at a later date they can raise their comments with the Environment and Conservation Division.

151. During the conduct of the EIA, the EIA consultant discussed the project again with the squatter family and the residents at Tabonikabauea. The discussions indicate an overall concurrence with the proposal, citing the reason for their support being that "Tabonikabauea Point would be looked after much better".

152. The major concern for Tabonikabauea residents, particularly the residents on accreted land at the western end of Bairiki, came out during individual discussions with landowners adjacent to the project site. The concern is that the proposed seawall/ reef reclamation does not, in any way, impact on the beach accretion that have become part of their land and livelihood. The purpose of the EIA was discussed with them, and they were assured that the EIA Report will attempt to address all concerns. The EIA Report will be publicly displayed for public comments so those interested will have a chance to raise their concerns if they were not adequately addressed in the report.

153. Throughout the assessment period no significant social environmental concerns were raised, though landowners expect opportunities to participate in project design to ensure environmental and social issues are fully addressed. This report has recommended that the Environmental Management Plan of the Contractor must include a discussion/involvement of the local community.

I. Conclusions

154. The LDS Bairiki project will provide for a new Chapel and Community Centre for Bairiki residents and will secure its coastline property by building a protective seawall around the southern and western end of its land at Tabonikabauea. The implementation of this project will in turn remove the restrictions to the growth of LDS Church followers and converts in Bairiki. Through the church activities Christian family values will spread through Bairiki settlements and can act as catalyst for far-reaching positive impacts that are crucial for improvement of social welfare in the country.

155. Currently, storm water drains directly into the sea. The project will install a new drainage system utilising gentle sloping grassed areas to disperse drain flows into the sea.

156. The operation of the Church Complex will see the increase in vehicular and foot traffic, and an insignificant noise nuisance to the neighbouring residents.

157. The LDS Church Project Manager will need to monitor the progress of the construction activities of the contractor, complete a final inspection prior to the commissioning of the Bairiki project and design the Environmental Management Strategy for LDS Bairiki project specifically for on-going monitoring of beach erosion and accretion at the site.

APPENDIX A

**DRAFT TERMS OF REFERENCE FOR
AN
ENVIRONMENTAL IMPACT ASSESSMENT
OF THE PROPOSED REEF EXTRACTION**

1 INTRODUCTION

1.1 LDS Bairiki Project.

The LDS Church is building a seawall and reclaiming the ocean reef to accommodate a new Chapel and Community Centre Complex with a basketball court and car park.

The landfill will require an estimated xxx,000 m³ of aggregate building material. It has been decided that all of this will come from a reef excavation to be opened for this purpose.

1.2 Purpose of the Terms of Reference

The purpose of the Terms of Reference is to describe the requirements for a comprehensive EIA study which will be sufficient to ensure that a report is prepared documenting all the impacts of quarrying – quarry location and operation on the environment and their mitigation and or management.

The proponent must show how the location will provide for the needs of the LDS-Bairiki project and its contributions.

The Report must be sufficiently comprehensive for the approval of the Director of Lands and the Environment and Conservation Division Environmental Regulations.

1.3 The Reef Sand and Gravel Extraction

The Reef aggregate resources are extensive and have been greatly exploited. Careful extraction is not considered to pose major environmental risk. However, it is important that the project proponent clearly demonstrates:

- the total project requirements of the reef aggregate source;
- that the resource can safely yield this requirement;
- the location(s) where it will be extracted; and
- the mitigation and operational management measures to be adopted to minimise environmental impact.

1.4 The Project Proponent

The LDS Bairiki is a project of the LDS Church and to be funded by the Church.

The EIA Project Proponent is the successful tenderer for the Contract.

Add Company Name and Contact details here

2 SCOPE OF THE STUDY

2.1 Screening

Environmental screening is to be undertaken in full consultation with LDS Church Project Manager, the Environment Division, the Public Works Department, the Lands and Surveys Department, and all relevant departments and agencies.

2.2 Assessment

Environmental assessment is to be undertaken to the extent that:

- a) it is relevant to the specific characteristics of the Reef Aggregate pits and of the environmental features likely to be affected by aggregate extraction; and
- b) the information may reasonably be gathered having regard to current knowledge and assessment methods.

All environmental impacts which are likely to be significant should be assessed. In this context the following factors should be considered:

- a) the relative importance of the environment i.e. is it of international, national, regional or local importance;
- b) the degree to which the environment is affected eg if its quality is enhanced or impaired;
- c) the scale of the change eg, the land area, number of people affected and degree of change from the existing situation.
- d) the scale of change resulting from cumulative impacts;
- e) whether the effect is temporary or permanent and if temporary its duration;
- f) the degree of mitigation that can be achieved.

2.2 Scope

The scope of the Reef Aggregate EIA should include but not be limited to the following:

- a) Government Policy and Legislation;
- b) Cultural Heritage;
- c) Marine Ecology and Biodiversity Conservation;
- d) Archaeological Values;
- e) Landscape Effects;
- f) Geology;
- g) Total resources and available resources;
- h) Disruption and impacts due to operation;
- i) Water quality;
- j) Waste disposal;
- k) Socio-economic issues and positive impact.

2.3 Aggregate Extraction

Uncontrolled aggregate extraction can cause major environmental damage to many parts of Kiribati. The impact associated with such practices include:

- changed hydrological and hydraulic regimes;
- increased flooding;
- decreased water drought flows;
- bank erosion and siltation;
- changed aquatic ecology with loss of biodiversity; poor water quality;
- hardship for water users – drinking, washing etc.; and,

- loss of edible fish resources

2.4 Mitigation and Abatement Measures

The study shall examine and recommend suitable mitigating and abatement measures for the adverse impacts identified. The effectiveness of the measures which are proposed should be stated and residual issues and impacts of significance clearly identified. Measures recommended should be practical and readily implementable. These should be discussed with the proponent prior to finalisation of the EIA report.

2.5 Environmental Management Plans

The Contractor will prepare separate stand-alone Environmental Management Plans for the extraction operations. The Aggregate Extraction Plan will be in accordance with the requirements of the PWD's Guidelines.

2.6 Additional Needs

The study shall examine and recommend environmental management practices that would assist in the implementation of the project. These will include the Codes of Environmental Practice and if necessary, appropriate EMS, monitoring and auditing requirements (as necessary).

3.0 ENVIRONMENTAL IMPACT ASSESSMENT STUDY PROPOSAL

3.1 Work Tasks

The proposal for conducting the EIA Study should consider the total Study as comprising a number of specific tasks and should describe each task sufficiently so that the work effort required to do it can be readily appreciated and quantified. The proposal should estimate the types and amounts of professional skills and supporting personnel to be required.

3.2 Study Schedule

The proposed schedule for carrying out the EIA should be indicated, so that the project will be completed within a specified timeframe. The schedule should include a one week period for the proponent/developer to review a draft of the EIA Study.

3.3 Review Sessions

The project work plan should include provision for periodic reviews of the work at meetings to be attended by representatives of the developer/proponent, its architectural, engineering and environmental advisers, and if appropriate DOE or other Government officials. These will be called, as necessary, by the developer and will be attended by the EIA consultant. Costs for such meetings are to be included in the proposal.

3.4 Printing or Reproduction of the EIA Study

The project budget should include provision for reproduction or printing and delivery of 7 copies of the Draft studies and 10 copies of the final EIA Study.

3.5 Study Team

It is important that the EIA Study be conducted by people with sufficient relevant expertise. A description of the proposed project team staff should be presented, including biodata for all key personnel.

4.0 TIME CONSTRAINTS

4.1 The EIA Study

The EIA Study should be completed within a period of three months from the award of the study which is currently planned to be on (xxxx to be completed).

4.2 Proposals

Proposals for conducting the EIA Study should be delivered to the address below not later than (xxxx to be completed).

Mo'oni Headquarters??
Eita

Public Works Tender Board??

5.0 COST QUOTATION

The consultant is to submit a lump sum cost quotation identifying all taxes and disbursements. A suggested payment schedule is to be included.

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