

**LIMITED ENVIRONMENTAL AND SOCIAL IMPACT
ASSESSMENT**

for

BIALLA TOWN WATER SUPPLY PROJECT



**WATER SUPPLY AND SANITATION DEVELOPMENT PROJECT
GOVERNMENT OF PAPUA NEW GUINEA AND THE WORLD BANK**

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Table of Contents

1	Introduction	4
1.1	Purpose of this Document.....	4
1.2	Scope of this Document.....	5
2	Project Description.....	6
2.1	Project Characteristics	6
2.2	Construction Activities.....	7
2.3	Materials	8
2.4	Land Acquisition	8
3	Policy, Legal and Administrative Framework.....	9
3.1	World Bank Policies and Guidelines	9
3.1.1	OP 4.01 Environmental Assessment.....	9
3.1.2	OP 4.10 Indigenous Peoples	9
3.1.3	OP 4.11 Physical Cultural Resources	10
3.1.4	OP 4.12 Involuntary Resettlement	11
3.1.5	Environmental Health and Safety Guidelines	11
3.2	Papua New Guinea Legislation and Guidelines	12
3.2.1	Environmental Legislation.....	12
3.2.2	Land Legislation.....	13
3.2.3	Water Quality Legislation and Guidelines.....	13
3.3	Administrative and Institutional Framework.....	14
4.	Description of the Environment	16
4.1	Physical Resources	16
4.1.1	Topography, Geology and Soils.....	16
4.1.2	Climate, Hydrology and Hydrogeology	16
4.1.3	Water Quality	17
4.2	Ecological Resources	17
4.3	Social and Cultural Resources.....	18
4.3.1	Population and Communities	18
4.3.2	Water Supply, Sanitation and Health	18
4.3.3	Land Resources.....	19
4.3.4	Economic Development	19
4.4.3	Transportation and Power Infrastructure.....	20
6.	Potential Environmental and Social Impacts	21
6.1	Physical Resources	21
6.1.1	Construction Phase Impacts	21

6.1.2	Operation Phase Impacts	23
6.2	Social and Cultural Resources.....	23
6.2.1	Positive Impacts.....	23
6.2.2	Land Acquisition	24
6.2.3	Indigenous Peoples	24
6.2.4	Physical Cultural Resources	24
6.2.5	Property Access.....	24
6.2.6	Affordability and Willingness to Pay	24
6.2.7	Worker and Public Health and Safety	24
7	Environmental and Social Management Plan.....	26
7.1	Physical Resources	26
7.1.1	Construction Phase Management Measures	26
7.2	Social and Cultural Resources.....	27
7.2.1	Physical Cultural Resources	27
7.2.2	Property Access.....	28
7.2.3	Worker and Public Health and Safety	28
8.	Environmental Monitoring.....	29
9.	Public Consultation and Disclosure and Grievance Redress.....	30
9.1	Community Consultation.....	30
9.2	Grievance Redress	30

1 Introduction

The World Bank, via the International Development Association (IDA), is proposing development financing to the Independent State of Papua New Guinea under the Water Supply and Sanitation Development Project (WSSDP). The WSSDP's objective is to support the development of a new water sector institution and to contribute to increased access to water supply services and improved sanitation and hygiene behavior in urban towns and rural districts in Papua New Guinea (PNG). The direct beneficiaries of the WSSDP will be the populations of towns and districts that will benefit from the water supply and sanitation schemes financed by the project. The Bialla Town Water Supply Project (the Project) is the initial project to be funded under the WSSDP and it will be delivered, owned and operated by Water PNG, a state-owned enterprise (SOE).

PNG has the lowest water and sanitation access indicators amongst the 15 developing Pacific Island nations. The latest (2014) update of the UN's Joint Monitoring Program (JMP) estimates access to safe drinking water and improved sanitation in PNG in 2012 at 40% and 19% respectively. Over the period of more than two decades since 1990, the increase in access to safe drinking water has been very small (access in 1990 was 34%), while improved sanitation coverage recorded a drop from 20% in 1990 to 19% in 2012. PNG has missed its Millennium Development Goal targets for water and sanitation, and is not on track to meet its own national development targets of 70% access by 2030, and 100% access by 2050.

1.1 Purpose of this Document

This Limited Environmental and Social Impact Assessment (ESIA) has been prepared to assess the potential environmental and social impacts associated with the Project to fulfill the World Bank and the Government of Papua New Guinea's environmental assessment requirements. The document and associated assessments have been prepared in accordance with the WSSDP's Environmental and Social Management Framework (ESMF) and following guidance in *Environmental and Social Safeguards Instruments for Pacific Island Countries* (ESSIP).

The ESIA's purpose is to: describe the Project; assess the likely environmental and social impacts associated with the Project's construction and operation; and recommend any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. Subprojects under the WSSDP are classified as Category B under the World Bank's Operational Policy (OP) 4.01 meaning that potential

environmental and social impacts are less adverse, site-specific, and few if any of the impacts are irreversible.

This document also provides mandatory guidance to the construction contractor in preparation of its Construction Environmental Management Plan (CEMP) and will be included in the bid documents for civil works.

1.2 Scope of this Document

The scope of this ESIA is the proposed water supply scheme for Bialla Town as described further in Chapter 2. The project's infrastructure will be situated wholly on Government-owned land within the Bialla Town boundaries or immediately adjacent.

Bialla Town is located in the East Nakanai Local Level Government (LLG) area in the Talasea District of West New Britain Province and has a population of approximately 7,000. Bialla is situated approximately 120km east of the provincial capital Kimbe (Figure 1).

The Bialla Town Water Supply Project will establish reticulated (piped) treated water supply to the town's residential and commercial premises. The raw water source will be groundwater, which will be treated, pumped to a reservoir and distributed to individual users by pipework buried within road easements.

There is currently no reticulated water supply in Bialla town. The Bialla Secondary School and the Bialla Health Centre use untreated groundwater sourced from bore wells. All other households, businesses and government institutions use rainwater tanks. Houses without rainwater tanks collect water from the nearest river which is more than 5km from town. During the dry season water is carted into town and sold to users while those with vehicles are able to travel to rivers to wash and do laundry. Apart from the Health Centre and Secondary School which use septic tanks, most town residences and businesses use pit toilets for sanitation.

This document has been prepared using the following source documents:

- *Bialla Town Water Supply Project Baseline Environmental Study and Economic Analysis* (Pacific Geotechnics, July 2014);
- *Bialla Water Supply Design Report* (Water PNG, February 2015); and
- *Social Assessment and Community Consultation for Bulolo and Bialla Water Supply Projects* (Social Environmental Research & Consultancy Services Ltd, February 2016).

2 Project Description

This chapter describes the Project and summarises key design features, construction methodology, and associated infrastructure and activities. The Project description is based on the Water PNG detailed design of February 2015 and is subject to refinement through the tendering process.

2.1 Project Characteristics

The Bialla Town Water Supply will comprise the following elements:

- a raw water source – groundwater obtained from the existing bore on the Health Centre site;
- a water treatment (chlorination) facility and back-up generator – these facilities will be established in a new building on the Health Centre site adjacent to the bore;
- a rising main to transfer water from the treatment facility to the storage reservoir;
- a water storage reservoir and system operator's residence;
- a water distribution systems to distribute water to the town's residences and commercial premises; and
- a secondary bore for back-up.

The location and layout of the various design elements is shown on Figure 2. The design criteria have been derived from the Water PNG Design Manual and are based on a projected town population in 2024 of approximately 8,500 with an associated water demand of approximately 900 kL per day (average daily flow).

The raw water from the bore will be treated with chlorine to ensure the water quality meets the required drinking water standards. Water PNG employs a number of techniques for chlorination including gas, powder and tablets. For the Bialla scheme tablets will be used as they have a longer shelf life, are non-volatile and are easy to handle. The chlorine will be mixed in tanks to a 12% solution with water and then automatically dosed direct to the rising main.

It is proposed to establish a secondary bore to provide back-up in case of failure of the main supply bore or to facilitate maintenance. This secondary bore may be the already established High School Bore (subject to agreement), or the development by Water PNG of a further bore within the town boundary.

The project has an expected capital cost of approximately 10 million kina (USD3.26 million).

2.2 Construction Activities

The Project will involve the following construction activities.

Bore Site

At the bore site raw water extraction facilities (submersible electric pump and surface pipework), a chlorination treatment facility, and back-up generator set will be established. The treatment facility and generator will be housed in a building comprising concrete slab structure with concrete brick walls, and corrugated iron roofing.

An electrical submersible pump of 11.5 litres per second (L/s) will be installed in the Health Centre bore approximately 90m below ground level.

Rising Main

The rising main will transfer treated water from the treatment facility to the storage reservoir along the route shown in Figure 1; a distance of approximately 600 metres. The 160 millimetre main, manufactured from high density polyethylene (HDPE), will be installed in an excavated trench.

Water Storage Reservoir

The water storage reservoir will be a tank of 684 kL capacity, with dimensions of approximately 5m height and 12.7m diameter. The tank is expected to be of steel construction, established on a concrete foundation. The proposed reservoir site does not provide adequate elevation to allow gravity supply to the whole distribution system, hence a building platform 1.5m above the current elevation will need to be constructed.

The reservoir site will also include the operator's residence and a Water PNG storage and laydown area. A further portion adjacent to the reservoir site will be used as the construction laydown area.

Distribution System

The distribution system will comprise approximately 13km of pipework of various diameters (150, 100 and 80 mm) with the route following the town's existing road alignment. The distribution pipework will also be buried in trenches at 600mm depth (900mm at road crossings) and will include valves and fire hydrants, the latter at 150m intervals within residential areas. Water PNG will supply water to the property boundary where it will be metered and charges a nominal fee for the household or commercial connection.

2.3 Materials

The majority of materials required for the Project will be sourced via either Port Moresby or Lae and will most likely be transported by ship and off-loaded at the nearby wharf operated by Hargy Oil Palm Limited (HOPL).

2.4 Land Acquisition

No land acquisition is required for the Project as all sites are Government-owned. The borehole site is owned by the Provincial Health Authority and Water PNG will enter into an MoU to allow establishment of the treatment facility and installation of the rising main. The reservoir site is currently under lease from the East Nakanai LLG to HOPL. A provision in that lease allows resumption of the land if required for Government purposes and it is expected that Water PNG will enter into a tri-party agreement with the LLG and HOPL to occupy a one hectare portion. The remaining land required for the distribution system is within the town boundary and is Government-owned, hence no MoU is required.

3 Policy, Legal and Administrative Framework

3.1 World Bank Policies and Guidelines

The World Bank has developed a series of operational policies (OP), or safeguards, to help identify, avoid, and minimize harms to people and the environment. These safeguards require borrowing governments to address certain environmental and social risks in order to receive Bank financing for development projects. Eight OPs apply to environmental and social risks and, of these, four are triggered by the WSSDP (as detailed in the ESMF) and are potentially applicable to the Bialla Project.

3.1.1 OP 4.01 Environmental Assessment

The World Bank requires environmental assessment (EA) of projects proposed for financing to help ensure that they are environmentally sound and sustainable, and to improve decision making. Guidance on the applicability of OP 4.01 to Pacific Island countries (PICs) is provided in the Bank's document Environmental and Social Safeguards Instruments for Pacific Island Countries (ESSIP) (2015). The ESSIP notes that an Environmental and Social Impact Assessment (ESIA), incorporating an Environmental and Social Management Plan (ESMP) is prepared when a project (or subproject) has complex issues that require some form of project-specific environmental and social impact analysis. For projects in the PICs with less complex issues and lower risk a Limited ESIA may be prepared. This more limited EA process is applicable to the Project.

3.1.2 OP 4.10 Indigenous Peoples

OP 4.10 ensures that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. The World Bank recognizes that the identities and cultures of Indigenous Peoples are inextricably linked to the lands on which they live and the natural resources on which they depend. These distinct circumstances expose Indigenous Peoples to different types of risks and levels of impacts from development projects, including loss of identity, culture, and customary livelihoods, as well as exposure to disease.

Indigenous Peoples (IP) are defined under OP 4.10 as distinct, vulnerable, social and cultural groups possessing the following characteristics in varying degrees:

- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;

- collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
- customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- an indigenous language, often different from the official language of the country or region.

Country-level social analysis undertaken during the preparation of the ESSIP suggests that groups meeting the four defining characteristics of OP 4.10 are likely to be found in PNG, which is recognized as being highly heterogeneous, with numerous groups exhibiting distinctive institutions, maintaining self-identification, and speaking more than 600 separate languages or dialects.

While there are indeed many groups within PNG that meet the IP definition, the key qualifier for the applicability of the policy is whether these groups are present in the project area of influence. Social assessment undertaken by Dr Rodney Kameata for the Project indicates that there are two cultural groups in the East Nakanai LLG that fit the definition of IP: the Meramera and Motutu groups. Notwithstanding that these two groups have ancestral territories in the region, they are not present within the Project's area of influence which is restricted to within the Bialla Town boundaries. The population of Bialla is highly heterogeneous, with members of cultural groups from various parts of PNG.

Hence OP 4.10 does not apply to the Project.

3.1.3 OP 4.11 Physical Cultural Resources

OP 4.11 policy addresses physical cultural resources (PCR) which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

This ESIA has not identified any known PCRs that will be impacted by the Project's infrastructure. However, it is recognized under OP 4.11 that PCRs may be encountered unexpectedly during project implementation. These types of PCRs are known as 'chance finds' and there is a potential for them to be uncovered during civil works on the Project. To cover this eventuality a Chance Finds Procedure has been incorporated in the ESMF.

3.1.4 OP 4.12 Involuntary Resettlement

Involuntary Resettlement may include involuntary land acquisition, loss of assets or access to assets, or loss of income sources or means of livelihood as a result of project implementation. World Bank experience indicates that involuntary resettlement under development projects, if unmitigated, often gives rise to severe economic, social, and environmental risks: production systems are dismantled; people face impoverishment when their productive assets or income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community institutions and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished or lost.

Since all the Project's infrastructure will be sited on Government land there will be no involuntary land acquisition required, hence this policy is not applicable. There will however be loss of assets due to the resumption of a portion of HOPL leased land for the reservoir site. These assets are immature palm oil plants and it is anticipated that compensation for this loss will be included in the MoU between Water PNG, the LLG and HOPL.

3.1.5 Environmental Health and Safety Guidelines

The World Bank Group's Environmental, Health and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. For the Project the relevant Industry Sector Guidelines are the *Environmental, Health, and Safety Guidelines for Water and Sanitation* (December 2007) which include information relevant to the construction, operation and maintenance of potable water treatment and distribution systems. This Limited ESIA has been prepared with regard to the General EHS Guidelines and the EHS Guidelines for Water and Sanitation.

Under the Guidelines water quality of potable water supply systems should meet nationally legislated drinking water standards or, in their absence, the most recent World Health Organization (WHO) Guidelines for Drinking Water Quality throughout the distribution network.

3.2 Papua New Guinea Legislation and Guidelines

3.2.1 Environmental Legislation

The key environmental legislation in Papua New Guinea is the *Environment Act 2000* and the associated *Environment (Prescribed Activities) Regulation 2002*.

Section 7 of the Act includes a general environmental duty whereby: “A person shall not carry out an activity that causes or is likely to cause an environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the environmental harm”, where an activity is one “...which results or is likely to result in a change to the environment.”

For the purposes of environmental assessment and permitting the Regulation classifies activities as Level 1, 2 or 3 based on the level of environmental risk. Level 2 or 3 activities require an Environment Permit prior to commencement. In relation to water supply activities the Regulation specifies a number of activities related to water supply that require Environment Permits including:

- Operation of potable water treatment plants with a design capacity of greater than 1 million litres per day;
- Abstraction or use of water for commercial purposes, except where such abstraction or use is ancillary or incidental to, or associated with, any other activity in this Regulation in which case that category of activity will apply to the abstraction or use of water.
- Construction of major hydropower schemes or water supply reservoirs inundating an area greater than 5 km².

The proposed Bialla project, while having a design capacity of greater than 1 million litres per day, does not involve operation of a potable water treatment plant. Similarly, the project does not include a water reservoir inundating an area greater than 5 km². The project will however involve abstraction or use of water for commercial purposes. For the latter activity Water PNG was granted an Environment Permit in September 2014 which permits it to extract water from both the Bialla Secondary School and Bialla Health Centre for period of 10 years up to October 2024. The permitted water extraction rate from the Health Centre bore is 216 kilolitres (kL) per day or 1,866 megalitres (ML) per annum.

While the existing permit covers the water extraction, it does not extend to the associated activities (i.e. water treatment, storage and distribution). Hence Water PNG, as the proponent of the activity, will be required to register the project with the Conservation and Environment

Protection Authority (CEPA) for screening and decision making. It is anticipated - based on the findings of this ESIA - that CEPA will determine that the associated activities will not have a significant impact on the environment classifying them as a Level 1 activity which does not require a permit.

3.2.2 Land Legislation

The *Land Act 1996* is the fundamental legislation to manage land issues in Papua New Guinea. The country has only 3% of the land that is under the state. 97% of the land is still under customary land tenure. For the purpose of the Project, the relevant provisions in the Act are in Division 10, which deals with Urban Development Leases. Where there is an urban development lease on a site and the road easement and allotments are clearly marked and identified, the land is confirmed to be under state (or private) ownership and therefore there is no infringement on customary land ownership.

3.2.3 Water Quality Legislation and Guidelines

The development and distribution of clean and safe water to communities in both villages and towns is a major issue. To address issues relating to water resources regulation, drinking water quality standards, and regulation of operations, the Government vested various responsibilities with three institutions. These are the Department of Environment and Conservation operating under the *Environment Act 2000*, the Department of Health under *Public Health Act 1973* and Water PNG under the *National Water Supply and Sewerage Act 1986*.

Public Health Act 1973

This Act makes provision with respect to matters of public health in Papua New Guinea including the supply of potable water, the maintenance of the purity of water supply and the associated licensing. It establishes water quality standards, and delegated responsibility for monitoring and regulation to the National Department of Health (DoH).

DoH is vested with the responsibility of setting Drinking Water Quality Standards through adoption of international guidelines and standards. The DoH adopted and set as PNG Drinking Water Quality Standards the World Health Organisation Drinking Water Quality Guidelines. For protection of the health of its citizens, the Government through DoH reviews the Drinking Water Quality Standards from time to time.

Public Health (Drinking Water) Regulation 1984

The *Public Health (Drinking Water) Regulation 1984* provides for the construction of water supply and treatment installations, prescribe standards for “raw water”, i.e. untreated water and standards

for “drinking water, i.e. treated water that is supplied for use by consumers, and regulate inspections, sampling and analysis for water supplied under these Regulations.

National Water, Sanitation and Hygiene Policy

Papua New Guinea’s National Water, Sanitation and Hygiene (WaSH) Policy was approved by the National Executive Council (NEC) in late January 2015. The Policy establishes PNG’s first sector-wide national policy on the development, management and implementation of the water supply and sanitation sector development and service provision plans. The Policy provides for the establishment of a National Water, Sanitation and Hygiene Authority (NWSHA) to form the anchor agency for policy implementation, sector regulation, coordination and systemization, monitoring and capacity building.

Drinking Water Guidelines

Water PNG has adopted the World Health Organisation’s (WHO) Guidelines for Drinking-water Quality as the basis for its operations and monitoring. Papua New Guinea (PNG) also has a Drinking Water Quality Code of Practice. The relevant drinking water guidelines for the Project are listed in Table 1.

Water PNG monitors the quality of water to consumers through physical, chemical, and microbiological analysis of intake sources, treatment plants, service reservoirs, and selected locations within the water distribution network in each of the serviced townships. All sampling and analytical work is performed by a NISIT (National Institute of Standard and Industrial Technology) registered laboratory.

Water PNG publishes an Annual Drinking Water Quality Report which is a valuable resource for information on the PNG drinking water supply system and for recent data on the physical and chemical composition of PNG drinking water.

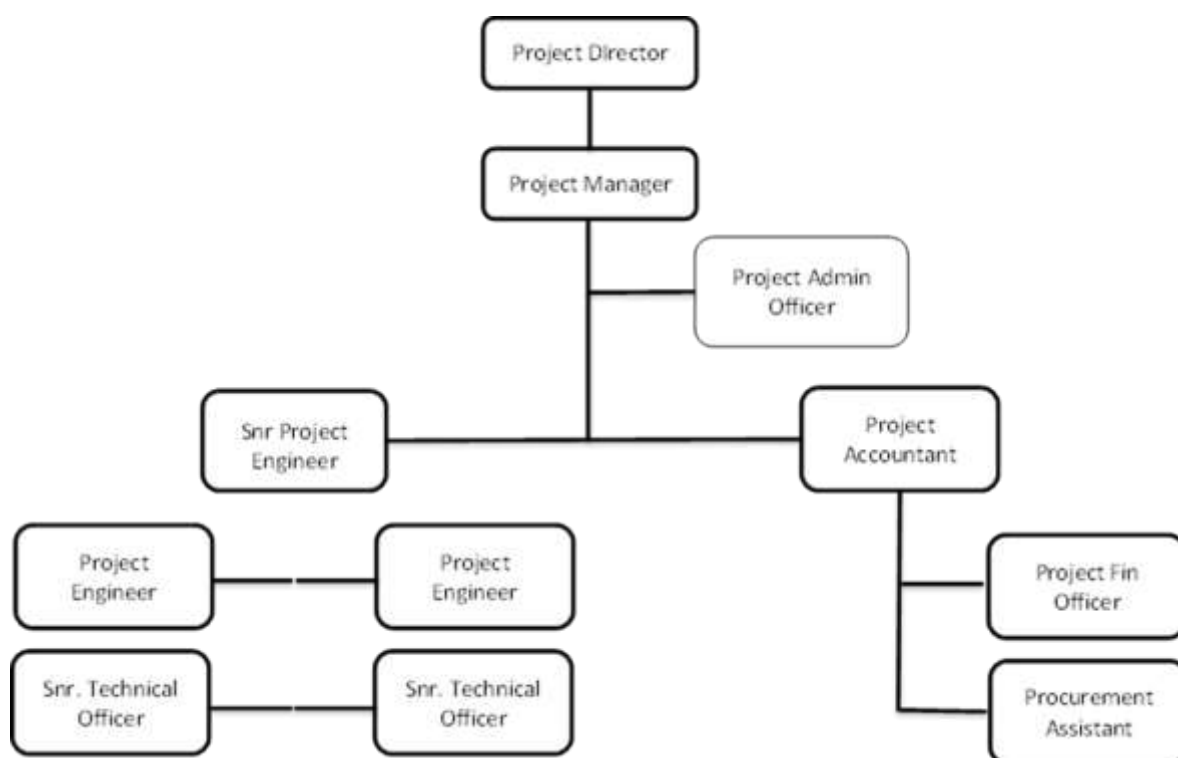
3.3 Administrative and Institutional Framework

Water PNG has established a Project Management Unit (PMU-WPNG) to implement the Project. A similar arrangement was adopted by Water PNG for its previous donor funded projects. The PMU will be located within the Water PNG Engineering and Major Projects Division and will have the structure shown in Figure 3.

Table 1 Guidelines for Water PNG Drinking Water Quality

Parameter	Units	WHO Health Value
pH	pH units	6.5-8.5*
Turbidity	NTU	5*
Fluoride	mg/L	0.8-1.5*
Iron	mg/L	0.5*
Manganese	mg/L	0.1
Aluminium residual	mg/L	0.2*
FAC - Free Available residual Chlorine	mg/L	0.2-0.5*
TAC - Total Available residual Chlorine	mg/L	0.2-0.5*
Percentage FAC	%	85-100*
Total Coliform	C/100ml	Nil*
Faecal Coliform	C/100ml	Nil*
E Coli	C/100ml	Nil*
Total Dissolved Solids (TDS)	mg/L	1000*

The personnel responsible for Project implementation would include personnel from units of Water PNG relevant to project activities (infrastructure investments, utility management, financial management, procurement and contracts management, and environment and social safeguards).

**Figure 3 Water PNG Project Management Unit Structure**

4. Description of the Environment

This chapter describes the existing environmental and socio-economic baseline conditions in the Project's area of influence. The area of influence is defined as the area within which the infrastructure is sited as shown on Figure 2 and the immediate surroundings.

4.1 Physical Resources

4.1.1 Topography, Geology and Soils

Bialla Town is situated on the foothills of Mount Galloseulo, an extinct volcano. Located approximately 2 km from the sea, the town is established on gently sloping land with elevations ranging from 20 to 40 metres above sea level. The town centre is located at an elevation of 40m, with the reservoir site at 45m.

The regional geology is predominantly of volcanic origin and includes basalt, andesite and breccia. In addition, there are extensive coralline limestone deposits (exhibiting karst topography) which form the bedrock beneath the town. Surface soils are derived predominantly from volcanic ash deposits (andisols) and have high fertility.

Land masses in PNG have a very high level of earthquake activity. Bialla Town is situated in seismicity zone 1¹ for building construction meaning it is likely to experience the strongest earthquakes.

4.1.2 Climate, Hydrology and Hydrogeology

Bialla's average annual rainfall is approximately 4,000mm with the wet season from December to April. Approximately 3,000mm of the annual average falls in this period meaning there is a pronounced dry season for the remainder of the year. Average maximum temperatures range from 20°C to 36°C and humidity is very high generally ranging between 70 and 90%.

Local surface hydrology follows a dendritic, or branch-like pattern, radiating from the volcano's summit. Minor creeks are located to the north and south of the town; however these are generally dry as water is extracted for palm oil plantations. There are no significant streams within the town boundaries and none of the proposed infrastructure sites are flood prone. The nearest perennial surface water source is the Toiru River approximately 5km south of the town and this is used for washing and drinking water during the dry season.

¹ <http://www.aees.org.au/wp-content/uploads/2013/11/10-Anton-Lawrence.pdf> Accessed 12 2 2016.

The hydrogeology beneath the Bialla Town and the surrounding region is dominated by the volcanic structures and physical characteristics of the Quaternary volcanic ash deposits which blanket the area. The ash deposits are permeable and form a viable groundwater resource. At the ground surface weathering of the rocks generally forms finer particle sized material (clayey sediments) with less permeability. Groundwater generally flows from the topographic higher regions towards the coastline. Beneath the site the general groundwater flow path will be to the west towards Kimbe Bay².

4.1.3 Water Quality

Water PNG commissioned a *Baseline Environmental Study and Economic Analysis* in 2014³ which included sampling and analysis of raw water quality from the Health Centre bore. The results of this analysis are summarised in Table 2 below and indicate that the water quality is of an acceptable standard for drinking based on these parameters.

Table 2 Health Centre Bore Water Quality

Parameter	Units	Health Centre	WHO Health Criteria
pH	pH	6.8	6.5-8.5
Faecal coliforms	C/100ml	Nil	Nil
E. coli	C/100ml	Nil	Nil
Total coliforms	C/100ml	Nil	Nil
Turbidity	mg/L	0.1	5
Iron	mg/L	0.3	0.5
Manganese	mg/L	0.03	0.1

4.2 Ecological Resources

The original native vegetation in the Bialla locality has been extensively cleared for oil palm plantations, with remnants only existing along creek lines. Within the town there are large numbers of trees in some parts (mango, pawpaw, banana, coconut etc.); however the Health Centre and reservoir sites are largely cleared of standing vegetation. The reservoir site is currently planted to oil palm.

Given the absence of vegetation from the area of influence, there are no significant fauna habitats available.

² Douglas Partners (2013) *Report on Test Pumping - Bialla High School Water Bore*. October 2013

³ Pacific Geotechnics Ltd (2014) *Baseline Environmental Study and Economic Analysis*. July 2014

4.3 Social and Cultural Resources

A social assessment was undertaken for the Project by Dr Rodney Kameata (*Social Environmental Research & Consultancy Services*, 2016). The findings of this assessment are summarised here together with information gathered from other sources described previously.

4.3.1 Population and Communities

Population estimates and projections for Bialla Town were made during the preparation of the design report (Water PNG, 2015). The 2014 population was estimated at 6,686 with a projected increase to 8,559 by 2024 under a growth rate of 2.7% per annum. Of the town's population approximately 500 are HOPL employees, with a further 500 being squatters on Government land; the latter being economically disadvantaged. There are approximately 730 households and 20 commercial premises within the town, including a health centre, and a primary and secondary school each with 700 students. Figure 2 shows the location of the commercial precinct, health centre and secondary school.

The town's population is heterogeneous with individuals from various cultural groups across PNG. The relevant cultural groups (indigenous peoples) in the East Nakanai LLG area are the Meramera and Motutu tribes. The Meramera's ancestral lands are located to the north-east of Bialla near Mount Ulawun. While these cultural groups exhibit the four characteristics under World Bank policy OP 4.10 (see Section 3.1) they are not present within the Project's area of influence.

4.3.2 Water Supply, Sanitation and Health

Existing water supply systems in the town are rudimentary. The Bialla Health Centre and high school draw water from their respective bores and testing indicates that the water quality meets PNG drinking water guidelines. The majority of households and commercial premises have rainwater tanks for drinking water; however those without tanks must collect water from the Toiru River 5km to the south of town. During the dry season there is an increased need for water collection from the river as water tanks deplete.

The health centre and high school use septic tanks for sanitation; however the remainder of the residences and commercial premises rely on pit toilets.

According to data obtained from the district health centre diarrhoea is the third highest recorded disease in outpatients from the Bialla Health Centre, after malaria and pneumonia, with most admissions during the drier months. This pattern is likely to have a close correlation with water supply as lack of water during the dry season would compromise sanitation practices thereby promoting the spread of diarrhoea.

4.3.3 Land Resources

All land within the Project's area of influence is Government-owned. The Health Centre site is the property of the Provincial Health Authority and the proposed reservoir site is Government land currently leased to HOPL. Water PNG will enter into MoUs for these two sites to allow siting of infrastructure.

All the local people living in Bialla come from varying ethnic groups and the population is made up of second and third generation descendants who came and worked in the Oil palm Development in the 1950s. The population consists of both workers from HOPL, Provincial Administration, services and utilities, education and squatters besides the other business as stated in D1.3.1.

4.3.4 Economic Development

The economic activity within Bialla is largely driven by the presence of the Hargy Oil Palm Limited (HOPL) with supporting Government, business houses, BSP bank and service providers. HOPL generated K60 to K70 million per annum and K6 million is spent on wages that are spent within Bialla or West New Britain and the rest of Papua New Guinea. There are a few guest houses, residences and Bialla Health Centre. In addition to formal employment, a large proportion of the population are involved in small holder oil palm production (38.4%) Coconut and Cocoa (31.8%); Betel Nut (20.5%); Food crops (11.6%) and Fishing (3.5%⁴). Most persons interviewed during the baseline study indicated no financial hardship and were keen in stating their income. Table 2 is an extract from the baseline study showing the general expenses and income for Bialla residents.

Table 3 Expenses and Income for Bialla Residents (kina per fortnight)

Sector	Average Income	Average Expenditure	Average Surplus Cash
Commercial employees	250.00	150.00	80.00
Government employees	650.00	300.00	200.00
Unemployed Villagers	150.00	100.00	50.00
Unemployed settlers	200.00	150.00	50.00

Other businesses within Bialla are Public Motor Vehicles (PMVs), trucking and selling of trade stores and associated businesses. There is also the Asian Development Bank bridge project which is upgrading bridges along Kimbe to Bialla up to Ulamona and employees will definitely be accessing goods and services at Bialla and this will provide a boost to the local economy.

⁴ NRI 2010, District and Provincial Profile. National Research Institute.

4.4.3 Transportation and Power Infrastructure

Bialla is half way on the New Britain Highway that runs from West New Britain to East New Britain province. With the bridges to connect the two provinces, there will more vehicles on the road and the possibility of accidents. Public Motor Vehicles (PMV) travel to and from Kimbe daily.

Power in Bialla Town is supplied by the Hargy Hydro Power Plant run by PNG Power Limited.

6. Potential Environmental and Social Impacts

This chapter describes the potential environmental and social impacts associated with the Project.

6.1 Physical Resources

6.1.1 Construction Phase Impacts

The construction phase is expected to extend over a period of 6-9 months. Works will be undertaken at the Health Centre bore and reservoir sites and at various locations throughout the town for installation of reticulation.

Soil Erosion and Sedimentation

Earthworks activities for the various system components have the potential to cause erosion and sedimentation. These impacts are not likely to be significant as the earthworks are of limited extent and will be undertaken progressively throughout the construction phase. The major earthworks component will be the establishment of the foundation for the water storage reservoir; however this will only be approximately 100 square metres hence the potential for any significant erosion and sedimentation is limited.

Noise

Noise Sources and Potential Impacts

The main noise receptors in Bialla Town are residential, institutional (eg. Bialla Health Centre), educational (eg. Bialla Community School (primary) and Bialla Secondary School) and commercial. Of these, the most sensitive are the schools and the Health Centre. The construction activities near most residential, commercial and educational receptors are of limited scale and will be of short duration at any one location. These temporary activities will include excavations of trenches for the distribution system, laying and connecting of pipework and backfilling of trenches. At any one location, noise impacts would not be expected on more than two to three days. Longer duration, but more variable, activities will occur at the Reservoir Site and the Health Centre bore site. These activities will include earthworks for building and reservoir foundations, concrete mixing and laying, building construction and other minor civil works. Once again, these works are of relatively small scale.

The main source of noise during the construction phase is operating equipment at construction sites. This equipment will include excavators, delivery trucks and other powered equipment (eg. drills and power saws). For most locations these activities will only be short-term (several days)

and noisy activities (eg. excavator operation) will be limited to intermittent periods during the course of construction days. Longer period works will be undertaken at the Health Centre site associated with the construction of the bore pipework, chlorination facility and back-up generator building. Similarly, works at the reservoir site (excavations, foundations and construction of the reservoir, and construction of the site manager's residence) will be undertaken over a longer period.

Works at the reservoir and Health Centre site, while of longer duration, will also consist of only intermittent noisy activities. For example, excavator operation for the chlorination building foundation is not expected to require more than one day's work. Hence, while there will be some noisy periods these will be offset by extended periods of relatively low noise levels (eg. concrete spreading for the building foundation and brickwork). It is also important to consider that internal background noise levels within the Health Centre are likely to be relatively high due to the use of ceiling fans. These noise levels are likely to be higher than ambient levels outside the Health Centre and will mask a portion of the noise from construction activities.

Noise Level Guidelines

Noise level guidelines are set out in the World Bank's General EHS Guidelines and these will be adopted for the Project. The relevant guidelines (one hour L_{Aeq}) for specific receptors are as follows:

- Daytime (0700 to 2200):
 - Residential, institutional and educational – 55 dBA;
 - Industrial and commercial – 70 dBA;
- Night-time (2200 to 0700):
 - Residential, institutional and educational – 45 dBA;
 - Industrial and commercial – 70 dBA;

It is important to note that these guideline levels are the equivalent (L_{Aeq}), or average, noise levels over a one hour period rather than absolute values. Hence, while some activities may exceed the guideline values over short periods (eg. sawing or hammering), compliance is measured based on the average noise over the one hour measurement period.

Air Quality

There are potential air quality impacts from fumes from operating construction equipment and dust generation from earthworks and exposed soils. These impacts will only be short-term in nature at most locations and are unlikely to cause anything more than nuisance. Earthworks at the reservoir site will be more substantial and of longer duration than elsewhere, however dust

generation is unlikely to be substantial. Given the small number of construction vehicles and the limited area of active construction at any one time the magnitude of potential impacts is very low.

Waste Management

Waste generation from the construction activities is not expected to be substantial and will be stored in bins at the construction compound. No hazardous waste is expected to be generated.

Fuel and Oil Spills

The construction compound will include fuel storage and potentially other hazardous materials storage. Provided these materials are appropriately stored and handled the potential impacts are unlikely to be significant.

6.1.2 Operation Phase Impacts

Water Quality and Quantity

There is the potential for contamination of the groundwater source from agricultural chemicals or other contamination (eg. leaking septic tanks). However these impacts are unlikely given the limited use of agricultural chemicals, the low population density and the depth below ground surface of the raw water source.

In terms of water quantity and sustainable yield, the Health Centre bore discharges at 22 L/s and the water demand estimation for the year 2024 is 10.43 L/s (average daily flow). Hence, the rate of extraction for the Project will not cause a reduction in groundwater yield and the source will be sustainable in the longer term.

Noise

Noise impacts during the operational phase are not expected to be significant. The raw water pump will be electrically-powered and submersible, hence it will be situated well below the ground surface and therefore not generate any perceptible noise. In the event of a blackout or other interruption to the public power supply, the back-up generator set will be employed. This diesel-powered generator will be a low noise version and will be housed within a brick building mitigating any significant potential noise impacts at the Health Centre.

6.2 Social and Cultural Resources

6.2.1 Positive Impacts

The main social impacts from the Project are positive and include:

- improved quantity and quality of safe drinking water;

- reduction in water related diseases such as diarrhoea, thereby minimizing the cost of healthcare in households;
- reduction in infant, child and maternal mortality and morbidity due to improved health and sanitation;
- reduced distances to water points which will lead to gains in productive time for women and girls.

Previously, many businesses and Government offices have had to close early during the dry season because of limited supply or to allow employees to collect water for their households. Reticulated water supply will eliminate these problems and will also allow the re-establishment of the public toilet system in the Bialla market place.

6.2.2 Land Acquisition

As noted in Chapter 4, all land required for the Project is Government-owned hence there will be no need for land acquisition. No people living on Government land will be adversely affected by the Project.

6.2.3 Indigenous Peoples

No indigenous peoples have been identified in the project area, therefore they will not be impacted by the Project.

6.2.4 Physical Cultural Resources

No physical cultural resources have been identified during project design; however there is the possibility of chance finds of artefacts during earthworks activities.

6.2.5 Property Access

There will be temporary restrictions on access to properties during the laying of pipework however these restrictions will likely be less than a day at any one property.

6.2.6 Affordability and Willingness to Pay

Water PNG, in accordance with its Customer Service Contract, does not charge for standard drinking water connections. Water consumption is levied at 30 toea per kilolitre. During the community consultation for the Project in Bialla Town on 4 February 2016 the community indicated its willingness to pay a fee for potable water supply, particularly given the difficulty in obtaining water during the dry season.

6.2.7 Worker and Public Health and Safety

During the construction phase there is the potential for impacts on worker and public health and safety from construction activities. Potential impacts may arise from operating construction equipment, open trenches and movement of materials and hardware to worksites. Through the

course of the construction period construction activities will be undertaken in close proximity to residences and roads.

7 Environmental and Social Management Plan

This chapter describes the measures to be implemented to manage the potential environmental impacts associated with the Project.

7.1 Physical Resources

7.1.1 Construction Phase Management Measures

Soil Erosion and Sedimentation

Soil erosion and sedimentation will be managed using the following procedures:

- limit ground disturbance and open trenches to areas of a workable size;
- scheduling construction to minimize areas of soil disturbance during wet seasons;
- keep vegetation and topsoil clearing to a minimum;
- reduce the time excavations and trenches remain open;
- place geotextile silt traps at drainage ditches and materials stockpiles;
- contain or isolate construction areas from other surface runoff through the use of diversion drains; and
- pass storm water runoff from construction areas through geotextile silt traps before discharge into culverts or drainage systems.

Clean water diversions will be established on the upslope side of the foundation site to divert clean water around the earthworks.

Excavation of trenches will be undertaken progressively along the various alignments. Once the pipe is laid, the trench will be immediately back-filled and rehabilitated limiting the potential for erosion from excavated soil.

Noise

Potential noise impacts on various receptors will be managed using general and receptor-specific mitigation measures. General mitigation measures will include:

- restrictions on construction hours: 0800 to 1700 on weekdays, 0800 to 1300 on weekends and no works on Sundays or public holidays;
- limiting the hours of operation for specific pieces of equipment, especially mobile sources such as excavators (eg. 0900-1200 and 1400-1700); and
- installing mufflers on engine exhausts.

Mitigation measures for the Health Centre will include:

- ongoing consultation between the supervising engineer and Health Centre manager to notify of upcoming works and respond to emerging issues (similar consultations will occur with the primary school);
- regular toolbox talks with workers to ensure noise is kept to a minimum; and
- erection of noise barriers (plywood hoardings) at the Chlorination Facility site.

Air Quality

All operating plant will be maintained to ensure exhaust emissions are not offensive. Should dust become an issue, construction sites will be watered to minimise dust generation.

Waste Management

All waste generated during construction will be stored in bins at the construction compound and disposed of at the nearest licensed waste management facility.

Fuel and Oil Spills

Fuels and oils will be stored in either bunded enclosures or in containers at the construction compound to ensure any spills are contained.

7.2 Social and Cultural Resources

7.2.1 Physical Cultural Resources

If chance finds of artefacts or similar occur during earthworks the following procedures will be followed:

- stop the construction activities in the area of the chance find;
- delineate the discovered site or area;
- secure the site to prevent any damage or loss of removable objects; and
- notify project representative who in turn will notify the responsible local authorities.

Decisions on how to handle the finding shall be taken by the responsible authorities and the relevant Ministry. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage. Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the relevant Ministry.

Construction work could resume only after permission is given from the responsible local authorities and the relevant Ministry concerning safeguard of the heritage.

7.2.2 Property Access

Where houses and businesses are affected opened trenches will closed as quickly as possible to reduce access issues. Where shops and other properties have high pedestrian or vehicle movement across the trench that will adversely affect their operation temporary bridging will be provided.

7.2.3 Worker and Public Health and Safety

WPNG will engage contractors to undertake the construction and they will be required to provide a safe workplace for workers. This includes site inductions and toolbox talks and provision of personal protective equipment (PPE) including hard hats, safety boots and high-visibility vests. The safety of the general public will be safeguarded by notifications of upcoming construction activities, visible barriers around active worksites, maintenance of safe access through worksites to commercial premises (eg. planks across open trenches) and traffic/pedestrian management during construction activities. .

8. Environmental Monitoring

Responsibility for environmental monitoring will be the responsibility of the civil works contractor with oversight from the design and supervision consultant and the Water PNG Project Engineer. Monitoring of implementation of the mitigation measures in this EMP, together with those in the Contractor's EMP, will be undertaken on a day-to-day basis during routine construction supervision.

The civil works contractor will be responsible for noise monitoring during the construction phase against the noise levels specified in Section 6.1.1. In the event of non-compliance more stringent mitigation measures will be implemented.

During the operational phase Water PNG will monitor the quality of water to consumers through physical, chemical and microbiological analysis. The monitoring regime will be consistent with WHO Guidelines and other Water PNG facilities will include the following measurements:

- pH, chlorine residual and suspended solids (daily);
- bacterial concentration (coliforms and E coli) (twice monthly; minimum 8 samples); and
- chemical indicators (annually; minimum 8 samples).

9. Public Consultation and Disclosure and Grievance Redress

9.1 Community Consultation

Community consultation about the Project was undertaken in Bialla town on 4 February 2016. The consultation session described the details of the Project and sought feedback from the community members. Approximately 200 people attended the session with almost half being female. The President of the East Nakani LLG chaired the discussions and the Water PNG Manager – Planning, Engineering and Major Projects provided the Design details of the Project. These included:

- the proposed water source and transfer of supply to the reservoir;
- the establishment of chlorination facility;
- the pipeline route from the borehole to the reservoir; and
- the reticulation system pipes.

It was explained that all infrastructure would be sited on Government land.

The following queries and concerns were raised by the community:

- Clarification on which areas will the reticulation lines cover and whether it would extend out to the urban town boundary into settlements or not. Water PNG clarified that the lines will only cover the current allotments in Bialla town.
- Connection fee. People asked when they can pay the connection fee to get connected. Water PNG stated that once the project is up and about, their customer service division will be in Kimbe to do awareness on the fees and also signed up customers.
- Community consent. The community members spoke about the fact during dry season it is difficult to have water, and the project is timely and that no one will oppose the project, it should proceed.

9.2 Grievance Redress

During the course of the Project it is possible that affected persons or communities may have concerns with the project's social or environmental implementation occurring during construction and possibly during operation. Any concerns will need to be addressed quickly and transparently, and without retribution to the affected parties.

Water PNG will employ a public relations officer (PRO) for the Project prior to the commencement of construction. The PRO will be a well-known individual respected in the town/community. Any grievance/complaints can be brought to the PRO in the first instance to address and resolve in

collaboration with the Project Engineer. If the complaint is unable to be resolved at this level it is elevated to the Project Manager and, if still unresolved, it can be elevated to the General Manager or the Board.

Water PNG conducts regular customer surveys at all its operating locations. Its Customer Charter provides for customer feedback, reports and complaints, primarily through their operational branch offices. Water PNG is also currently setting up a national call center (expected to be launched in mid-2016) to which customers will be able to make free calls to provide service feedback, breakage reports and complaints. These surveys and customer feedback channels will form an important part of beneficiary engagement and grievance response during the implementation of the project.

Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org

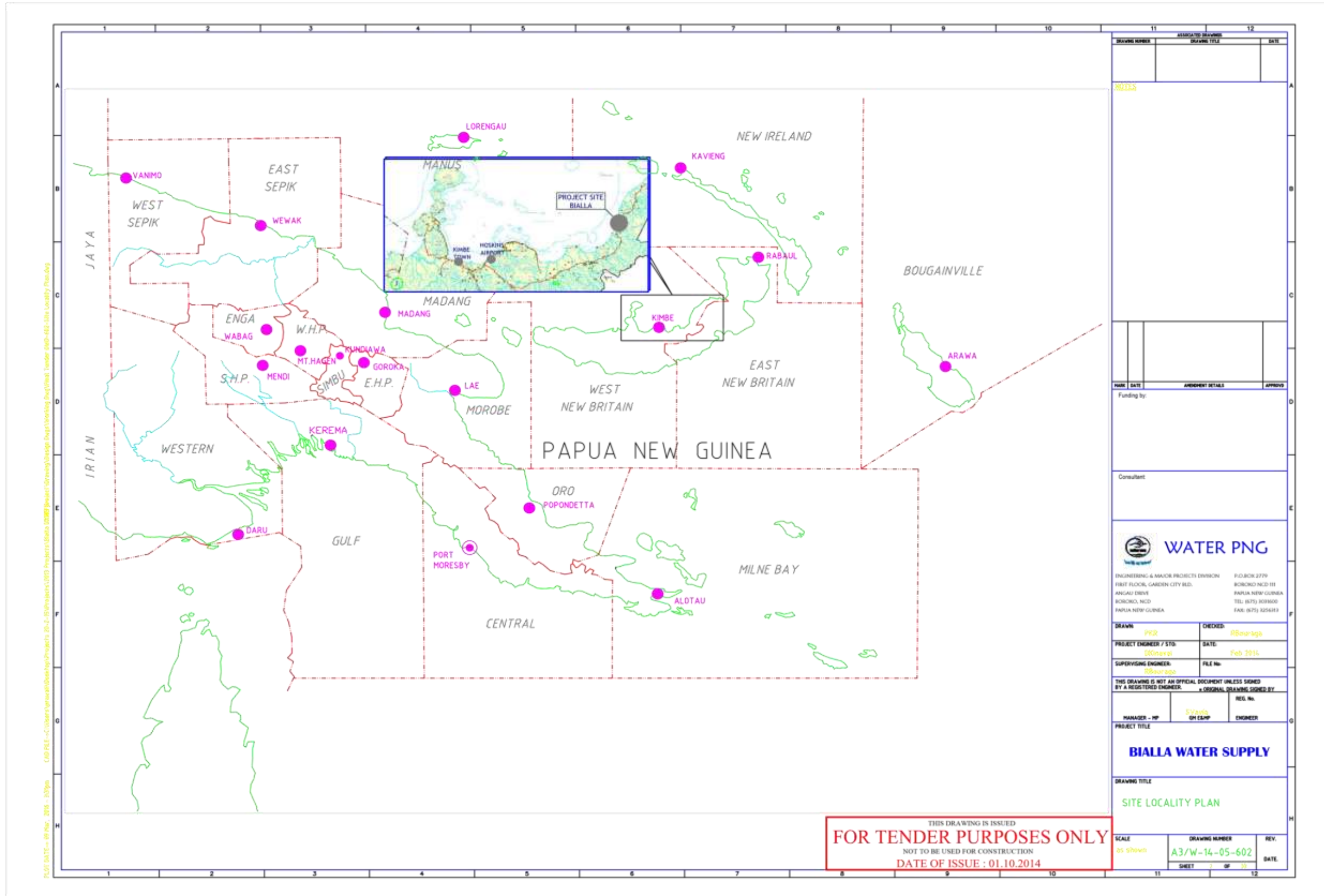


Figure 1 Project Location

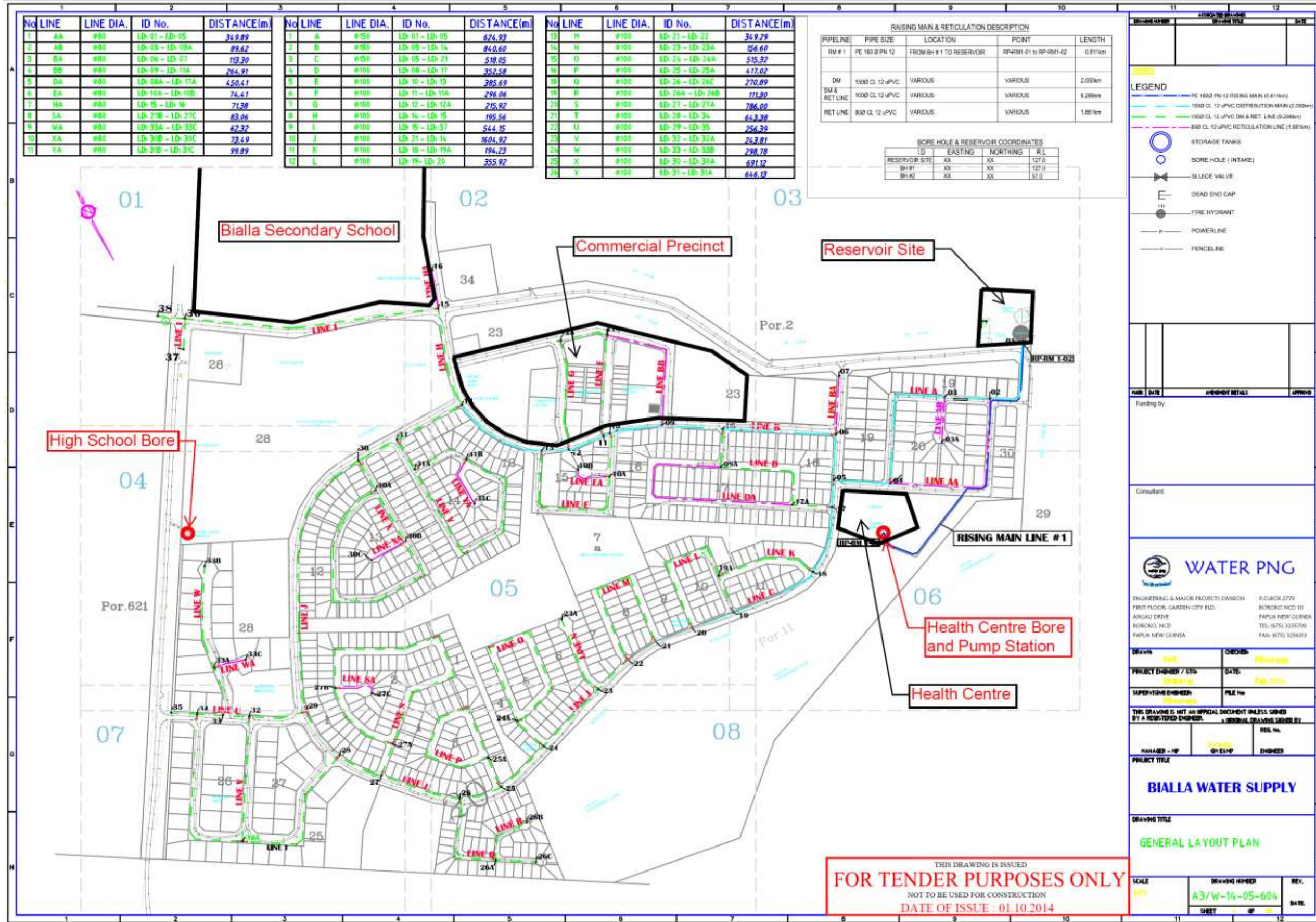


Figure 2 Project Layout

