Office of the Utilities Regulatory Authority of Vanuatu

# Luganville Water System Fixed Asset Valuation & Expenditure Estimates

February 2013

**Wilson Cook Ltd**
Engineering Advisers & Valuers

**Wilson Cook Ltd**
Engineering Advisers & Valuers

Our ref: 1217
Email: info@wilsoncook.co.nz

18 April, 2013

Mr James Ryan
Economist
Office of the Utilities Regulatory Authority
PO Box 138
Vanuatu
BY EMAIL

Dear Mr Ryan,

***RE: LUGANVILLE WATER SYSTEM FIXED ASSET VALUATION & EXPENDITURE ESTIMATES***

In accordance with your instructions, we have completed our valuation for regulatory purposes of the public water supply system fixed assets in use in Luganville at 20 February 2013 ("the Assets") and the likely future operating and capital expenditure requirements of the operation over the five-year tariff review period, and we have pleasure in presenting our report. Details of the work undertaken, the assumptions made, our opinions and the qualifications attached to them are set out in the report.

In summary:

### *Value of System Fixed Assets*

The depreciated replacement cost value of the system fixed assets in service as at 20 February 2013 for the Authority's regulatory purposes is Vatu 230 million.

If the Authority were to exclude the value of assets thought to have been funded by non-repayable grants, an indicative reduction in the value would be Vatu 31 million. However, this is not able to be confirmed, due to the lack of evidence to support such a presumption or the assumptions needed for its calculation.

In addition, a reduced value is not recommended for the Authority's use. In the interest of the efficient allocation of resources economically and consistent with valuation theory and practice, the tariff for water supply services in Luganville ought to be calculated by taking into account the costs related to all assets in use in the water supply system, not just those of a selected portion of them; and the correct way to incorporate a subsidy is to do so transparently, not by deliberately understating the value of the assets involved.

### *Capital Expenditure*

The request from the Operator (the Public Works Department) for around 500 million Vatu for the establishment of a new point of supply of bulk water to replace the existing well and pumping facility is not considered by us to have been substantiated and therefore we are unable to recommend its inclusion in the Authority's tariff calculations.

We further recommend that a competent and detailed engineering study be carried out to determine the capital expenditure requirements of the system before any commitment is made to major expenditure.

In the meantime, we have proposed a lower level of capital expenditure for the Authority's tariff calculations.

### *Institutional Strengthening*

A programme of institutional strengthening is needed to address a perceived lack of basic engineering and supervisory skills and possibly more widely.

### *Reduction of Water Leakage and Unaccounted-for Water Generally*

There remains a pressing need to reduce water leakage from the system and "unaccounted-for water" generally. Leakage reduction will more than offset the alleged need for augmentation of bulk water supply capacity, as growth in demand is projected to be at a low rate.

### *Operating Expenditure*

In other respects, the projected operating expenditure foreseen by the Authority in its *Draft Tariff Decision* appears reasonable.

### *Concluding Matter for the Authority's Consideration*

Because of the relatively poor quality of the technical reports available to underpin the valuation and to underpin the Authority's tariff calculations, it is important that the Authority's reports avoid endorsing the technical documentation in any way as, otherwise, the inadequate technical assessments made to date may gain credence that they do not warrant and may, as a result, lead to inefficient investment decisions.

### *Conclusion*

In conclusion, we thank you for entrusting us with these important and most interesting matters and for the assistance given to us during the course of the work.

Yours faithfully,

**Wilson Cook Ltd**

Encl: Report

# Luganville Water System Fixed Asset Valuation & Expenditure Estimates

Prepared for the Office of the Utilities Regulatory Authority of Vanuatu

By Wilson Cook Ltd

Our reference 1217

February 2013

**Wilson Cook Ltd**

Registered Office:

176 Broadway Ave

Palmerston North 4440

New Zealand

Email: info@wilsoncook.co.nz

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# 1 Introduction

## 1.1 Appointment and Terms of Reference

In January 2013, the Utilities Regulatory Authority of Vanuatu (the Authority) appointed Wilson Cook Ltd, Engineering Advisers and Valuers of Palmerston North, New Zealand, to evaluate the assets and operation of the Luganville public water supply system. [1]

Specifically, we were asked to (a) prepare a valuation of the existing infrastructure using an optimised depreciated replacement cost (ODRC) method and (b) for any new infrastructure considered necessary to provide safe drinking water to the urban area of Luganville in the next 15 years, prepare an estimated cost of its installation (but with reasonable accuracy only for the 5-year tariff review period).

The terms of reference for the work are given in appendix A.

## 1.2 Objective

The principal objective of the work was to provide information for use by the Authority in its current tariff review for water services in Luganville.

In parallel with this, we were asked to provide a view both of the current state and the potential future state of the assets and operations of the water supply system with the intention that our findings might also be used in future discussions between the Government and development agencies regarding future water projects in Luganville.

## 1.3 Background

Luganville on the island of Espiritu Santo is the second-most-populated urban area in Vanuatu with a total population of approximately 13,000. Mains water supply in the town is provided by the Public Works Department, a branch of the Ministry of Infrastructure and Public Utilities (MIPU), to approximately 2,600 customers. [2]

The system was developed originally by American forces during the Second World War and is thought to have been refurbished in two main tranches since then, the first being before handover by the retiring colonial powers and the second in or around the year 2001 with financial assistance from the Asian Development Bank (ADB).

## 1.4 Information Received

The following documents of relevance to our work were received from the Authority:

- *Vanuatu Water Supply System Assessment Report*, SOPAC, 2006;
- *Luganville Stage One Assessment Report (Final)*, Wide Bay Water, 2009;
- *JICA Grant Application [for Luganville] Water Project*, MIPU, September 2012;

[1] References to "the Authority" in this report are to the secretariat to the Authority (our contact being Mr James Ryan, Economist), unless the sense requires reference to the Authority itself.

[2] The Public Works Department's water supply operation in Luganville is generally referred to in this report as "the Operator".

- A set of engineering drawings prepared by SMEC, consulting engineers, at the end of 1998 and understood to describe the refurbishment work carried out in or around the year 2001 (referred to in this report as the SMEC drawings); [3]
- Recent photographs of selected assets;
- Emails from the Authority, particularly those of 28 January 2013 and 7 February 2013, reporting on field visits made in November 2012 and January 2013 by Authority staff and their discussions with MIPU officers (in which supplementary information is given, stating *inter alia* that the work shown on the SMEC drawings was constructed and that the drawings are thought to show the full extent of the network as at the time of completion of those works in or around the year 2001, and in which some additional years of installation are given for other assets, based on the recollections of the operator's officers and staff); [4]
- Nameplate data for the main pumps;
- Some operational data, e.g. on chlorine consumption;
- Some information on a small network extension made in 2012;
- Some information on actual or potential water supplies in private developments; [5] and
- The Authority's *Tariff Issues Paper* of November 2012, *Tariff Framework Paper* and *Tariff Application Report* of December 2012 and *Draft Tariff Decision* of February 2013.

The reports received were descriptive of the physical works as they presently exist but only in a general sense, without much quantitative data on the assets, and were therefore of limited use.

No information of relevance to the cost of laying pipes in Luganville was available, e.g. on ground conditions in the town, although some information could be gleaned from the photographs.

No network flow analyses or calculations were made available to us.

The Wide Bay Water assessment of 2009 was of reasonable engineering quality but was concerned mainly with the management of water losses.

The documents dealing with prospective future investment requirements were generally of a poor engineering standard, being characterised by unsubstantiated claims and a lack of cogent, supporting evidence.

### *Comment*

The reports referred to provided some background information but we noticed many discrepancies in and between them. In addition, as an observation for the future, we noticed that few of the parties had taken the trouble to make any reference in their reports to previous work or reports done. The effect of this is to weaken the foundation of all the work and to reduce the reliance that should be placed on it.

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[3] The drawings also showed the extent of the existing network that was to be retained.

[4] The officers advised the Authority's staff that all records of additions and alterations to the network since 2001 have been lost.

[5] Private networks, including the supply to the agricultural college (which is stated on the SMEC drawings to be private) are excluded from the valuation.

In short, only the SMEC drawings provided us with comprehensive data on the quantitative extent and nature of the assets that could be considered reliable for our purposes. We have, therefore, had to rely exclusively on those drawings, supplemented by the information emailed to us by the Authority.

We return to these matters later in the report, particularly in relation to the uncertainty attached to the valuation and to the lack of a strong foundation for the expenditure estimates on which the Authority has had to rely in its *Draft Tariff Decision*.

## 1.5 Work Programme

Work on the assignment commenced in mid-January on confirmation of our appointment and the signing of a contract for the work with the Authority. A preliminary assessment of the adequacy of the available data was provided to the Authority immediately and further information was requested. This was provided by the Authority after the site visit by its staff at the end of that month. We then proceeded with the work, giving a preliminary indication of the order of the values involved to the Authority on 12 February. Several subsequent discussions were held with the Authority to explore potential areas of interest or concern and to confirm the form in which we should report, with a preliminary value (presented for discussion only) being provided on 14 February and various key points being discussed on that day. The intention of these communications was to convey our thinking and preliminary findings to the Authority as soon as possible and, together, these submissions and discussions were considered by us to have constituted our preliminary report.

Following the discussions on 14 February, the first valuation figures endorsed for use by the Authority were presented on 25 February with a revision on 27 February. The figures comprised a valuation of all system fixed assets in use (other than those specifically excluded in this report) and a reduced valuation, excluding those assets thought to have been funded by non-repayable grants.

Further issues were discussed and clarifications were sought from the Authority on 28 February, after which we proceeded to finalise this report.

## 1.6 Site Visit

Normally, for a valuation of this type, a site visit would be made to inspect representative samples of the assets, view the physical conditions on site and discuss the assets first-hand with the Operator. However, because of time constraints and budget, it was agreed that if sufficient information could be provided to us, a site visit would not be made. It was accepted by the Authority that, if this was not possible, a site visit would be commissioned and carried out in January 2013.

In the event, it was not clear to us that such a visit would add materially to the integrity of the valuation and so no visit was requested.

## 1.7 This Report

This report was presented to the Authority in draft form on 5 March for confirmation that it met the terms of reference, and then presented in final form, including agreed modifications, on 18 April.

It summarises the work carried out, our conclusions and observations. It is presented in five sections as follows:

- Section 1 – Introduction (this section)

- Section 2 – Valuation of Fixed Assets
- Section 3 – Reduced Value
- Section 4 – Future Expenditure Requirements
- Section 5 –Conclusion.

## 1.8 Acknowledgements

The co-operation and assistance of the staff of the Authority are gratefully acknowledged.

## 1.9 Disclosure

Wilson Cook Ltd has prepared this report in accordance with the instructions of its client on the basis that all data and information that may affect its conclusions have been made available to it. No responsibility is accepted if full disclosure has not been made. No responsibility is accepted for any consequential error or defect in our conclusions resulting from any error, omission or inaccuracy in the data or information supplied directly or indirectly.

## 1.10 Disclaimer

This report has been prepared solely for our client, the Utilities Regulatory Authority of Vanuatu, for the stated (regulatory) purpose. Wilson Cook Ltd, its officers, agents, subcontractors and their staff owe no duty of care and accept no liability to any other party, make no representation or warranty as to the accuracy or completeness of the information or opinions set out in the report to any person other than to its client including any errors or omissions howsoever caused, and do not accept any liability to any party if the report is used for other than its stated purpose.

# 2 Valuation of System Fixed Assets

## 2.1 Purpose, Methodology and General Matters

### *Purpose*

It was made clear to us by the Authority that this valuation was to be prepared for its regulatory purposes and the methodology used is suited to that purpose alone.

### *General Nature of the Assets*

In outline, the Assets comprise a water collection well, a pumping station, bulk water supply mains, reservoirs, a water distribution network, water meters, customer connections and ancillary system fixed assets.

### *Valuation Methodology*

#### *International Practice*

Valuations of the fixed assets of naturally monopolistic utility businesses for regulatory purposes generally follow internationally accepted accounting principles for the valuation of fixed assets for general-purpose financial reporting. The relevant International Financial Reporting Standard (IFRS) is International Accounting Standard 16 *Property, Plant and Equipment* (IAS 16). Variants of this standard are used in different countries. For example, the New Zealand equivalent, NZ IAS 16, is based on IAS 16 (2003) initially issued by the International Accounting Standards Committee (IASC) and subsequently revised by the International Accounting Standards Board (IASB). The Australian equivalent is AAS 116. We are not aware if there is a variant applicable to Vanuatu but the principles applied in this valuation are believed to be substantially those in IAS 16.

Fixed assets comprising plant and equipment are valued in accordance with IAS 16 at cost or fair value. [6] However, the standard recognises that where there is no discernible market for the assets concerned because of their specialised nature or because such assets are rarely sold, an estimate of fair value may need to be derived using an income or a depreciated replacement cost (DRC) approach. [7]

When dealing with natural monopolies an income-based approach to determining fair value would create a circularity of argument, as the valuation would form part of the normal tariff-setting process.

In accordance with these principles, we have adopted a DRC approach to the valuation.

#### *Matters Arising*

The following matters arise when carrying out DRC valuations:

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[6] An entity is required to decide whether to adopt a cost-based approach or a fair value approach to stating its asset values and must then continue to use that methodology.

[7] For example, NZ IAS 16 states, "An item of property, plant and equipment which qualifies for recognition as an asset should be measured at its cost." And, "After recognition as an asset, an item of property, plant and equipment whose fair value can be measured reliably shall be carried at a re-valued amount, being its fair value at the date of the revaluation less any subsequent accumulated depreciation and subsequent accumulated impairment losses." In addition, "If there is no market-based evidence of fair value because of the specialised nature of the item of property, plant and equipment and the item is rarely sold, except as part of a continuing business, an entity may need to estimate fair value using an income or a depreciated replacement cost approach."

(a) whether the replacement cost of an individual asset should be for replacement of the existing asset in its present form, or for replacement with its "modern equivalent"; and
(b) whether the suitability and utilisation of the present assets ought to be considered. For example, if certain assets have excessive capacity for foreseen requirements, it needs to be agreed whether they should be valued based on their existing capacity or whether their value should be reduced ("optimised") to reflect a capacity more closely matched to the projected need. Redundant items would be assigned a nil value under this methodology.

An Optimised Depreciated Replacement Cost (ODRC) valuation calculated in this way could give a truer indication of asset values, as could the application of a "used or useful" test or an "impairment" test.

A "used or useful" test would determine whether the asset concerned had a demonstrable use at present or could reasonably be assumed to have a use in the future.

An "impairment" test, however, is usually based on the earning capacity of the asset in the future. Thus, a circularity of argument exists if impairment-tested valuations are used as the basis of price-setting calculations as they are themselves dependent on an estimate of the revenues that the assets will earn in the future. [8]

It would be possible (and could be appropriate) to go further and value the system fixed assets using a "deprival" methodology. Using this methodology, the value of a particular asset would be the lesser of:

(a) the cost of its replacement with a modern equivalent asset if the owner was deprived of the asset (applicable if the asset is worth replacing - i.e. if a satisfactory rate of return can be earned on the investment in the asset); or
(b) the present value of the earnings stream that can be expected from the asset during its remaining life. [9]

An Optimised Deprival Value (ODV) value so calculated would be consistent with the underlying efficiency objectives of economic reform and regulation but, as with impairment testing, a circularity of argument exists if deprival values are used as the basis of price-setting calculations, as they are themselves dependent on an estimate of the revenues that the assets will earn in the future.

### *Choice of Method*

Without attempting to consider the principles of economic regulation, our view is that the most appropriate methodology to follow for this valuation is the DRC approach rather than an ODRC or ODV approach. However, we comment, where necessary, on any areas where it appeared to us that optimisation (or the application of a used-or-useful test) would result in a material change in the valuation.

### *"Continuing Business" Basis*

It is also necessary to consider whether the assets are used by a "continuing business" and thus likely to continue in their present use. Given their specialised nature and the continued need for the production and supply of potable water in the area, we consider it reasonable so to assume.

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[8] A further practical difficulty that would arise if an impairment test were undertaken is that it would need to be determined whether the asset being valued is "divisible" – that is, whether it can be broken down into separate parts for the purpose of applying such a test or whether all parts need to be used together "as a whole" for the asset to fulfil its intended function and generate the revenue stream.

[9] This calculation is usually referred to as "economic value testing".

### *Valuation of Land and Buildings*

The discussion and reasoning just set out relates in the main to system fixed assets, not to the other fixed assets used by the Operator such as land, buildings, interests in land and non-system fixed assets.

In some jurisdictions, the valuation of land, buildings and interests in land must be undertaken by a valuer registered for that purpose in the country concerned. We are not aware of the law in Vanuatu and are not competent to value such assets anyway, other than in the case of specialised buildings such as pump houses.

If a valuation of land and buildings other than the pumping station building is required, it may be necessary for the Authority to engage a local valuer to determine their value. [10]

If easements or other interests in land exist, they may be valued at cost or at present value and the same situation will apply.

### *Valuation of Non-System Fixed Assets*

Non-system fixed assets generally comprise tools, workshop equipment and fittings, office and staff accommodation and associated furniture and equipment, vehicles, mobile plant and inventories. [11] Such assets are normally valued at book value.

If required, the value of such assets will need to be obtained from the Government's accounts and added to the value stated in this report.

If suitable information is not available from the Government's accounts, e.g. because the assets are shared with other Governmental operations or because items such as inventory are not readily discernible, then they should either be omitted if thought immaterial or a notional allowance ought to be included for them.

### *Valuation Not Bound by Act, Regulation or Agreement*

We are not aware of any circumstance that requires the valuation to be bound by the terms of any Act, regulation or agreement and accordingly we have placed no weight on such terms or on any rates of depreciation of plant and equipment that may be stated in any such Act, regulation or agreement.

### *Work Not Undertaken*

Our work was limited to the context of our instructions – specifically, the particular scope of work set out at the commencement of this report.

In addition, the following matters were excluded from consideration in our work or were not undertaken:

(a) physical inspection or testing of the Assets to determine their existence or condition or for any other purpose;
(b) examination or verification of any matters to do with the ownership of the Assets;
(c) examination or verification of any matters to do with funding the Assets (whether by grant, capital contribution, capital injection or other means) or any debt or other obligation that may exist in relation to the Assets or otherwise;
(d) examination of any matters to do with the Operator's accounts or the Government's accounting policies;
(e) verification of the adequacy of the consents or rights needed to operate the Assets and to collect water or to use land or suchlike;

[10] A potential complication is that the ownership of some or all of the land involved may be unclear.

[11] They normally also include office and technical records.

(f) verification of the Operator's representations or information;
(g) valuation of land, interests in land and buildings other than buildings specifically identified in the valuation schedule;
(h) valuation of non-system fixed assets;
(i) preparation of a detailed asset register of the type normally used for accounting or asset management purposes;
(j) any audit of the Assets, records, data or statements or any other checks such as might constitute an audit of the data or information or its methods of compilation; and
(k) such other items identified in the remainder of this report as having been excluded from our review.

### *Qualifications of the Valuer*

Our valuation team has considerable experience in the fields of plant condition audits, fixed asset valuations, public utility planning and the assessment of utility assets and businesses for regulatory purposes, sale and purchase and other commercial purposes in Australia, New Zealand, the Pacific Islands and internationally.

### *Independence*

Wilson Cook Ltd and its team members are independent of the Authority. In addition, neither Wilson Cook Ltd nor its team members have previously advised any of the parties involved in the water sector in Vanuatu (other than the Authority) on any matter and thus we do not believe that there are any conflicts of interest arising in respect of our work.

## 2.2 The Assets

### *Assets Valued*

The assets valued included the following items:
(a) the Sarakata water collection and pumping station, including its associated site development works, buildings and ancillary assets;
(b) bulk water supply pipelines to the Sarakata and Hospital reservoirs;
(c) the Sarakata and Hospital reservoirs and associated pipe work and valves;
(d) the distribution network including customer connections, meters and ancillary network fixed assets.

### *Assets Not Valued*

The valuation excludes the following items:
(a) assets that are not the property of the Government or that are identified on the SMEC drawings as being a "private service"; [12]
(b) land or interests in land, including easements if any;
(c) rights to construct, operate or reconstruct the Assets including rights to use land or water if any;
(d) buildings other than those buildings specifically identified in the valuation schedule;
(e) houses including operators' houses;
(f) boundary fencing and landscaping;
(g) resettlement costs, if any, associated with the construction of the Assets or that would be associated with their reconstruction;
(h) vehicles and any other mobile plant;
(i) tools and workshop equipment;
(j) furniture, office fittings and office equipment including computers, telephones etc.;

[12] See footnote 5.

(k) documents and records;
(l) consumables including spare parts and inventories;
(m) any other non-system fixed assets; and
(n) the accumulated cost of capital work in progress.

### *Condition of the Assets*

Our terms of reference asked us to determine standard lives for each asset category and to assess the representative useful remaining life of each asset. They noted that "this approach may be particularly relevant in cases where the maintenance and repair of the plant or equipment is below the standard normally expected or is unknown. It could also be relevant where older assets have been refurbished with a consequential expected increase in life."

We interpreted this to mean that the Authority wished to be apprised of the general condition of the assets in use by the Operator as at the date of valuation and that we should take into account such factors when determining the value.

It is normal for a valuer to satisfy himself of the general condition of the assets he values in order to estimate their remaining lives and thus calculate the accumulated depreciation to fix the values and we considered the condition of the assets from that standpoint.

In addition, we looked to see if the condition of the Assets was commensurate with their age and whether it reflected a reasonable standard of stewardship by the Operator, although that was difficult to determine as the age of many of the Assets was open to conjecture. By 'reasonable' in this context we refer to a standard of asset management that could reasonably be expected of a competent owner and operator seeking to provide the required services in a prudent and efficient manner whilst maintaining the assets in sound condition and reliable working order.

The investigatory work carried out by us for this purpose was limited to a study of the photographs of selected, representative assets given to us.

We did not carry out any site visit or inspections of the Assets, undertake tests on the Assets or search for detailed evidence of their condition and performance to date but the Authority's staff did discuss the condition and performance of the assets with the Operator's staff in general terms.

In addition, we noted the considerable refurbishment programmes carried out in 2001 and, we believe, earlier (before Independence) and the predominance of PVC pipelines with only an insignificant residual of galvanised steel pipeline in service in the smaller pipe diameters. [13]

On balance, having considered these factors, we consider the condition of the Assets commensurate with their age.

We further note that this opinion is expressed as at the date of valuation and that we have given no undertaking to the Authority to advise it of any alterations that could be considered necessary as a result of new information coming to our attention after the tabling of our Final Report and the conclusion of the services.

[13] The use of steel for pumping mains and major delivery lines is a different matter.

## 2.3 Valuation

### *Determination of Quantities*

Quantities related to the principal assets such as pumps, bulk water supply mains, distribution pipelines, reservoirs and bulk water meters were obtained from the SMEC drawings and the supplementary information provided to us by the Authority.

Quantities of consumer meters were obtained from the Authority's papers and the number of customer connections was matched to them.

Quantities of other system assets such as pipe work at the various stations, pump control equipment, air vents and suchlike were estimated.

Discrepancies were found in some data and judgement was exercised in relation to them when determining quantities.

### *Determination of Replacement Costs*

Replacement costs were based on prevailing unit rates for assets of the same type in other Pacific island countries (or where necessary in New Zealand), adjusted for price levels in Vanuatu. They are based on modern equivalent assets of the same general nature and capacity, adjusted for price levels in Vanuatu (and, where necessary, for Espiritu Santo).

No consideration could be given to the historical costs incurred by the Operator, as none were made available.

#### *Cost Components*

The following elements are allowed for in all costs:

- the direct costs of material, labour, plant and manufactured items including construction, procurement, shipping, local transportation, erection and commissioning and any applicable taxes other than valued-added taxes payable in Vanuatu (VAT); and
- engineering and administration costs incurred in procuring the asset and putting it into service and that would normally be capitalised.

#### *Interest during Construction*

Interest during construction is not material in distribution network construction and minimal on water treatment and storage installations as construction times are short; no allowance has been included for it in the valuation.

#### *Exchange Rates*

Exchange rates applicable at the date of valuation have been applied where necessary.

### *Assumed Asset Lives*

Table 1 summarises the lives assumed for the main asset categories for depreciation purposes. The lives have been determined for conditions in Vanuatu and assume a reasonable standard of maintenance.

**Table 1: Assumed Asset Lives**

| Asset Category | Estimated Total Life (years) |
|---|---|
| **Water Collection** | |
| Wells | 50 |
| **Pumping Stations, Reservoirs, etc** | |
| Site establishment & misc. site development works | 50 |
| Buildings (masonry) | 50 |
| Buildings (wooden superstructure) | 40 |
| Chlorination and water testing equipment | 10 |
| Reservoirs and tanks (steel) | 60 |
| Reservoirs and tanks (wood) | 50 |
| Bulk water lift pumps and motors | 15 |
| Station pipework, valves, pressure relief vessels | 30 |
| Switchboards, motor drives, cabling | 20 |
| Standby generator sets | 20 |
| Instrumentation and controls | 15 |
| Flow meters (bulk supply) | 20 |
| **Pipelines and Distribution Assets** | |
| Pipes (cast iron) | 80 |
| Pipes (PVC or high-density polyethylene) | 50 |
| Pipes (galvanised steel) | 45 |
| Valves | 30 |
| Pressure reducing valves | 30 |
| Meters (customer) | 20 |
| Fire hydrants | 30 |

No specific life extensions (e.g., through refurbishment) [14] were considered necessary except in the case of the pumping station building (which remains serviceable well past the standard life for structures of that type), a concrete-lined main and the generating set, the life of which was reduced because of its apparent poor condition.

### *Determination of Asset Ages*

The age of assets installed before the refurbishment work of 2001 was estimated, based on such limited information as was available and on advice received through the Authority (which in turn relied in part of the recollections of the Operator's officers and staff). An average age for each diameter of pipeline was calculated for distribution pipes of each type of material. The ages of valves were matched to the average age of pipelines of the same diameter. The ages of other assets were averaged where different installation dates applied to the same asset category.

Discrepancies and inconsistencies were found in some data, especially those related to older assets, and judgement was exercised in relation to them.

The ages so determined were fixed by the methods considered to give the most accurate calculation of the valuation of the Assets in total, rather than item by item.

Overall, we were satisfied that the approximations made were broadly consistent with the evidence available and, on that ground, that they were reasonable.

[14] Refurbishment should result in a material level of improvement or restoration in excess of that achieved by accumulated maintenance.

### *Straight-Line Depreciation*

Straight-line depreciation was applied to each asset category as a *pro rata* apportionment of expired life against economic life plus any extra life assigned.

### *No Residual Value*

On average, it was considered that the assets would have a nil residual value at the end of their lives, as any scrap value or residual useful value would be offset by the cost of their eventual de-commissioning, removal and site clean-up. Each asset category was therefore depreciated to a zero value over its life. [15]

### *Optimisation (or Application of a 'Used-or-Useful' Test)*

We discussed earlier in this report the need for optimisation (or for the application of a "used-or-useful" test) to be considered in situations where an asset has no demonstrable use or is considered to be of excessive capacity. Apart from excluding a short length of spare pipeline on the Sarakata River Bridge, and in the absence of any flow analysis for the network, we found no ground for optimisation to be applied to the value. . Our reasoning is that *prima facie* the configuration of the Assets appears reasonable and that there is no practical substitute for the technology.

## 2.4 Valuation Opinion

Based on our review as described above and subject to the statements made in this report, our opinion is that the depreciated replacement cost value of the Assets in service as at 20 February 2013 for the Authority's regulatory purposes is Vatu 230 million, made up as shown in Table 2.

Land, buildings other than the pumping station, interests in land, non-system fixed assets and privately-owned assets (and the extension serving only the agricultural college) are excluded, together with the other exclusions listed on p. 8.

### *Valuation Schedule*

The valuation schedule in Appendix B summarises the valuation.

### *Additional Value in Land, Buildings and Non-System Fixed Assets*

If a valuation of land and buildings other than the pumping station building is required, it may be necessary for the Authority to engage a local valuer to determine their value, as mentioned earlier in this report. Likewise, if easements or other interests in land exist, they may be valued at cost or at present value and the same situation will apply. [16]

In addition, if required, the value of non-system fixed assets will need to be obtained from the Government's accounts and added to the valuation stated in this report. [17]

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[15] Land is excluded from the valuation. However, if its value is to be added by the Authority, it could (in our opinion) be assumed on reasonable grounds that all land presently used for the Assets would continue indefinitely in this use and, accordingly, possible future site clean-up and restoration costs need not be deducted from its value.

[16] See p. 7.

[17] Ibid.

**Table 2: Summary of the Valuation (Vatu 000)**

| Asset | | Replacement Cost | Depreciated Replacement Cost a/ | Percent Depreciation | Percent of Total DRC |
|---|---|---|---|---|---|
| **Bulk Water Supply Well, Pumping Station, Reservoirs, etc.** | | | | | |
| Civil Works | | 59,951 | 36,348 | 39% | 16% |
| Buildings | | 6,958 | - | 100% | 0% |
| Plant | | 27,410 | 10,872 | 60% | 5% |
| | | 94,319 | 47,220 | 50% | 21% |
| **Bulk Water Supply Mains and Distribution Network** | | | | | |
| Civil Works | | - | - | - | - |
| Buildings | | - | - | - | - |
| Plant | | 463,932 | 182,311 | 61% | 79% |
| | | 463,932 | 182,311 | 61% | 79% |
| Total, All Groups | | **558,251** | **229,531** | **59%** | **100%** |

a/ As at 20 February 2013 (excluding any assets added since 2001 for which no records made available).

The corresponding average annual depreciation rate is 1.81% and the average annual depreciation charge is 10.099 m Vatu.

## 2.5 Conditions Applying to the Valuation

### *Tolerance*

The valuation is subject to a wide range of tolerance, principally because of uncertainty in the determination of replacement costs. In particular, the cost of laying pipelines can vary within wide limits, depending on the ground reinstatement requirements applying, the scale (volume) of work undertaken when pipes are laid and the procurement arrangements applying. In this context, small-scale installations cost more to undertake than large-scale programmes; bi-laterally-funded works generally cost more than work that is bid competitively and internationally; and ground conditions and reinstatement works in town centres cost more than works in villages or where roads and footpaths are not sealed.

The potential impact of these and other relevant factors can only be conjectured.

Accordingly, the valuation opinion expressed in this report is qualified on this ground and otherwise as stated in the body of this report.

### *No Comparison with Previous Valuation Possible*

No previous valuation of the Assets was available to us for comparison with ours as a check on the reasonableness of our estimates.

### *Limited Purpose and Use*

The valuation has been prepared using the depreciated replacement cost method and is intended solely for the Authority's use for its regulatory purposes and not for use by any other party or for any other purpose.

### *Limited Purpose and Use of the Valuation Schedule*

The schedule that accompanies this report is not intended to be used for the valuation of individual parts of the Assets. It is presented solely to indicate the general nature of the Assets, the valuation of which is expressed as a whole. Thus, the valuation should be treated as a whole and should not be disaggregated for any purpose without prior written consultation with Wilson Cook Ltd.

### *Valuation Not an Assessment of Commercial Value of Assets or Operation*

The valuation is not to be taken as an assessment of the commercial value of the Assets, or the commercial value of the water supply operation, or of any business. Nor is it an expression in any way of the worth of any such undertaking or business.

### *Valuation Not an Assessment of Condition, Performance or Safety*

The valuation is not intended to be an assessment of the condition, performance or safety of the Assets and nothing in this report shall be taken to convey any such undertaking on our part to any party whatsoever.

# 3 Reduced Value

## 3.1 Reduced Value Using Authority's Tariff Approach

Although we do not recommend it for reasons that we explain in section 3.2 below, we understand that the Authority may intend to determine the water tariff by excluding from its calculations the recovery of and return on capital investment thought to have been funded by non-repayable grants.

Anecdotal evidence suggests that a portion of the network assets **may** have been installed by the departing colonial powers, shortly before Independence, and funded by them as a non-repayable grant. However, we are not aware of any records confirming this or detailing any such assets, and therefore their existence, nature and extent can only be conjectured.

If the Authority were to exclude the value of assets thought to have been funded in this way, an indicative reduction in the value would be Vatu 31 million. However, this is not able to be confirmed, due to the lack of evidence to support such a presumption or the assumptions needed for its calculation.

## 3.2 Reasons for Not Recommending Use of Reduced Value

As already stated, we do not recommend the use of any such reduced value. Our reasons are as follows.

### *Valuation Theory and Practice*

From the standpoint of valuation theory and practice, the method of funding capital investment has no relevance to the calculation of the value of an asset *per se*. Instead, the value should be determined in accordance with the principles set out in section 2.1 of this report, under the sub-heading, "*Valuation Methodology*" without any regard to the method of funding. [18]

Any argument that the value of gifted assets is nil because they were gifted to the Government in cash or in kind is specious, as the assets so created unquestionably have a use and, therefore, a value. They are, in fact, essential elements in the creation of revenue by the Operator. And the value so created is normally the principal consideration in the determination of the market value or fair value of the asset concerned. The fact that in a natural monopolistic situation a different valuation methodology is required for reasons discussed earlier in this report has no bearing on the present matter.

If there is any doubt about this point, then a simple test to determine the matter is to ask, "*What would be the position if the assets so granted in cash or kind ceased to be available for use by the Operator or anyone else?*" It is axiomatic that such a situation would cause severe disruption to the water supply and that therefore the assets have a value to the entity.

### *Adverse Economic Impact of Incorrect Pricing Signals*

A further consideration is that any failure to state assets at their fair value leads to understatement of the revenue requirement and therefore the sending of incorrect pricing

[18] The cost of debt funding is a separate matter to be considered under the heading of liabilities, not under the heading of fixed assets.

signals to consumers, with a consequential deleterious impact on the efficient allocation of resources.

Unsatisfactory situations of this type come to light when, as the result of such price distortions, inconsistencies arise in the pricing of goods and services.

Such a situation exists in the water sector already in Vanuatu, as there are reported disparities between the pricing of water supply to ships refilling in Port Vila and those refilling in Luganville.

This type of distortion should be removed, not further supported.

A related consideration is that the largest component of the cost of water delivery in Luganville is electricity consumed for pumping. Should it be the case that the electricity supply is not is not priced in a sound manner – and there are distortions in it, as we found from our valuation of the electricity assets for the Authority [19]– then the economic inefficiencies in that sector (electricity) are immediately transferred to the water sector and serve to amplify the inefficient allocation of resources in the economy.

The problem is made more significant by the fact that water, like electricity, is an intermediate good and that the incorrect pricing of such goods can have widespread and unsatisfactory ramifications for the economy as a whole.

### *Subsidies ought to be Transparent*

Without attempting to consider the principles of economic regulation, a third point that could be mentioned is that *"someone always pays if subsidies are present".*

The international lending agencies – the World Bank and the Asian Development Bank, for example – invariably take the view that loans at concessional rates constitute assistance to the government of the borrowing country, not to the agency responsible for the implementation of the project that the loan is to finance (usually referred to by the banks as the Implementing Agency). The concessional funding provided to the Government by a bank is then re-lent at a commercial rate of interest by the Government to the Executing Agency under a subsidiary loan agreement prepared by the bank. There is some modification to these arrangements when the Executing Agency is a department of the government but the principle remains the same.

The point here is that any subsidies considered necessary by the Government in accordance with its policies ought to be transparent. [20]

### *Conclusion*

In the interest of the efficient allocation of resources economically and consistent with valuation theory and practice, the tariff for water supply services in Luganville ought to be calculated by taking into account the costs related to all assets in use in the water supply system, not just those of a selected portion of them; and the correct way to incorporate a subsidy is to do so transparently, not by deliberately understating the value of the assets involved. [21]

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[19] The distortions stem from the omission of the value of the hydro-electric assets from the electricity tariff calculations.

[20] Government subsidies to a utility's customers are ideally provided by way of payment out of the Government's budget and shown as revenue in the utility's books.

[21] The URA indicated when commenting on the draft of this report that it expected to follow this advice.

# 4 Future Expenditure Requirements

## 4.1 Introduction

In this final section of the report, we consider the remaining matters in our terms of reference – specifically, the capacity of the existing assets to supply potable water to an expanding urban area in future years and the resulting capital and operating expenditure requirements.

The terms of reference proposed that a 15-year view be postulated, whilst accepting that reasonable accuracy could be attained only for the 5-year tariff review period. Unfortunately, given the paucity of sound engineering analysis available at present, even that modest goal is impractical to attain without a detailed engineering investigation that would go beyond the scope of our engagement.

The terms of reference also make it clear that the purpose of this additional work is limited to (a) background consideration in future tariff-setting exercises and (b) potentially assisting future discussions between the Government and prospective aid agencies interested in assisting the Government in this area.

Within this scope, we offer the following views, all of which must be considered to be subject to verification by a competent engineering investigation.

## 4.2 Definitions

Before proceeding further (and noting a lack of clarity in the various documents sent to us due to the lack of definition of terms – and, potentially, some errors of reasoning as a result), we define our use of the following terms:

### *Water Supply System*

We define the term ‘water supply system’ as the water supply system as a whole, including the bulk water supply assets (*viz.* the well, pumping station, pumping mains, reservoirs and related pipe work at those locations) and the distribution network (*viz.* the supply mains from the reservoirs and the distribution network including its consumer connections and meters).

### *Network or Distribution Network*

We use the term ‘network’ to refer to the distribution network – the only network involved – as opposed to the water supply system as whole.

### *Leakage*

Correctly speaking, ‘leakage’ is just that: water leaking physically from the system.

### *Unaccounted-For Water*

‘Unaccounted-for water’, to adopt a concept commonly used in the gas industry, is defined for our purposes as the difference between the total volume of water entering the system at the pumping station and the total metered volume of water supplied to consumers. It is comprised of:

- Physical leakage from the system (mainly from the distribution network);

- Un-metered supply to consumers; [22]
- Un-metered supply to special classes of consumer such as charitable entities or public bodies whom the Operator may customarily not have metered;
- Un-metered supply to customers whom the Operator bills at a fixed rates per month;[23]
- Un-metered supply to fire hydrants for legitimate water draw-off for fire-fighting, flushing or the Operator's own use;
- The Operator's own use at depots, offices, etc.;
- Inaccuracy in the meters (which will exist in some) or errors in the billing procedures or records (which ought not to exist);
- The physical theft of water or corrupt practice in the meter reading or billing processes.

## 4.3 Quality of Supply

There is an unsupported statement in the SOPAC report to the effect that water quality is generally very good but that the aquifer is under increasing pressure from agriculture, housing and other developments within the catchment protection zone that has been established. It reads, [24]

> Water quality in both urban in Port Vila and Luganville is generally very good with only calcium hardness to note. The only treatment is chlorination. However in both cases, aquifer levels are dropping while pumping demand is increasing. Both aquifers are under increasing pressure from agriculture, housing and other developments within the catchment protection zones that have been established.

The statement is not substantiated in any way and therefore needs verification in relation to the Luganville aquifer.

The *Draft Tariff Decision* states at p. 13,

> The Authority's investigations of water quality in Luganville have shown that there is a need for improvement. The public survey carried out as part of Consultation Stage 1 indicated that customers are concerned with the current quality levels and have a desire for better quality water. (The full results of the survey are available in the Luganville Water Tariff Review Consultation Stage 1 Report.)

We were not provided with the report cited and it is not clear from the text cited what the quality issues referred to are. For example, (a) it is understood that chlorination has been disrupted by theft of the chlorine drums and possibly for other reasons, but that is a matter that could be remedied easily and thus the water should be expected to be potable; (b) references in the Wide Bay Water report to numerous failures of water mains are hard to reconcile with the fact that the network was overhauled in 2001; and (c) there is no substantiated statement that the aquifer itself is contaminated. [25]

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[22] There is reference on the documents given to us to some new areas of development being supplied un-metered. There is also reference in Wide Bay Water's report (p. 12) to un-metered supplies, the report stating, "Of the 3142 connected meters, 1420 have been disconnected due to non-payment or other reasons".

[23] May include some Government operations.

[24] Source: "Water safety plan water supply description assessment – Vanuatu", SOPAC Water Safety Plans Programme, a project Funded by AusAID, 2006.

[25] The JICA application grant states, "A chlorine treatment plant was installed in 1998-1999 [other references say 2001] to ensure water treatment for safer water but was not functioning properly due to either a breakdown which awhile to get fix [sic] and or shortage of chlorine solutions". Again, such problems could be rectified inexpensively.

On this basis, there is no reason why the water supply should not be of adequate quality in terms of being potable and probably in terms of freedom from interruption of supply as well.[26]

## 4.4 Capacity of Supply

### *Lack of Clarity of Source of Claimed Constraint*

Various unsubstantiated claims are made in the documents sent to us to the effect that the present water supply system or the present "network" – both terms are used – does not have the capacity to supply an increased demand for potable water.

We consider it unlikely that the present **distribution network** (as defined above) lacks capacity, given the recent refurbishment work carried out on it.

If it is meant that the bulk water supply system lacks capacity, then that ought to be made clear and the separate parts of it examined individually.

For example, if it is meant that the well itself is not capable of producing more water, then the text should have said so, but it did not.

If it is meant that the existing pumping capacity is limited, then that could be remedied by the addition of more pumps. [27]

If it is meant that the capacity of the pumping mains is the issue, then that also appears unlikely to us, as our calculations suggest that the pumping mains from the pumping station to the reservoirs are capable of a delivering a material increase in flow (if their stated present maximum level of discharge of 50 litres/sec is correct), without excessive water velocities or head loss. [28]

A further point is that the JICA application document goes on to state,

> The immediate catchment and intake currently are highly susceptible to flooding and contamination due to increase settlement and development at the catchment area. Surface water runoff during flood storms flood into the catchment and intake.

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[26] An email received from the URA on 27 March enclosed a document about water quality in Luganville. However, the document did not identify the testing party or the dates of the tests carried out and appeared to find, in relation to the quality of water at its source – *viz.* at the present pumping station – that E-coli was not present but that the total coliform count was positive. However, tests carried out in the distribution system appeared to show that in some instances coliform was not present downstream. How it could be present at the pumping station and not present downstream was unclear to us. We therefore suggest that the test results are inconclusive.

A further consideration is that it if the source is found by comprehensive assessment to be contaminated, then the removal of the source of contamination may be a preferred solution, rather than the establishment of a new source (which, without proper catchment protection, may itself become contaminated, rendering the investment in it ineffective).

Once again, a more thorough examination is required to determine the condition of the water at its source and therefore we maintain our position – that the arguments advanced for a new source are inadequate and that a comprehensive and competent study is required to properly assess the situation before the Government commits itself to major capital expenditure or commits scarce loan/aid funds to a project that might not be justified.

[27] The document *"Proposal to increase capacity and improve quality of water supply for Luganville urban population",* Public Works Department, Ministry of Infrastructure & Public Utilities, September 2012, gives several reasons (unsubstantiated by data) for capital investment, stating, *inter alia*, "Luganville water supply currently performs at its peak expectation and no longer able to meet new water demands from both residential and business investors. Within Luganville town CBD new buildings and commercial activity increases have been demanding on water resulting at a daily average of 2,200 cubic meters per day. This reaches the maximum output the two pumps are producing in 24hours interval. New connections being installed have been done to meet public demand for water but have caused reduction to pressure at the homes and business. .. The water supply staff has been kept on shifts to ensure that the service is kept to an acceptable level with quick response to faults and main bursts. Minimal disruption to the business and homes in Luganville has been the key objectives however with the aged infrastructure frequent incidents are experienced." We see no reference to limitations in the capacity of the well to deliver more flow and note that the problem cited could be addressed by the addition of further pumping capacity.

[28] If an economic evaluation shows that it would be beneficial to duplicate the pumping mains, then that could be done relatively inexpensively.

However, it is not clear to us that the well is being flooded in this way. Our reason is that the photographs show the floor of the pump room to be at a level below the bund protecting the well from contamination by surface water flooding and that the pump room is open to the well through its trench. This suggests that if flooding and contamination of the well by surface water runoff had occurred, the pumping station would have been flooded at the same time, causing a significant interruption in supply. We find no record of such occurrences.

### *Lack of Adequate Leakage Reduction and Water Management*

The Authority's report, *"Luganville water tariff review tariff application report"* of December 2012 cites (p. 12) the Wide Bay Water report of 2009, stating,

> Leakage accounts for the difference in the amount of water pumped and water delivered to customers. The assumed leakage rate is 42% of the total amount of water pumped. This is based on a bottom-up water balance."

It is now more than three years since the Wide Bay Water team carried out their investigation and reported. We have no information on the extent to which its recommendations have been acted upon but clearly no request for major capital expenditure to supplement bulk water supply capacity should be accepted as long as leakage from the system continues to run at the level determined by Wide Bay Water.

It is axiomatic that the curtailment of waste should precede any investment to increase supply.

### *Conclusion*

*Prima facie*, therefore, the claims that the present capacity of supply is at its limit are yet to be explained and the conclusion that the situation warrants the replacement of the entire present bulk water supply system (inclusive of its well, pumping station and pumping mains) is unsubstantiated and ought not to be accepted as it stands.

*Prima facie*, also, there is no apparent need to abandon the present bulk water supply assets instead of retaining them in service and developing an additional point of supply (if the need for one is established) in order to supplement it. [29]

## *Verification Recommended*

Any claimed need for expenditure to reinforce the water source, the pumping capacity, the capacity of the pumping mains, or the capacity of the distribution network should be verified by flow analyses and detailed engineering assessments based on substantiated data, before any significant expenditure is agreed to by the Government.

This verification should take the form of a competent engineering investigation that examines the state and capacity of the aquifer and the spring, the future demand projection, the extent to which leakage can be reduced by sound water management – note the reference here **only to leakage**, not to unaccounted-for water in general – the condition of the existing installation and all other relevant factors, sufficient to establish:

- The likely magnitude and timing of future increases in the demand for water (in other words, the **need** for capital investment); [30]

[29] There is no discussion evident in the documents on this lower-cost alternative.

[30] Without going into detail, there are several points at issue here. First, the assumed rate of growth of 1.35% is the growth in the volume of water delivery. That is relevant to considerations of bulk water supply but not to the cost of the likely, accompanying distribution network extensions. Those costs will be determined more by the number and location of the new connections foreseen.

- Whether the proposed works constitute the least-cost way of meeting the projected increase in demand; [31]
- Whether they are the least-cost way of addressing any other problems found on detailed review to require capital investment; [32]
- Whether they are consistent with the overall development plans for the water supply system as a whole; [33]
- Whether they are consistent with the Government's national development objectives and its accompanying plans for Luganville;
- Whether the estimated cost of the foreseen development is soundly based;
- Whether the foreseen investment would be capable of earning acceptable economic and financial internal rates of return (considering the allocation of scarce public funds). [34]

## 4.5 Capital Expenditure Requirements

### *Operator's Capital Expenditure Proposals Not Endorsed*

The preceding parts in this section of the report should have left the reader in no doubt that we see no compelling evidence in support of the major capital expenditure programme envisaged by the Operator (to augment bulk water supply capacity) and reflected in the Authority's *Draft Tariff Decision.* Instead, we consider that the reduction of leakage is likely to obviate the need for such capital investment – if it existed anyway.

As a result, we are unable to endorse the expenditure proposals put to the Authority by the Operator.

### *Our Alternative Level of Capital Expenditure in Tariff Period*

In the absence of any robust assessment of future capital expenditure requirements having been provided by the Operator, we suggest that the best guidance for tariff calculation purposes would be to adopt the **long-term** average **annual** expenditure levels that are implied by the fixed asset valuation in section 2.4 of this report. [35]

On that basis, the average annual capital expenditure requirements would be determined as follows.

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Secondly, if the water tariff is presently inadequate and if the tariff is increased, the price elasticity of demand will need to be taken into account. Amongst other things in this respect, there is a claim that it is less expensive for shipping to re-fill at Luganville than in Port Vila. All such supplies ought to be at a commercial rate (as we note in section 3.2 of this report) and, if tariff increases result, that also may affect the future demand projections, albeit that the shipping demand is small in comparison with the total.

(The JICA application states, "Discussions with the Utilities Regulatory Authority and UNELCO in Port Vila have revealed a disparity in tariffs. In Luganville the tariff is 52 VT per cubic meter [sic] with no differential costs. For this reason, commercial shipping re-waters in Luganville not Vila where costs are nearly double.")

[31] As mentioned, the alternative of supplementing the present bulk water supply instead of replacing it is not discussed in the documents. It should be examined in detail. Note also that the least-cost comparisons should take into consideration both the capital investment costs and the lifetime operating costs of each alternative.

[32] For example, network modelling may reveal constraints that need to be addressed; and water loss management programmes may lead to other remedial work.

[33] A long-term development plan for the water supply ought to be prepared as part of the examination and it ought to include an assessment of the catchment area and plans for its protection from contamination by settlement or other actions.

[34] All public funds are scarce and all donor assistance comes at an opportunity cost. Therefore, it is important that any capital investment, whether financed on concessional terms or otherwise, is capable of earning a satisfactory financial internal rate of return to the Operator and a satisfactory economic internal rate of return to the economy as a whole.

[35] **Not** the reduced value discussed in section 3.

(a) Average annual long-term **growth-related network capital expenditure** would be calculated as the product of the replacement cost of the network assets and the foreseen rate of growth in customer connections; [36]
(b) Annual **growth-related "bulk water supply" capital expenditure** should be calculated case by case, based on detailed engineering assessments; [37]
(c) Average annual long-term **capital expenditure for the replacement of network assets at the end of their service life** would be calculated as the product of the replacement cost of the network assets and the average depreciation rate for those assets – unless specific replacement requirements are known; [38]
(d) Annual **capital expenditure for the replacement of bulk water supply assets** should be assessed case by case, the only indicative requirement at present being the replacement of the bulk water pumps and chlorination equipment;
(e) Annual **capital expenditure for safety or quality-related reasons** should be assessed case by case, the only indicative requirement at present being the replacement of the chlorination equipment.

The resulting **annual** costs for each of the next five years on this basis are:

| | |
|---|---|
| Network growth: | 6.1 m Vatu |
| Replacement of customer meters in the network: | 10.5 m Vatu |
| Replacement of bulk supply assets (pumps and chlorination equipment) | 6.2 m Vatu |
| **Total p.a.** | **22.8 m Vatu.** |

This estimate of 22.8 m Vatu p.a. may be compared to the projected capital expenditure level of 16.5 m Vatu over 5 years, plus the enormous sum (for this small system) of 500 m Vatu requested by the Operator, assumed in the *Draft Tariff Decision* (p. 21).

Our estimate is indicative only, is based on the assumptions stated above, is made in the absence of better information, and thus should be verified by a detailed engineering study.

## 4.6 Operating Expenditure

Projected operating expenditure for the year 2013 is reported by the Authority in its *Draft Tariff Decision* as:

| | |
|---|---|
| Electricity consumption, principally for pumping | 23.6 m Vatu |
| Staff costs | 11.4 m Vatu |
| Materials | 4.1 m Vatu |
| **Total** | **39.1 m Vatu.** |

The corresponding annual cost per connection is 18,600 Vatu or $202 USD equivalent. [39] That is within the range of the operating costs of Australian water utilities that we have studied (taking their water supply costs alone and excluding costs associated with their sewerage systems). However, the situation in the two countries is far from comparable and

[36] For our calculations, we have assumed a rate of growth in customer connections equal to the rate of growth in volume throughput assumed in the *Draft Tariff Decision*. However, this assumption should be verified as suitable.

[37] No need for such expenditure has been substantiated by the Operator.

[38] The only specific programme mentioned in the documents appears to be the replacement of customer meters over the next five years. That is consistent with our valuation schedule and our expenditure estimate below assumes that this is the only **network** replacement expenditure needed in the tariff review period.

[39] Costs per connection were found in our Australian water utility benchmarking study in 2012-13 to be a better basis of comparison than costs per unit of volume of water delivered.

comparisons between the two are made more problematic when it is noted that 60% of the reported costs in Luganville relate to electricity charges, principally for pumping. [40]

Dealing with the cost elements in turn:

### *Cost of Electricity*

Our terms of reference asked us to assess the cost of electricity used for pumping and to make any recommendations considered necessary. However, there is little to be said other than that (a) the cost of electricity delivery in Luganville is or potentially will be regulated – we understand that no concessionaire has yet been appointed to replace the previous concessionaire, UNELCO – and (b) other than through the optimal management of water flows, there is no potential to reduce electricity costs except through tariff negotiation. An investigation of the electricity tariff is outside the scope of this report.

We note, however, that energy costs generally are rising in the world at present and can be expected to continue to rise in the medium term. This highlights the importance of reducing water leakage in particular, reducing unaccounted-for water in general, and setting economically efficient prices for delivered water that reflect the full cost of supply, as emphasised in section 3.2 of this report.

### *Unaccounted-For Water*

We have commented already in this section of the report on the importance of reducing leakage. However, the remaining constituent elements of unaccounted-for water ought to be reduced as well.

There is nothing further to add here except to say that careful attention should be paid to determining (or attempting to determine) each of the constituent elements of unaccounted-for water (as defined in section 4.2 above) separately, to be sure of the integrity of the calculations and thus of the conclusions drawn from them.

### *Staff Costs and Training*

The Operator appears to be sparsely staffed presently but that is commensurate with the small size of the operation in Luganville and the low rate of economic growth in the area. Neither of those factors appears likely to change in the medium term and, as a result, the Government should be careful not to build up a large, permanent establishment that adds excessively to costs.

### *Need for Institution-Building*

We have not had the opportunity to visit the site for the purpose of this review or to meet the Operator. However, the admitted loss by the Operator of all records relating to network extensions and alterations carried out since the major refurbishment work in 2001 suggests a lack of basic engineering and supervisory skills exists in the organisation and that is something that ought to be addressed as part of an institution-building programme.

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[40] The Authority may wish to review the international comparisons that it presents (in terms of revenue collection per unit of water volume delivered and the number of staff employed per thousand of population served) as the circumstances in the selected group of countries differ greatly from those prevailing in Vanuatu – especially in Luganville – and thus the comparisons may not be valid. In addition, the country-wide presentation of data masks the considerable differences that exist between utilities serving cities and smaller towns, in terms of scale and type of operation, not to mention the different water sources involved and the degree of other infrastructure to be worked around. Many other complications arise in benchmarking operating costs of utilities, including but not limited to the outsourcing or otherwise of services such as maintenance and construction, IT services and suchlike. Unless the data and operating circumstances are known to be comparable (which we submit is unlikely), the results of such comparisons are likely to be inconclusive and may be misleading.

By way of a further example, a reference in the Operator's document covering the small extension to the network in 2012 to "sand being expensive these days" (and thus implicitly not being used to bed pipes when laying them) suggests the need for a review of the technical practices being applied and, again, for increased skills in engineering and supervision in the operation.

There may be a room for further institution-building, for example in relation to meter reading, billing, record-keeping and administration generally, but we are not able to comment on these aspects.

### *Recommended Focus*

The institutional strengthening programme should be wide-ranging and aimed at the principal objectives of the operation, *viz.*:

- carrying out installation and maintenance work in accordance with good standards,
- keeping good records of all required types,
- reducing the level of unaccounted-for water,
- optimising water flows,
- collecting all dues for the delivery of water and
- managing the operation satisfactorily in all other respects. [41]

The detailed engineering study that we have referred to earlier in this section of the report should identify the technical training and support needed.

## ***Performance Monitoring***

In the meantime, the Authority might anticipate that the performance monitoring regime that it promotes on p.27 of the *Draft Tariff Decision* can be expected only to continue to reveal poor performance, unless it is accompanied by measures to address the institutional shortcomings discussed here.

## ***Other Matters Related to Operating Expenditure***

### *Level of Service*

Our terms of reference asked us to assess the operational cost impact of providing an improved level of service with the existing infrastructure. To the extent that improved service relates to the more reliable chlorination of the water supply, the solutions appear managerial in nature and ought to have little or no material financial impact.

Likewise, given the major refurbishment of the distribution network in 2001, breakages in pipelines ought not to be prevalent. If they are, the cause of such incidents ought to be examined carefully.

### *Impact of New Infrastructure on Operating Costs*

Our terms of reference also asked us to assess the impact on operating costs of adding new infrastructure to the system. This is a sound consideration but difficult to assess, given the rudimentary level of the operation in Luganville and its potential for operational improvement.

[41] Reference should be made to the Wide Bay Water report of 2009 for recommendations on water management, including the installation of area meters to help track losses and recommendations to install pressure reducing valves to reduce the pressure in the distribution system and thus losses.

More light may be cast on this subject if the institutional strengthening that we recommend proceeds but, for the Authority's immediate view, we see no necessity for any material change in the projected operating costs over the 5-year tariff review period, as growth in the demand for water is projected to be at such a low rate that it may be more than offset by reductions in unaccounted-for water and other operational costs and resulting increases in revenue.

### *Conclusion in Relation to Operating Expenditure*

Other than in these respects, we do not have any concrete evidence to suggest alterations to the Authority's projections of operating expenditure.

## 4.7 Depreciation

The average annual depreciation charge and depreciation rate for the Assets taken as a whole is stated in section 2.4 of the report, following Table 2. The preliminary figures assumed in the *Draft Tariff Decision* for the asset value and for the annual depreciation charge should be replaced by the appropriate figures from that section.

Any new assets added in the 5-year period of analysis for the present tariff decision could be depreciated at a rate corresponding to the assumed asset lives given in Table 1 of this report for each separate type of asset.

# 5 Conclusion

## 5.1 Summary of Main Findings

In concluding this report, we summarise our main findings as follows.

### *Value of System Fixed Assets*

The depreciated replacement cost value of the system fixed assets in service as at 20 February 2013 for the Authority's regulatory purposes is Vatu 230 million.

If the Authority were to exclude the value of assets thought to have been funded by non-repayable grants, an indicative reduction in the value would be Vatu 31 million. However, this is not able to be confirmed, due to the lack of evidence to support such a presumption or the assumptions needed for its calculation.

In addition, a reduced value is not recommended for the Authority's use. In the interest of the efficient allocation of resources economically and consistent with valuation theory and practice, the tariff for water supply services in Luganville ought to be calculated by taking into account the costs related to all assets in use in the water supply system, not just those of a selected portion of them; and that the correct way to incorporate a subsidy is to do so transparently, not by deliberately understating the value of the assets involved.

### *Capital Expenditure*

The request from the operator for around 500 million Vatu for the establishment of a new point of supply of bulk water to replace the existing well and pumping facility is not considered by us to have been substantiated and therefore we are unable to recommend its inclusion in the Authority's tariff calculations.

We further recommend that a competent and detailed engineering study be carried out to determine the capital expenditure requirements of the system before any commitment is made to major expenditure.

In the meantime, we have proposed a lower level of capital expenditure for the Authority's tariff calculations.

### *Institutional Strengthening*

A programme of institutional strengthening is needed to address a perceived lack of basic engineering and supervisory skills and possibly more widely.

### *Reduction of Water Leakage and Unaccounted-for Water Generally*

There remains a pressing need to reduce water leakage from the system and "unaccounted-for water" generally. Leakage reduction will more than offset the alleged need for augmentation of bulk water supply capacity, as growth in demand is projected to be at a low rate.

### *Operating Expenditure*

In other respects, the projected operating expenditure foreseen by the Authority in its *Draft Tariff Decision* appears reasonable.

## 5.2 Other Matters for the Authority's Consideration

In addition to the main findings, we note the following additional matter for the Authority's consideration.

Because of the relatively poor quality of the technical reports available to underpin the valuation and to underpin the Authority's tariff calculations, it is important that the Authority's reports avoid endorsing the technical documentation in any way as, otherwise, the inadequate technical assessments made to date may gain credence that they do not warrant and may, as a result, lead to inefficient investment decisions.

## 5.3 Additional Conditions Accompanying the Use of this Report

### *All Earlier Advice Superseded*

This report supersedes any previous advice from us on its subject matter, whether written or oral, and constitutes our sole statement about that subject matter.

### *Disclosure*

Wilson Cook Ltd has prepared this report in accordance with the instructions of its client on the basis that all data and information that may affect its conclusions have been made available to it. No responsibility is accepted if full disclosure has not been made. No responsibility is accepted for any consequential error or defect in our conclusions resulting from any error, omission or inaccuracy in the data or information supplied directly or indirectly.

### *Disclaimer*

This report has been prepared solely for our client, the Utilities Regulatory Authority of Vanuatu, for the stated (regulatory) purpose. Wilson Cook Ltd, its officers, agents, subcontractors and their staff owe no duty of care and accept no liability to any other party, make no representation or warranty as to the accuracy or completeness of the information or opinions set out in the report to any person other than to its client including any errors or omissions howsoever caused, and do not accept any liability to any party if the report is used for other than its stated purpose.

### *Non-Publication*

Neither the whole nor any part of this report nor any reference to it may be included in any published document, circular or statement, nor published in any way without our prior written approval of the content and form in which it may appear.

# Appendix A: Terms of Reference

## *Background, Understanding and Approach*

### *Water supply in Luganville*

Luganville on the island on Espiritu Santo is the second-most populated urban area in Vanuatu with a total population of approximately 13,000. Mains water supply is currently provided by the Public Works Department, a branch of the Ministry of Infrastructure and Public Utilities (MIPU), to approximately 3,000 customers. The water tariff has not changed since 1991. In September 2012, MIPU requested that the Utilities Regulatory Authority (the Authority) commence a review of water tariffs in Luganville, to be completed by the end of March 2013.

### *Legal and Regulatory Framework*

The Utilities Regulatory Authority is the economic regulator of electricity and water services throughout Vanuatu. It was established by the Government in February 2008 under the *Utilities Regulatory Authority Act No. 11 of 2007* (the URA Act).

The Authority's role differs in the two regulated sectors but generally involves regulating prices, service standards, market conduct and consumer protection. The Authority also investigates and advises the Government on regulatory matters that affect the regulated industries.

The URA Act states that the objectives of the Authority are: to regulate the utilities to ensure the provision of safe, reliable and affordable regulated services, to maximise access to regulated services throughout Vanuatu, and to protect the long-term interests of consumers.

Water supply by the government is provided according to the *Water Supply Act 1955* (the Water Supply Act). Section 11 of the Water Supply Act assigns the power to prescribe charges for water, and is assigned to the URA with ministerial approval.

## *Purpose of Assessment and Scope of Work*

### *Purpose of the Assessment*

The primary purpose of this assessment is to inform key sections of the financial model that the Authority will use to estimate a reasonable tariff level for water services in Luganville. As the financial model is forward-looking, this assessment requires the consultant to provide a view both of the current state and the potential future state of the assets and operations of the water supply system. The information provided in this assessment may also be used to inform any future discussions between MIPU and aid organisations regarding future water projects in Luganville.

### *Methodology and Definitions*

*Asset Valuation Method*

The following types of asset valuation are required:

- For the existing installed infrastructure, valuations both in terms of historic cost, and optimised depreciated replacement cost (ODRC); and
- For any new infrastructure required to provide safe drinking water to the whole urban area of Luganville for the next 15 years, an estimated current market value. Such an estimate is only required to be considered accurate for the period of the forecast used in the tariff review, which will be 5 years.

*Depreciation Method*
The consultant will determine "standard" lives for each asset category but will also assess the representative useful "remaining" life of each asset. This approach may be particularly relevant in cases where the maintenance and repair of the plant or equipment is below the standard normally expected or is unknown. It could also be relevant where older assets have been refurbished with a consequential expected increase in life.

Straight-line depreciation will be recommended in accordance with accepted international practice.

*Replacement Costs*
The valuation will be based on replacement costs as at the date of valuation. Replacement costs will assume construction of the replacement asset by international competitive bidding (ICB) procedures using modern construction techniques.

Replacement costs will be based on exchange rates and prices prevailing at the date of valuation, including capitalised interest during construction but excluding the cost of demolition of existing works.

*Drinkable Water Definition*
For the purposes of this review, the World Health Organisation (WHO) definition of safe drinking water will be used.

## *Scope of Work*

*Deliverables*
The deliverable of this work is expected to include an Assessment Report containing:

- A description of the current condition of the installed infrastructure, broken down as appropriate to different types of assets
- An estimate of the current capacity of the network in its current condition, and an estimate of the ultimate capacity if the network was brought into good order
- An estimate of the value of the installed infrastructure for consideration in tariff setting
- An assessment of what new infrastructure would be required to provide safe drinking water to the whole urban area of Luganville for the next 15 years
- An estimate of the value of/investment required for such infrastructure, for consideration in future tariff setting and to inform future discussions between MIPU and aid agencies
- An assessment of the current operational costs of PWD in Luganville
- An assessment of the operational cost impact of providing an improved level of service with existing infrastructure
- An assessment of the impact on operating costs of new infrastructure being installed to provide safe drinking water for the whole urban area of Luganville for the next 15 years
- An assessment of the electricity cost of the utility with some recommendations that could potentially result in a reduction of the cost of electricity for the utility

The Client acknowledges that the practicality of completing the tasks outlined in these terms of reference is contingent on sufficient information being available in time for the Consultant to meet the stated deadlines and that any assessment of operating expenditure will be limited, given the time constraint and lack of a visit to Vanuatu. The final scope of work, therefore, will be subject to agreement between the client's representative and the Consultant, as the work proceeds.

*Activities*
The activities that the consultant is expected to undertake in order to produce the deliverables include:

- Reviewing information and data provided by the Authority;
- Providing a request for any supplementary data required;
- Analysing the data provided to assess assets and operations;
- Researching other data sources as required;
- Compiling the draft Assessment Report;
- Reviewing feedback on the draft Assessment Report;
- Compiling the final Assessment Report; and,
- If required, performing a site visit to Luganville.

It is intended that sufficient information can be provided to the consultant such that a site visit is not required. If this is not possible, it is suggested that a site visit is carried out in January 2013.

*Information to be Supplied*
The following documents and information will be shared with the consultant during the initial phase of the project, and updated as the project progresses.

- Drawings of network and any other information available to PWD
- All financial data available to PWD
- Draft financial model

*Timeline*
In order to inform the on-going tariff review process, the following timeline must be followed:

- Preliminary Findings delivered January 30, 2013
- Draft Assessment Report delivered by 28th February 2013
- Final Assessment Report delivered by 15th March 2013

*Supplementary Information Attached*

- Water Loss Management, Sectorisation, Metering and Logging Program, Stage 1 Report Luganville
- Utilities Regulatory Authority Luganville Water Tariff Review Issues Paper
- PWD Discussion Document
- Photographs of pumping station and water tank
- Water Supply Act
- URA Act.

# Appendix B: Valuation Schedule

Reference in main text: section 2.4.

# Utilities Regulatory Authority of Vanuatu

Client

Valuation of System Fixed Assets for Regulatory Purposes - Luganville Water

Purpose of Valuation

As at 20 February 2013 (excl. most assets added since 2001)

Date of Valuation

Vatu 1,000

Currency Unit

**Wilson Cook Ltd**
Engineering & Management Consultants
Advisers & Valuers
Auckland
New Zealand

This schedule has been prepared solely for the use of the client named above and the purpose stated. Please refer to accompanying report for interpretation.

Our ref: 1217

| Asset | Unit | Q'ty | Year First Installed | Age | Normal Service Life | Addn'l Life | Remaining Life | **Estimated Replacement Cost** | **Depreciated Replacement Cost** |
|---|---|---|---|---|---|---|---|---|---|
| **Bulk Water Supply Well, Pumping Station, Reservoirs, etc.** | Years of installation are estimated averages. | | | | | | No residual values have been applied. | | |
| **Civil Works** | | | | | | | | | |
| Well (concrete-lined pit with associated steelwork, including cover) | Allow | 1 | 1979 | 34 | 50 | 0 | 16 | 1,890 | 605 |
| Site establishment & misc. site development works - Pumping Station | Allow | 1 | 1942 | 71 | 50 | 0 | 0 | 3,779 | - |
| Site establishment & misc. site development works - Sarakata Reservoir | Allow | 1 | 1942 | 71 | 50 | 0 | 0 | 3,779 | - |
| Site establishment & misc. site development works - Hospital Reservoir | Allow | 1 | 1942 | 71 | 50 | 0 | 0 | 3,779 | - |
| Reservoir - Sarakata (900 $m^3$ steel) | No. | 1 | 2000 | 13 | 60 | 0 | 47 | 21,026 | 16,470 |
| Reservoir - Hospital (1,100 $m^3$ steel) | No. | 1 | 1998 | 15 | 60 | 0 | 45 | 25,698 | 19,273 |
| **Buildings** | | | | | | | | | |
| Pumping station | Allow | 1 | 1942 | 71 | 40 | 20 | 0 | 6,958 | - |
| **Plant** | | | | | | | | | |
| Bulk water pumps | No. | 3 | 1996 | 17 | 15 | 0 | 0 | 3,156 | - |
| Chlorination equipment | Lot | 1 | 2001 | 12 | 10 | 0 | 0 | 983 | - |
| Pipework, valves and misc. hydraulic equipment at Pumping Station | Lot | 1 | 2001 | 12 | 30 | 0 | 18 | 5,352 | 3,211 |
| Switchboards and cabling at Pumping Station | Lot | 1 | 1996 | 17 | 20 | 0 | 3 | 5,669 | 850 |
| Standby generator set (100 kVA, Chinese) at Pumping Station | kVA | 100 | 2003 | 10 | 20 | -5 | 5 | 2,744 | 915 |
| Controls at Pumping Station (cabling to reservoirs, float switches) | Lot | 1 | 1996 | 17 | 20 | 0 | 3 | 1,890 | 283 |
| Bulk water meters at Pumping Station (on line to Sarakata Res. only) | Lot | 1 | 2001 | 12 | 20 | 0 | 8 | 301 | 120 |
| Pipework and valves - Sarakata Reservoir | Allow | 1 | 2001 | 12 | 60 | 0 | 48 | 2,542 | 2,034 |
| Bulk water meters - Sarakata Reservoir (2 meters on delivery mains) | No. | 2 | 2001 | 12 | 20 | 0 | 8 | 602 | 241 |
| Pipework and valves - Hospital Reservoir | Allow | 1 | 2001 | 12 | 60 | 0 | 48 | 3,872 | 3,098 |
| Bulk water meters - Hospital Reservoir (1 meter on delivery main) | No. | 1 | 2001 | 12 | 20 | 0 | 8 | 301 | 120 |
| | | | | | | | | 94,319 | 47,220 |
| **Bulk Water Supply Mains and Distribution Network** | | | | | | | | | |
| **Plant** | | | | | | | | | |
| *Bulk Water Supply Mains* | | | | | | | | | |
| Pumping main - Pumping Station to Sarakata Reservoir (200 mm CI) | km | 0.15 | 2001 | 12 | 80 | 0 | 68 | 1,579 | 1,342 |
| Pumping main - Pumping Station to Hospital Reservoir (200 mm M SCL) | km | 0.80 | 1942 | 71 | 80 | 15 | 24 | 8,421 | 2,127 |
| *Distribution Pipelines (PVC or HDPE)* | | | | | | | | | |
| 50 mm diameter | km | 18.17 | 1989 | 24 | 50 | 0 | 26 | 104,204 | 54,186 |
| 75 mm diameter | km | 6.99 | 1981 | 32 | 50 | 0 | 18 | 42,949 | 15,462 |
| 80 mm diameter | km | 3.87 | 1997 | 16 | 50 | 0 | 34 | 24,372 | 16,573 |
| 100 mm diameter | km | 9.60 | 1987 | 26 | 50 | 0 | 24 | 70,231 | 33,711 |
| 150 mm diameter | km | 7.08 | 1988 | 25 | 50 | 0 | 25 | 55,637 | 27,819 |

| Asset | Unit | Q'ty | Year First Installed | Age | Normal Service Life | Addn'l Life | Remaining Life | **Estimated Replacement Cost** | **Depreciated Replacement Cost** |
|---|---|---|---|---|---|---|---|---|---|
| **Bulk Water Supply Mains and Distribution Network (cont....)** | Years of installation are estimated averages. | | | | | | No residual values have been applied. | | |
| *Distribution Pipelines (Steel)* | | | | | | | | | |
| 40 mm diameter | km | 0.41 | 1970 | 43 | 45 | 0 | 2 | 2,868 | 127 |
| 50 mm diameter | km | 0.10 | 1970 | 43 | 45 | 0 | 2 | 765 | 34 |
| 65 mm diameter | km | 0.44 | 1970 | 43 | 45 | 0 | 2 | 3,465 | 154 |
| 150 mm diameter | km | 0.55 | 1979 | 34 | 45 | 0 | 11 | 5,276 | 1,290 |
| 200 mm diameter | km | 0.13 | 2001 | 12 | 45 | 0 | 33 | 1,266 | 928 |
| *Distribution Pipelines (Cast Iron)* | | | | | | | | | |
| 100 mm diameter | km | 0.21 | 1942 | 71 | 80 | 0 | 9 | 1,639 | 184 |
| 150 mm diameter | km | 1.56 | 1942 | 71 | 80 | 0 | 9 | 15,620 | 1,757 |
| 200 mm diameter | km | 1.23 | 1942 | 71 | 80 | 0 | 9 | 12,947 | 1,457 |
| *Valves* | | | | | | | | | |
| 50 mm diameter | No. | 74 | 1988 | 25 | 30 | 0 | 5 | 3,244 | 541 |
| 75 mm diameter | No. | 31 | 1981 | 32 | 30 | 0 | 0 | 1,863 | - |
| 80 mm diameter | No. | 10 | 1988 | 25 | 30 | 0 | 5 | 457 | 76 |
| 100 mm diameter | No. | 23 | 1990 | 23 | 30 | 0 | 7 | 1,443 | 337 |
| 150 mm diameter | No. | 27 | 1990 | 23 | 30 | 0 | 7 | 2,508 | 585 |
| 200 mm diameter | No. | 2 | 1942 | 71 | 30 | 0 | 0 | 341 | - |
| *Meters* | | | | | | | | | |
| 25 mm diameter | No. | 2,071 | 1988 | 25 | 20 | 0 | 0 | 48,528 | - |
| 32 mm diameter | No. | 11 | 1988 | 25 | 20 | 0 | 0 | 561 | - |
| 50 mm diameter | No. | 15 | 1988 | 25 | 20 | 0 | 0 | 1,644 | - |
| 100 mm diameter | No. | 9 | 1988 | 25 | 20 | 0 | 0 | 1,946 | - |
| *Service Connections (excluding meter)* | | | | | | | | | |
| Small | No. | 2,071 | 1988 | 25 | 45 | 0 | 20 | 24,285 | 10,793 |
| Medium | No. | 11 | 1988 | 25 | 45 | 0 | 20 | 416 | 185 |
| Large | No. | 24 | 1988 | 25 | 45 | 0 | 20 | 2,721 | 1,209 |
| *Other Assets* | | | | | | | | | |
| Fire hydrants | No. | 197 | 1999 | 14 | 30 | 0 | 16 | 20,847 | 11,118 |
| Other assets (e.g. air valves) thought to be installed | Allow | 1 | 1988 | 25 | 30 | 0 | 5 | 1,890 | 315 |
| | | | | | | | | 463,932 | 182,311 |
| **TOTAL, ALL GROUPS** | | | | | | **Vatu 1,000** | | **558,251** | **229,531** |