



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

December 14, 2007

In Reply Refer To: WTR-7

Michael Keyser, Acting CEO
American Samoa Power Authority
P.O. Box PPB
Pago Pago, AS 96799

Re: July 16-19, 2007 Clean Water Act Inspections

Dear Mr. Keyser:

Enclosed is the December 14, 2007 report for our July 16-19 diagnostic inspection of the American Samoa Power Authority ("ASPA"), Tutuila Island sewage treatment works.

We found that the ASPA wastewater utility functions as designed and up to capability. The sewage treatment plants and their sewer collections systems are well run and maintained. The staff is trained, largely experienced, and capable to successfully operate and maintain plant and equipment. However, funding is not linked to the sewer services and lessened engineering capability has made it difficult to accomplish capital improvement projects. Future compliance largely depends on whether the NPDES permits are reissued with 301(h) waivers intact, and how compliance with the water quality standards will be measured. Without the waivers, future capital costs associated with treatment plant upgrades to full secondary treatment could range up to above \$20 million.

The main requirements and recommendations of this inspection are summarized below:

- ASPA should complete the upgrade of the Airport force main and the rehabilitation of the Malaloa lift station.
- ASPA should complete a rate study to determine the costs to operate and maintain the wastewater sewerage works as well as the costs of capital improvements.
- ASPA should consider reinstating formal staff training through courses in the operation and maintenance of plant and equipment.
- Sewage sludges must be self-monitored and the results reported at least once per year.
- Sewage spills must be reported as bypasses of treatment necessary to comply.
- The water quality standards for total nitrogen and phosphorus would better apply to the sewage treatment plant discharges as NPDES permit effluent limits.
- ASEPA should consider whether water quality standards for enterococci should be amended to exempt the ocean outfalls in order to take into account the lack of off-shore recreational contact and the hazards of transporting and handling chlorine.

- Self-monitoring for turbidity, enterococci, chlorophyll-a, and dissolved oxygen should continue in the receiving waters but the water quality standards for these indicator parameters should not be applied as zone-of-initial-dilution permit limits.
- The influent and the effluent discharges from both sewage treatment plants should be self-monitored for total nitrogen and total phosphorus.

I appreciate the helpfulness extended to me by the ASPA staff during this inspection. Please do not hesitate to call me at (415) 972-3504, or e-mail arthur.greg@epa.gov.

Sincerely,

Greg V. Arthur

cc: Fai Mareko, Wastewater Operations Manager, ASPA
LT Matt Vojic, USPHS, American Samoa EPA



U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION 9

CLEAN WATER ACT COMPLIANCE OFFICE

NPDES DIAGNOSTIC EVALUATION INSPECTION

NPDES Permittee: American Samoa Power Authority

- Fogagogo-Tafuna Sewage Treatment Plant and Ocean Outfall
Serving the Southwestern Tutuila Island Sewer Collection System
(NPDES Permit No. AS0020010)
- Utulei Sewage Treatment Plant and Harbor Outfall
Serving the Pago Pago Harbor Sewer Collection System
(NPDES Permit No. AS0020001)

Dates of Inspection:

July 16, 2006 Fogagogo-Tafuna Sewage Treatment Plant Inspection
Utulei Sewage Treatment Plant Inspection

July 17, 2006 Sewer Collection System Review and Inspection
Wastewater Division Organizational Review

July 18, 2006 Data Review

July 19, 2006 Close-out Interviews

Inspection Participants:

US EPA: Greg V. Arthur, CWA Compliance Office, (415) 972-3504

American Samoa EPA: None

ASPA:

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Report Prepared By: Greg V. Arthur, Environmental Engineer, USEPA Region 9
December 14, 2007



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1.0 Executive Summary

On July 16-19, 2007, EPA conducted an NPDES diagnostic evaluation inspection of the American Samoa Power Authority (“ASPA”), Tutuila Island sewage treatment works. The purpose of this evaluation inspection was to ensure compliance with the two controlling NPDES permits and to assess the operational capability of the public utility to provide sewage collection and treatment in compliance with the permits, both now and in the future.

This report covers the publicly-owned treatment works owned and operated by ASPA, serving the Pago Pago harbor area and the Tafuna plains. This report specifically covers the findings and assessments pertaining to the Utulei and Tafuna sewage treatment plants, their outfalls to the harbor and ocean, the separate sewer collection systems serving both sewage treatment plants, and the proposed expansions of the sewer service areas. This inspection did not involve and does not cover the other sewage related utility work performed by ASPA involving septic tank installations on other islands and in the villages on island outside of the sewer service areas.

The ASPA wastewater utility functions as designed and up to capability. The sewage treatment plants and their sewer collections systems are well run and maintained. The staff is trained, largely experienced, and capable to successfully operate and maintain plant and equipment. Funding is not linked to the sewer services. Lessened engineering capability has made it difficult to accomplish capital improvement projects.

The sewage treatment plants consistently comply with their NPDES permit effluent limits. There have been no sewer system spills due to equipment failure. As a result, both plants provisionally can be considered to have the capacity and capability to handle the domestic contributions into their collection systems. Neither plant provides disinfection. Determinations of impacts on the receiving waters through water column sampling cannot be made with certainty. In particular, the water quality does not significantly differ at the zones-of-initial-dilution near both outfalls and at their reference stations. Both plants would likely meet the water quality standards for nitrogen and phosphorus, if applied as effluent discharge limits.

Future compliance by the wastewater treatment works as they are currently configured depends on (1) whether their NPDES permits are reissued with 301(h) waivers intact, (2) the limited space at Utulei, and (3) the way compliance will be determined for the nutrients and enterococci water quality standards. The estimated capital costs for the viable options range up to above \$20 million.

Options	Capital (est)	Project Scope
1	\$ + 250,000	Two primary sewage plants both with waivers
2	+ 5,000,000	One primary plant with a waiver and one secondary without
3	+ 14,000,000	Two secondary sewage plants both without waivers
4	+ 24,000,000	One regional secondary sewage plant without a waiver



2.0 Scope and Purpose

On July 16-19, 2007, EPA conducted an NPDES diagnostic evaluation inspection of the American Samoa Power Authority (“ASPA”), Tutuila Island sewage treatment works. The purpose of this evaluation inspection was to ensure compliance with the two controlling NPDES permits and to preliminarily assess the operational capability of the public utility to provide sewage collection and treatment now and in the future.

This report covers the two principal publicly-owned treatment works on Tutuila Island owned and operated by ASPA, one serving the Pago Pago harbor area and the other serving the airport, the business park, the community college, and domestic structures in the Tafuna plains. This report covers the findings and assessments pertaining to the Utulei and Tafuna sewage treatment plants, their outfalls to the harbor and ocean, the separate sewer collection systems serving both sewage treatment plants, and the proposed expansions of the sewer service areas. This inspection did not involve and does not cover the other sewage related utility work performed by ASPA involving septic tank installations in the villages on Tutuila outside of the sewer service areas and on other islands.

This NPDES diagnostic evaluation inspection of the ASPA Tutuila Island sewage treatment works consisted of the following:

- On-site inspection of the Tafuna sewage treatment plant;
- On-site inspection of the Utulei sewage treatment plant,
- On-site inspections of the three sewer lift stations (Matafo, Faga’alu, Airport);
- Review of equipment maintenance, data management, and operator training procedures;
- Close-out briefing with management and staff from ASPA;
- A discussion with American Samoa EPA (“ASEPA”);
- Review of the 1985 facilities plan for Tutuila Island;
- Review of July 2006-June 2007 influent and effluent data for the Tafuna and Utulei sewage treatment plants;
- Review of 1999-2007 receiving water data for both outfalls and reference stations;
- Review of the NPDES permits and their supporting 301(h) variance decisions;

The inspection participants are listed on the title page. Arthur conducted the inspections on July 16 through 18 and the final close-out briefing on July 19.

2.1 Wastewater Facilities Plan

The 1985 wastewater facilities plan prepared by CH2MHill for the American Samoa Environmental Protection Agency (“ASEPA”) established the course of action now followed of expanding the two existing primary sewage treatment plants to accommodate expanded sewer service areas throughout the built-up areas. ASEPA revised the wastewater facilities plan in 2003 to specifically direct funding toward the public health issues posed by raw sewage discharges. Capital improvement projects have been funded through outside grants from the US Department of the Interior and the US Environmental Protection Agency. The current capital improvement projects identified for future funding include sewer service into

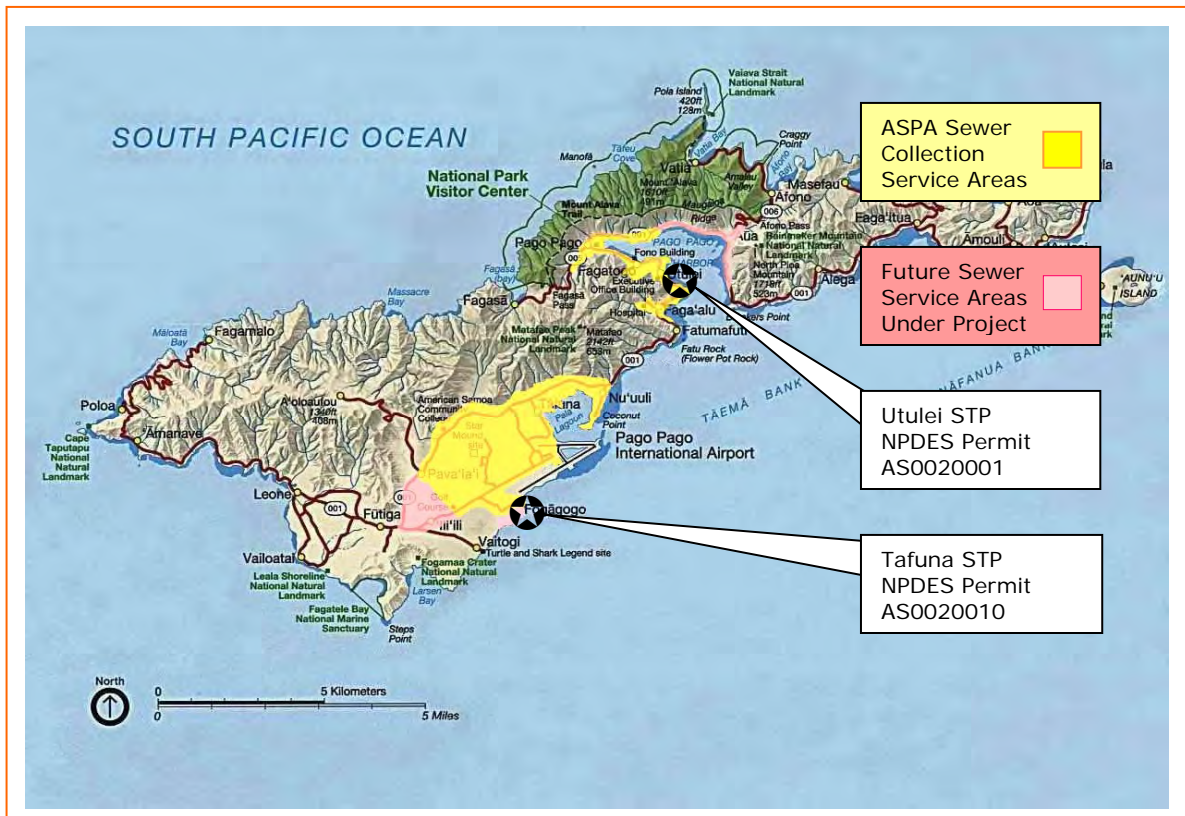


Aua with an upgrade of a pump station and an Utulei clarigester (\$3.7 million), furthering sewer service in Taulauta (\$1.5 million), extending sewer service into Fatuma’futi (\$100k), a rate study (\$75k), and an upgrade of the airport force main (\$550k). The capital improvement projects identified for funding also included the island-wide installation of satellite septic systems (\$500k) outside of the sewer service areas. All projects except the satellite septic systems are currently on hold.

<u>Proposed Costs</u>	<u>FY2007</u>	<u>FY2008</u>	<u>FY2009</u>	<u>FY2010</u>
Utulei Clarigester Rehab	\$245,000	\$0	\$0	\$0
Aua Sewers and Lift Station Rehab	\$540,000	\$825,000	\$900,000	\$1,200,000
Fatumafuti Sewer Service	\$1,485,000	\$0	\$0	\$0
Sewer Service Rate Study	\$75,000	\$0	\$0	\$0
Airport Force Main Upgrade	\$550,000	\$0	\$0	\$0
Satellite Septic Systems	\$500,000	\$0	\$0	\$0

2.2 Description of the Sewer Service Area

The facilities comprise two sewer service areas, independent from each other, and each handling the sewage through primary sewage treatment plants for discharge through outfalls to the ocean. See sections 3.1, 3.2, 3.3, 4.1, 4.2 and 4.3 of this report for configuration, operational, and capacity details.





2.3 NPDES Permits

EPA reissued the NPDES permits to ASPA on September 30, 1999 for the Tafuna sewage treatment plant and October 5, 2001 for the Utulei sewage treatment plant. Both reissued NPDES permits advance less-than-secondary technology-based limits based on 1999 EPA 301(h) ocean waiver variance final decisions. The less-than-secondary limits for BOD and TSS removal rates are based on the Federal minimum of 30% for primary treatment. The BOD and TSS concentration and loading limits reflect past performance data. Both reissued NPDES permits also establish limits to apply at and beyond the Zone of Initial Dilution based on the American Samoa water quality standards, which differ for Utulei into Pago Pago Harbor and Tafuna into Vai Cove. The receiving water permit limits are water column averages of discrete samples taken at three depths (top, mid, bottom) from defined water column sampling stations. Both reissued permits also establish additional monitoring requirements of the sediment, benthic communities, and sludge.

The 301(h) waiver of secondary standards for sewage treatment works requires the nine conditions in addition to those in the NPDES permit to be met through the life of the permit:

- Applicable water quality standards specific to the pollutants modified by the waiver;
- No interference with the attainment or maintenance of receiving water quality;
- Establish a system for monitoring the impacts in the receiving waters;
- No resulting additional requirements on any other point or non-point source;
- Enforcement of applicable pretreatment requirements for non-domestic sources;
- A pretreatment program for treatment works serving a population over 50,000;
- Controls for toxic pollutants from domestic sources into the treatment works;
- No substantial increases in the permitted discharge volume;
- The discharge of primary or equivalent treated wastewater that also meets the water quality standards in the receiving waters after initial mixing.

See Appendices 1 and 2 for summaries of the NPDES permit requirements.

2.4 Photo Documentation

Arthur took twenty-six (26) photographs during this inspection of the ASPA sewage treatment plants and contributing sewers. Fourteen of these are depicted here in this report. The others were either duplicates or were not recognizable enough for use as documentation. The photo file names are those used by EPA to store the digital photo files.

Photo Log	#	Photo File Names
Tafuna	12	<i>samoa-tafuna-1.jpg through samoa-tafuna-12.jpg</i>
Utulei	6	<i>samoa-utulei-1.jpg through samoa-utulei-6.jpg</i>
Sewers	8	<i>samoa-collection-1.jpg through samoa-collection-8.jpg</i>



3.0 Description of Wastewater Treatment Plant and Equipment

Summary

Both the Tafuna and Utulei sewage treatment plants provide primary sedimentation, anaerobic sludge digestion, and ocean outfall discharge. Both plants currently operate below their design capacities. The Tafuna sewage treatment plant serves the contributions from the Tafuna plains. The Tafuna plant also accepts all septage generated island-wide and provides covered sludge drying beds for all digested sludge. The Tafuna plant discharges a quarter mile off-shore into the Pacific Ocean. The Utulei sewage treatment plant serves the Pago Pago Harbor area with digested sludge trucked to the Tafuna plant for sludge drying. The Utulei plant discharges 400 feet into the Pago Pago outer harbor. The sewer collection systems include 23 lift stations -- main lift stations at each sewage treatment plant, 6 satellite lift stations feeding into Utulei, and 15 satellites lift stations feeding into Tafuna.

Requirements

- None.

Recommendations

- ASPA should complete the upgrade of the Airport force main and the rehabilitation of the Malaloa lift station.

3.1 Tafuna Sewage Treatment Plant

The Tafuna sewage treatment plant provides primary treatment and undisinfected discharge through an ocean outfall. The unit processes consist of long-channel grit removal, manual bar screens, a deep-well influent pump station, three clarigesters, and an ocean outfall. Outfall studies have listed the critical initial dilution from the Tafuna outfall to be 190:1. Clarigesters are primary sedimentation basins with a clear well section above an anaerobic digester section. Like primary sedimentation basins, clarigesters are outfitted with a rotating arm to scrape off scum. Unlike primary sedimentation basins, clarigester sludge drains directly to the underlying digester section through a portal in the conical-shaped partition.

ASPA operates the Tafuna sewage treatment plant under the assumption that each clarigester has a rated capacity of 1.0 mgd, for a total rated plant capacity of 3.0 mgd. However, the as-built drawings list a smaller design criterion of 2.16 mgd. The average daily flows of 1.92 mgd over the 12 months from July 2006 through Jun 2007 are nearing the as-built design criteria but not the assumed rated capacity. Maximum daily flows have reached 4.5 mgd while instantaneous peak flows have exceeded 6.0 mgd at least once in most months. These peak flows indicate that short-term conditions can result in flows that exceed a standard 3.0 design peaking factor but not exceed the daily peak design criteria. Moreover, the influent wastewater arrives near normal strength in organics but weak in solids with influent



concentrations averaging around 140 mg/l BOD and 65 mg/l TSS. As a result, Tafuna sewage treatment plant is not nearing capacity.

<u>Plant Design Criteria</u>		<u>Primary Sed Section</u>		<u>No.1</u>	<u>Nos.2,3</u>
Daily Peak Flow	6.00 mgd	Diameter	45 ft	45 ft	45 ft
Average Daily Flow	2.16 mgd	Surface Area	1590 ft ²	1590 ft ²	1590 ft ²
Minimum Daily Flow	0.60 mgd	Sidewall Depth	8.0 ft	9.0 ft	9.0 ft
Service Population	14424	Volume	95153 gal	107048 gal	107048 gal
Sewer Inlet Diameter	24 inch	Hydraulic Detention	3.50 hrs	3.50 hrs	3.50 hrs
Outfall Diameter	24 inch	Min Detention Time	1.25 hrs	1.25 hrs	1.25 hrs
Outfall Length	1562 ft				
Outfall Diffuser Depth	95 ft	<u>Anaerobic Digesters</u>		<u>No.1</u>	<u>Nos.2,3</u>
Diffuser Design	6 ports	Diameter	45 ft	45 ft	45 ft
Critical Initial Dilution	190:1	Height	12 ft	12 ft	12 ft
		Volume	142743 gal	142743 gal	142743 gal
		Sludge @ 3% solids	180 lbs/d	180 lbs/d	180 lbs/d
		Residence Time	> 20 days	> 20 days	> 20 days
		<u>Wet-well Design</u>			
		Wet-well Capacity	4300 gal		
		Number of Pumps	4 - 17 ft of head		
		Pump Capacity	1200 gpm each		

Operations at Tafuna have remained essentially unchanged since the previous NPDES permit issued in 1999. With one minor exception, all plant and equipment, including flow metering, were observed to be in working order. The one exception, the influent pump station, nevertheless was observed to be fully functioning with three of four pumps in operation.

See Appendix 1 for the statistical summaries of the influent and effluent sampling at Tafuna. Also see Section 4.0 for a discussion of the operation and maintenance system-wide.



Photo: Tafuna STP – Clarifiers Nos.1 and 2
 Taken By: Greg V. Arthur
 Date: 07/16/07



Photo: Tafuna STP – Clarifier No.3
 Taken By: Greg V. Arthur
 Date: 07/16/07



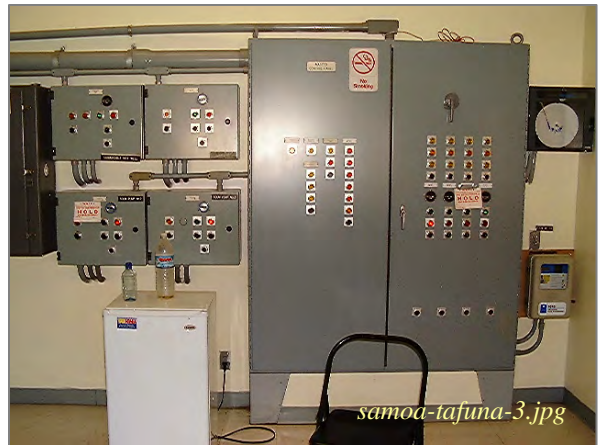
*Photo: Tafuna STP – Headworks
Taken By: Greg V. Arthur
Date: 07/16/07*



*Photo: Tafuna STP – Sludge Draw-off Valving
Taken By: Greg V. Arthur
Date: 07/16/07*



*Photo: Tafuna STP – Sludge Drying Beds
Taken By: Greg V. Arthur
Date: 07/16/07*



*Photo: Tafuna STP – Effluent Monitoring Station
Taken By: Greg V. Arthur
Date: 07/16/07*

3.2 Utulei Sewage Treatment Plant

The Utulei sewage treatment plant provides primary treatment and undisinfected discharge through an outfall to the outer Pago Pago harbor. The unit processes consist of a manual bar screen dropped into a deep-well influent pump station, a flow splitter box, four clarifiers, a decommissioned chlorine contact outlet structure, and an ocean outfall. The unit processes do not include grit removal or sludge drying. Outfall studies have listed the critical initial dilution from the Utulei outfall to be 202:1. The Utulei plant occupies a fully-developed site without room for expansion, between cliffs, a highway along the waterfront, and a tank farm.

The Utulei as-built drawings list a design dry-weather capacity of 2.21 mgd. The average daily flows of 1.69 mgd over the 12 months from July 2006 through Jun 2007 are not nearing the as-built design criterion. Maximum daily flows of 3.5 mgd and instantaneous peak flows



over 3.9 mgd are within the standard 3.0 design peaking factor and do not exceed the daily peak design criteria. The influent wastewater also arrives less than half strength in organics and solids with influent concentrations averaging around 103 mg/l BOD and 59 mg/l TSS.

<u>Plant Design Criteria</u>		<u>Primary Sed Section</u>		<u>Nos.1,2</u>	<u>Nos.3,4</u>
Daily Peak Flow	6.13 mgd	Diameter	35 ft	35 ft	40 ft
Average Daily Flow	2.21 mgd	Surface Area	962 ft ²	962 ft ²	1257 ft ²
Minimum Daily Flow	0.80 mgd	Sidewall Depth	6.5 ft	6.5 ft	9.0 ft
Service Population	14734	Volume	47000 gal	47000 gal	85000 gal
Sewer Inlet Diameter	24 inch	Hydraulic Detention	2.90 hrs	2.90 hrs	2.90 hrs
Outfall Diameter	24 inch	Min Detention Time	1.00 hrs	1.00 hrs	1.00 hrs
Outfall Length	954 ft				
Outfall Diffuser Depth	150 ft	<u>Anaerobic Digesters</u>		<u>No.1,2</u>	<u>Nos.3,4</u>
Diffuser Design	6 ports	Diameter	35 ft	35 ft	40 ft
Critical Initial Dilution	202:1	Height	12 ft	12 ft	12 ft
		Volume	86342 gal	86342 gal	112776 gal
		Sludge @ 3% solids	180 lbs/d	180 lbs/d	180 lbs/d
		Residence Time	> 20 days	> 20 days	> 20 days
		<u>Wet-well Design</u>			
		Wet-well Capacity	21000 gal		
		Number of Pumps	4 - 55 ft of head		
		Pump Capacity	2 @ 900 / 2 @ 1600 gpd		

Operations at Utulei have remained essentially unchanged since the previous NPDES permit issued in 2001. Clarigester No.1 and the chlorine contact chamber were observed not to be in working order. Everything else, including flow metering, was observed to be fully functioning and in operation.

See Appendix 3 for the statistical summaries of the influent and effluent sampling at Utulei. Also *see* Section 4.0 for a discussion of the operation and maintenance system-wide.

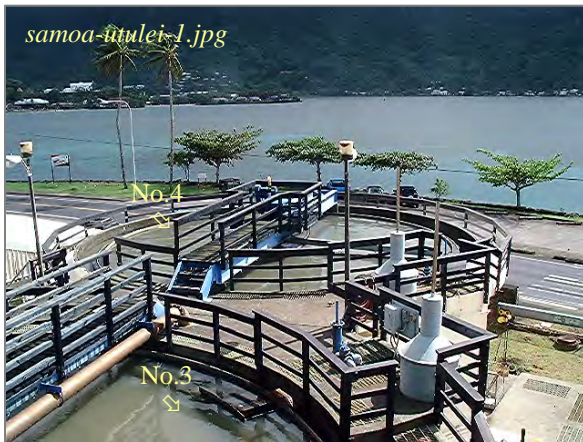


Photo: Utulei STP – Clarigestors Nos. 1 and 2
Taken By: Greg V. Arthur
Date: 07/16/07



Photo: Utulei STP – Clarigestors Nos. 3 and 4
Taken By: Greg V. Arthur
Date: 07/16/07



*Photo: Utulei STP – Inlet Lift Station
Taken By: Greg V. Arthur
Date: 07/16/07*



*Photo: Utulei STP – Flow Splitter Box
Taken By: Greg V. Arthur
Date: 07/16/07*

3.3 Sewer Collection Systems

ASPA owns and operates two sewer collection systems separately feeding into the Utulei and Tafuna sewage treatment plants. The Utulei sewer system has one main and six satellite lift stations. The Tafuna sewer system has one main and 15 satellite lift stations. The main lift stations each have three pumps. The inlet lift stations at the sewage treatment plants each have four pumps. Five of the other 21 lift stations are single pump stations. The other 16 are dual pump stations. All 51 pumps of differing capacities and sizes are manufactured by Flygt as a sole source. ASPA maintains spare stand-by pumps of different sizes. ASPA has installed but not begun the operation of SCADA telemetry at the lift stations.

Also *see* Section 4.0 for a discussion of the operation and maintenance system-wide.



*Photo: ASPA Sewers – Stand-by Pumps
Taken By: Greg V. Arthur
Date: 07/17/07*



*Photo: ASPA Sewers – SCADA Telemetry
Taken By: Greg V. Arthur
Date: 07/17/07*



*Photo: ASPA Sewers – Matafo Lift Station
Taken By: Greg V. Arthur
Date: 07/17/07*



*Photo: ASPA Sewers – Fagaalu Lift Station
Taken By: Greg V. Arthur
Date: 07/17/07*



*Photo: ASPA Sewers – Fagaalu Lift Station
Taken By: Greg V. Arthur
Date: 07/17/07*



*Photo: ASPA Sewers – Airport Lift Station
Taken By: Greg V. Arthur
Date: 07/17/07*

3.4 Point(s) of Compliance

Sewage Treatment Standards - Federal secondary sewage treatment standards as modified by the 301(h) waivers and the American Samoa water quality standards for pH apply end-of-process-after-treatment to the discharge into the ocean outfall effluent discharge points, designated in this report by NPDES permit numbers (NPDES-0020001 and 0020010).

Receiving Water Standards - The NPDES permit also sets zone-of-initial-dilution limits for turbidity, nutrients (total phosphorus, total nitrogen), dissolved oxygen, pH, change in pH, and indicator parameters (enterococci, chlorophyll-a, light penetration). These zone-of-initial-dilution limits are water column averages of discrete samples taken at three depths (top, mid, bottom) from defined water column sampling stations.



4.0 Description of Wastewater Operations and Maintenance

Summary

The ASPA wastewater utility functions as designed and up to capability. Both sewage treatment plants and the sewer collections systems are well run and maintained. Nearly all aspects of the sewerage works were found to be in working order. Both sewage treatment plants have standby power generators. Most staffing positions were filled. The staff was trained, largely experienced, and capable to successfully operate and maintain plant and equipment. Funding is not linked to the sewer services provided but rather comes from the water billing and subsidies from electrical billing. The budgeting also does not bond or capitalize new construction but relies on grants. Engineering capability has lessened making it difficult to accomplish capital improvement projects. Improved performance would require new plant and equipment and restored if not increased engineering capabilities.

Requirements

- None.

Recommendations

- ASPA should complete a rate study to determine the costs to operate and maintain the wastewater sewerage works as well as the costs of capital improvements.
- ASPA should consider reinstating formal staff training through courses in the operation and maintenance of plant and equipment.

4.1 Operation and Maintenance Procedures

The sewage treatment plants and sewer collection systems are well run and maintained. All aspects of the sewerage works were observed to be fully functioning. ASPA has the in-house abilities and procedures to properly operate and maintain the sewerage works. ASPA uses computer calendar scheduling. All operational steps, routine maintenance tasks, and the manufacturers' maintenance tasks for every piece of equipment are entered into a database which generates a daily punch list. All work orders and trouble calls are entered into the scheduling database upon completion to ensure staff accountability. ASPA staff has radio and cell phone communication throughout the service area, as well as a \$50,000 grant for the installation of SCADA remote sensing telemetry in all 23 pump stations. There is lab capability for BOD, TSS, pH, temperature, and meter calibration at both sewage treatment plants.

Tafuna Sewage Treatment Plant - ASPA mans the Tafuna sewage treatment plant around the clock. The staff isolates the grit channels in order to pump them out one channel at a time. The headworks include manually-cleaned bar screens with the old comminuters removed. Three of the four influent pumps in the deep-well were observed to be in working order. The influent pumps feed up to a surge tank and flow splitter to provide gravity feed to the three clarifiers. The Tafuna plant includes a standby generator.



Utulei Sewage Treatment Plant - ASPA mans the Utulei sewage treatment plant around the clock. The Wastewater Services Department is headquartered at the Utulei sewage treatment plant, which includes the main office, a small lab, and maintenance shop and stores. A course screen cage is dropped into the influent deep-well by a hoist. There is no grit removal. The wet-well pumps, which turn on and off in response to float-level switches, pulse feed incoming sewage through manually-cleaned bar screens to a surge tank above the clarifiers. The flows split by gravity through hand gates to the clarifiers. The Utulei plant has a standby generator. Digested sewage from Utulei is trucked to the sludge drying beds at the Tafuna sewage treatment plant.

Sewer Collection Systems - ASPA has instituted effective procedures to ensure the continuous operation of the sewers. All lift stations are visited daily for inspection, recordings of electrical and pump readings, painting, clean-up, and other routine maintenance. There is no vandalism so the fences around the lift stations are gated but left unlocked. ASPA keeps an inventory of spare pumps of each model, and repair kits for in-house repacking. ASPA contracts out rewinding. The ASPA Power Generation machine shop has the capability to repair worn shafts. The Wastewater Division of ASPA has started to institute a computerized inventory of the all plant and equipment parts for automatic reordering. The use of ITT Flygt as the sole source pump supplier has allowed ASPA to standardize procedures.

4.2 Training and Staffing

Staffing - ASPA has 27 positions dedicated to wastewater operations of which 22 are filled. Four wastewater branches function within the Wastewater Services Department of ASPA (*Treatment Plants, Collections, Maintenance, Line Maintenance*). A fifth wastewater branch functions in the Engineering Services Department (*Construction*).

ASPA Wastewater Services Department (July 2007)	
Supervisors Office (5 Staff)	wastewater operations and maintenance supervision office administration self-monitoring, sampling, and laboratory analyses
Treatment Plants Branch (6 Staff)	routine sewage treatment plant operations self-monitoring and sampling
Collections Branch (6 Staff)	routine collection system and lift station operations FOG inspections of grease traps
Maintenance Branch (2+ Staff)	pump inventory and maintenance with surplus assistance from ASPA Power Generation Division
Line Maintenance Branch (8 Staff)	sewer line pressure flushing connections smoke testing facility inventory and sewer connections
ASPA Engineering Services Department (July 2007)	
Construction Branch (0+)	capital improvement projects for all of ASPA's utilities electrical / water / wastewater



Training - ASPA started the plant and equipment maintenance program in 1994 under the direction of Skeet Arrowsmith, a consultant, and Mike Dworski, the staff engineer. The consultant wrote skills packages by position which ASPA implemented as the basis of its wastewater training program. ASPA also periodically funded cross training in wastewater and electrical power distribution with other utilities, in particular with the Rotorua District Council in New Zealand. The Wastewater Services Division also has cross trained four staff members from other branches to do the critical function of pump repair. ASPA maintains good records of the training offered and who completed the training. The training included courses in Flygt pump, confined space entry, electrical fundamentals, collection system operations, treatment plant operations, installation of electrical metering, utility and office software, as well as a Wastewater Level 1 Certification. However, ASPA has de-invested from technical training courses, and instead now relies upon in-house training for pump removal, assembly, electrical, and tag-out lock-out. The Wastewater Services Department last held technical training courses for plant and equipment in April 2006.

Experience - The Wastewater Services Division has experienced personnel, with 30 years of service in one position, between 10-15 years in four positions and more than 4-9 years in another ten positions. Overall, more than half of the positions are staffed by workers with more than four years of experience. The engineering and construction positions transferred to the Engineering Services Division. Engineering capabilities have lessened, in particular, because the engineering position transferred as vacant to the Engineering Services Division, and the staff engineer, a US Public Health Service Officer, transferred back to the mainland.

4.3 Budgeting

ASPA has a wastewater operating budget of nearly \$2 million. In FY2007, ASPA funded wastewater operations through three sources -- 13% of the water billing receipts (\$807,282), a block subsidy from electrical billing receipts (\$1,000,884), and capital set asides of 5% of capital improvement project grants (\$151,470). The FY2007 funding also included Federal capital improvement project grants from EPA (\$2,255,000) and the Department of Interior (\$1,640,000), and the portion of the grants set aside to the Environmental Services Division (\$724,435).

All of this means there is no direct link between the sewer services provided and the collection of receipts. Furthermore, this means capital improvement projects are funded strictly through grants. Bonding for future capital improvements would prove difficult to do without a rate structure linked to sewer services. The Wastewater Services Division costed a rate study for funding as a capital improvement project but the ASPA Board rejected the proposal.



5.0 Wastewater Treatment Plant Performance

The sewage treatment plants must meet discharge effluent limits for conventional pollutants, removal rates, pH, and nuisance conditions. [NPDES Permit AS0020010 for Tafuna §A(1,2) and NPDES Permit AS0020001 for Utulei §A(1,2)]

The receiving waters near the sewage treatment plants must meet zone-of-initial-dilution limits for nutrients, pH, enterococci, and other indicators of ambient conditions. [Tafuna Permit §A(3) and Utulei Permit §A(3)]

Sewage entering the collection systems may only discharge from the ocean outfalls of the sewage treatment plants. [Tafuna Permit §A(1) and Utulei Permit §A(1)]

Sewage sludges must meet the Federal sludge standards in 40 CFR 503. [Tafuna Permit §D(1-8) and Utulei Permit §D(1-8)]

Summary

The sewage treatment plants consistently comply with their NPDES permit effluent limits. There have been no sewer system spills due to equipment failure. Therefore both plants provisionally can be considered to have the capacity and capability to handle the domestic contributions into their collection systems. However, neither plant provides disinfection and a determination of impacts upon their receiving waters through water column sampling cannot be made with certainty. In particular, although the receiving waters have not consistently met the water quality standards that apply at the zone-of-initial-dilution near both outfalls, the water quality at the reference stations does not significantly differ. Moreover, both plants would likely meet the water quality standards for nitrogen and phosphorus, if they were applied as effluent discharge limits. *See* Appendix 1 - Table 1.3 and Appendix 2 - Table 2.3.

Requirements

- Sewage sludges must be self-monitored and the results reported at least once per year.
- Sewage spills must be reported as bypasses of treatment necessary to comply.

Recommendations

- The water quality standards for total nitrogen and phosphorus would better apply to the sewage treatment plant discharges as NPDES permit effluent limits.
- ASEPA should consider whether water quality standards for enterococci should be amended to exempt the ocean outfalls in order to take into account the lack of off-shore recreational contact and the hazards of transporting and handling chlorine.
- Self-monitoring for turbidity, enterococci, chlorophyll-a, and dissolved oxygen should continue in the receiving waters but the water quality standards for these indicator parameters should not be applied as zone-of-initial-dilution permit limits.



- The influent and the effluent discharges from both sewage treatment plants should be self-monitored for total nitrogen and total phosphorus.

5.1 NPDES Permit Limits for Tafuna

5.1.1 - Conventional Pollutants

Tafuna produces primary-treated wastewater that consistently complies with the NPDES permit effluent discharge limits for conventional pollutants. The effluent average and calculated 99th% peaks are 66 and 92 mg/l BOD and 34 and 49 mg/l TSS. The Tafuna influent arrives weaker than typical domestic sewage, with influent average and calculated 99th% peaks of 136 and 193 mg/l BOD and 64 and 91 mg/l TSS. Nevertheless, consistent operation of the primary treatment results in BOD and TSS removals rates that average 50% and 46%, respectively, above the 30% NPDES permit requirements but nowhere near the 85% secondary treatment standards. All daily pH measurement and all but one daily settleable solids sample complied with NPDES permit effluent limits.

5.1.2 - Nutrients

The NPDES permit sets zone-of-initial-dilution (“ZID”) receiving water limits for total nitrogen and phosphorus. The water column sampling for the Tafuna outfall indicates that the receiving waters usually exceed the water quality standards for nutrients. However, the water column sampling at the ZID stations also did not significantly differ from the samples at the reference station sited away from the outfall’s influence.

- Total Nitrogen - The average and calculated 99th% peaks were 187 and 466 µg/l and 210 and 701 µg/l at the ZID stations, and 214 and 1517 µg/l at the reference station.
- Total Phosphorus - The average and calculated 99th% peaks were 19 and 33 µg/l and 19 and 38 µg/l at the ZID stations, and 16 and 30 µg/l at the reference station.

The water quality standards, if applied upstream as effluent discharge limits, would translate upward by a factor proportional to the critical initial dilution, which is 190:1. The resulting water quality standards for the discharge would calculate out to 24.7 mg/l total nitrogen and 2.9 mg/l phosphorus. Typical weak-strength sewage has ~15 mg/l total nitrogen and ~4 mg/l total phosphorus. Typical primary treatment removes 20% and 30% of the nitrogen and phosphorus. As a result, although there is no sampling of the Tafuna discharges for nutrients, the effluent is expected to be ~12 mg/l nitrogen and ~3 mg/l phosphorus and thus should meet the calculated limits consistently for nitrogen and most of the time for phosphorus.

5.1.3 - Indicator Parameters

Turbidity and dissolved oxygen are indicators of suspended solids and biological growth. Chlorophyll-a is an indicator parameter of nutrient-induced algal growth. Water column



sampling for these indicator parameters at the ZID stations did not significantly differ from the samples at the reference station sited away from the outfall's influence.

- Turbidity - The average and calculated 99th% peaks were 0.18 and 0.54 NTUs and 0.19 and 0.73 NTUs at the ZID stations, and 0.19 and 0.72 NTUs at the reference station.
- Dissolved Oxygen - The average and calculated 1% minimum were 6.3 and 4.3 mg/l and 6.3 and 4.6 mg/l at the ZID stations, and 6.3 and 4.7 mg/l at the reference station.
- Chlorophyll-a - The average and calculated 99th% peaks were 232 and 796 µg/l and 220 and 776 µg/l at the ZID stations, and 209 and 709 µg/l at the reference station.

5.1.4 - Pathogens

The NPDES permit also sets zone-of-initial-dilution receiving water limits for enterococci as an indicator of pathogenic hazard. Since the Tafuna sewage treatment plant does not provide disinfection, the plant may be a source of enterococci detected in the receiving waters. However, not only was there a limited sample record but the water column sampling was inconsistent or incorrectly determined at the ZID stations and at the reference station. *See* section 5.2.4 below.

5.2 NPDES Permit Limits for Utulei

5.2.1 - Conventional Pollutants

Utulei produces primary-treated wastewater that consistently complies with the NPDES permit effluent discharge limits for conventional pollutants. The effluent average and calculated 99th% peaks are 54 and 86 mg/l BOD and 32 and 50 mg/l TSS. The Utulei influent arrives weaker than typical domestic sewage, with influent average and calculated 99th% peaks of 103 and 166 mg/l BOD and 59 and 91 mg/l TSS. Nevertheless, consistent operation of the primary treatment results in BOD and TSS removals rates that average 47% and 46%, respectively, above the 30% NPDES permit requirements but nowhere near the 85% secondary treatment standards. All daily pH measurement and all but one daily settleable solids sample complied with NPDES permit effluent limits.

5.2.2 - Nutrients

The NPDES permit sets zone-of-initial-dilution (“ZID”) receiving water limits for total nitrogen and phosphorus. The water column sampling for the Utulei outfall indicates that the receiving waters sometimes exceed the water quality standards for nutrients. However, the water column sampling at the ZID stations also did not significantly differ from or were less contaminated than the samples at the reference station sited away from the outfall's influence.



- Total Nitrogen - The average and calculated 99th% peaks were 163 and 295 µg/l at the ZID stations, and 273 and 923 µg/l at the reference station.
- Total Phosphorus - The average and calculated 99th% peaks were 22 and 77 µg/l at the ZID stations, and 15 and 34 µg/l at the reference station.

The water quality standards, if applied upstream as effluent discharge limits, would translate upward by a factor proportional to the critical initial dilution, which is 202:1 for Utulei. The resulting water quality standards for the Utulei discharge would calculate out to 40.4 mg/l total nitrogen and 6.1 mg/l phosphorus. The weak sewage strength and primary treatment removals would result in effluent discharges expected to be ~12 mg/l nitrogen and ~3 mg/l phosphorus and thus should meet the calculated limits consistently for nitrogen consistently and most of the time for phosphorus.

5.2.3 - Indicator Parameters

Turbidity and dissolved oxygen are indicators of suspended solids and biological growth. Chlorophyll-a is an indicator parameter of nutrient-induced algal growth. Water column sampling for these indicator parameters at the ZID stations did not significantly differ from the samples at the reference station sited away from the outfall's influence.

- Turbidity - The average and calculated 99th% peaks were 0.11 and 0.34 NTUs at the ZID stations, and 0.07 and 0.21 NTUs at the reference station.
- Dissolved Oxygen - The average and calculated 1% minimum were 6.1 and 5.5 mg/l at the ZID stations, and 6.3 and 4.9 mg/l at the reference station.
- Chlorophyll-a - The average and calculated 99th% peaks were 336 and 1062 µg/l at the ZID stations, and 172 and 432 µg/l at the reference station.

5.2.4 - Pathogens

The NPDES permit also sets zone-of-initial-dilution receiving water limits for enterococci as an indicator of pathogenic hazard. The Utulei sewage treatment plant had the capability to chlorinate. This capability was decommissioned because of the hazards involved in the transportation of chlorine to the island and in the delivery from the port to the treatment plants. It is questionable whether disinfection is an available option on American Samoa because of the hazards. Since the Utulei does not provide disinfection, it may be a source of enterococci detected in the receiving waters. However, not only was there a limited sample record but the water column sampling was inconsistent or incorrectly determined at the ZID stations and at the reference station.



5.3 Collection Systems

The NPDES permits requires all domestic sewage contributions into the sewage collection systems to be discharged only through the ocean outfalls [*§A(1a) of the permits*]. The NPDES permits also prohibit the bypassing of treatment necessary to comply with standards [*Attachment 4 (14d) of the permits*]. Sewage spills would violate both provisions. The NPDES permits do not require explicitly the reporting of sewage spills, although they do require notice of bypassing [*Attachment 4 (14c) of the permits*].

The ASPA staff could recall no spills due to pump and equipment failures. They did say there have been a small number of sewage spills due to cement pipe settling that causes collapse and to grease obstructions. There were no reports submitted by ASPA listing the sewage spills from the Utulei and Tafuna sewage collection systems.

5.4 Federal Sewage Sludge Disposal Limits

The sewage sludges from both Tafuna and Utulei are mixed together for combined handling and drying at the Tafuna sewage treatment plant prior to disposal. A single sample from 2004 of combined Tafuna and Utulei sludges complied with the Federal ceiling sludge metals limits for disposal as landfill cover in Table 1 of 40 CFR 503.13, and the more stringent Federal clean sludge metals limits suitable for any reuse in Table 3 of 40 CFR 503.13. No PCBs were detected. No other pesticides and toxic organics except a DDT derivative were detected at levels above quantification.

The Federal standards set requirements for only metals content, PCBs content, vector attraction, and pathogenic destruction. Compliance with the vector attraction and pathogenic destruction requirements would be expected because the treatment plants provide more than enough anaerobic digestion time in the clarifiers. Compliance with the metals and PCBs content requirements also would be expected since there are no identified sources of industrial wastewaters into the sewer systems. The industrial wastewaters from the tuna canneries discharge through an independent outfall owned by the canneries.



6.0 Compliance Options and Projected Costs

Summary

The future configuration of the sewage treatment works on Tutuila Island depends largely on whether ASPA continues to qualify for and receive 301(h) waivers of the Federal secondary treatment standards. Lesser considerations include (1) the operational difficulty of certain types of secondary treatment, (2) the confined site at Utulei, (3) the availability of other land near Utulei for plant expansion, (4) whether water quality standards for pathogens will apply to the outfalls and require disinfection, and (5) the risks of chlorine transportation and handling. A number of other factors are not considerations. First, ASPA is fully able to operate and maintain any plant and equipment including low-tech secondary treatment. Second, high dilution rates attributable to the deep outfalls largely negate the need to provide nutrient removal. Third, although the influents are weak in strength, standard peaking factors apply because the influent flow rates do not closely correlate with heavy rainfall events. *See* Sections 5.1 and 5.2 of this report.

This report provides an analysis of four main options, ranging in costs from the lowest involving continued primary treatment at both Utulei and Tafuna, to the highest involving the decommissioning of Utulei and the upgrade of Tafuna into a regional secondary sewage treatment plant. The principal options are presented in the following sections. Preliminary cost estimates are from the Army Corp of Engineers, Publication TM 5-814-8, April 1987 and the Clean Water Needs Survey, 2004, as updated to 2007 dollars with the Army Corp of Engineers, Quarterly Cost Indexes, Publication EM 1110-2-1304, September 2007.

6.1 Option 1 - Primary at Utulei / Primary at Tafuna

Option 1 involves only the upgrade to full capacity of the primary clarigesters at Utulei.

Option 1 - Project Elements	Capital (<i>est</i>)	Annual O&M (<i>est</i>)
Recondition Clarigester No.1 at Utulei	\$ + 250,000	\$ - 0 -
Adjusted Self-Monitoring Program	- 0 -	+ 1,000
Totals	+250,000	+ 1,000

Permit Limits - Option 1 depends on ASPA continuing to qualify and receive 301(h) waivers from the Federal secondary treatment requirements for both Utulei and Tafuna. With both waivers, the primary treatment provided by the clarigesters should result in consistent compliance with the NPDES permit limits as long as there are certain adjustments made to the permits. The permit adjustments would have to include application of the water quality standards for nutrients and pH only to the effluent discharges, and a reassessment of whether the enterococci standard applies to the outfalls.

Self-Monitoring - Self-monitoring for the indicator parameter standards in the receiving waters would continue as it is under the 301(h) waivers and nominally increase to add influent and effluent sampling of nitrogen and phosphorus.



6.2 Option 2 - Primary at Utulei / Secondary at Tafuna

Option 2 involves (1) the installation of a high-rate plastic-media trickling filter, secondary clarifier, and filter recycling pump station at Tafuna, and (2) the upgrade to full capacity of the primary clarifiers at Utulei. This option does not include the installation of anaerobic digestion at Tafuna.

Option 2 - Project Elements	Capital (<i>est</i>)	Annual O&M (<i>est</i>)
Trickling Filter at Tafuna (3.0 mgd)	\$ + 1,300,000	\$ - 0 -
Secondary Clarification at Tafuna (2 @ 3.0 mgd)	+ 2,200,000	- 0 -
Recirc / Return Pumps at Tafuna	+ 1,300,000	+ 170,000
Recondition Clarifier No.1 at Utulei	+ 250,000	- 0 -
Adjusted Self-Monitoring Program	- 0 -	- 18,000
Estimated Totals	+ 5,000,000	+ 150,000

Permit Limits - Option 2 depends on ASPA continuing to qualify and receive a 301(h) waiver from the Federal secondary treatment requirements for Utulei. With one waiver, primary treatment provided by the clarifiers at Utulei, and secondary treatment at Tafuna should result in consistent compliance with NPDES permit limits as long as there are certain adjustments made to the permits. In particular, the permit adjustments would have to include application of the water quality standards for nutrients and pH to the effluent discharges, and a reassessment of whether the enterococci standard applies to the outfalls.

Design Considerations - Option 2 depends on the installation of a low-tech version of secondary treatment at Tafuna. More complicated forms, such as activated sludge, oxidation ditches, or sequencing batch reactors, require a level of engineering to operate that ASPA does not possess. Other low-tech versions, such as aerated lagoons, extended aeration, and facultative lagoons, require much more land. Option 2 would continue to use both ocean outfalls for disposal and all existing clarifiers for primary settling and anaerobic sludge digestion. A high-rate plastic-media trickling filter at Tafuna would need to be ~10 to 20 feet in depth and ~80 to 100 feet in diameter, with 3:1 recirculation, in order to handle a dry-weather design capacity of 3.0 mgd. Secondary clarifiers remove organic growth sloughed from the filter media, would need to be ~15 feet in depth and ~70 to 80 feet in diameter. Secondary sludge would return to one or more of the clarifiers for anaerobic digestion and to provide sludge contact (which improves removals).

Self-Monitoring - Self-monitoring for the indicator parameter standards in the receiving waters would continue as it is under the 301(h) waiver at Utulei but could be streamlined to a minimum for the secondary effluent from Tafuna. There would be a nominal increase to add influent and effluent sampling of nitrogen and phosphorus.



6.3 Option 3 - Primary at Utulei / Secondary near Utulei / Secondary at Tafuna

Option 3 involves (1) the installation of a high-rate plastic-media trickling filter, secondary clarifier, and filter recirculation pumping at Tafuna, (2) the upgrade to full capacity of the primary clarifiers at Utulei, and (3) the siting of another trickling filter, secondary clarifier, and recirculation pumping within 1 mile of the Utulei sewage treatment plant. This option does not include the installation of anaerobic digestion at either Utulei or Tafuna.

Option 3 - Project Elements	Capital (<i>est</i>)	Annual O&M (<i>est</i>)
Trickling Filter at Tafuna (3.0 mgd)	\$ + 1,300,000	\$ - 0 -
Secondary Clarification at Tafuna (2 @ 3.0 mgd)	+ 2,200,000	- 0 -
Recirc / Return Pumps at Tafuna	+ 1,300,000	+ 170,000
Recondition Clarifier No.1 at Utulei	+ 250,000	- 0 -
Land Acquisition near Utulei (≥1.0 acre)	n/a	- 0 -
Trickling Filter for Utulei (3.0 mgd)	+ 1,300,000	- 0 -
Secondary Clarification for Utulei (2 @ 3.0 mgd)	+ 2,200,000	- 0 -
Recirc / Return Pumps for Utulei	+ 2,600,000	+ 300,000
24" Line to Utulei 2° / Back to Outfall (<1 mile)	+ 2,000,000	- 0 -
6" Sludge Line from Utulei 2° to Clarifiers	+ 250,000	- 0 -
Adjusted Self-Monitoring Program	- 0 -	- 36,000
Estimated Totals	+ 14,000,000	+ 400,000

Permit Limits - Option 3 does not depend on ASPA continuing to qualify and receive a 301(h) waiver from the Federal secondary treatment requirements. Full secondary treatment should result in consistent compliance with NPDES permit limits for both outfalls as long as there are certain adjustments made to the permits. In particular, the permit adjustments would have to include application of the water quality standards for nutrients and pH to the effluent discharges, and a reassessment of whether the enterococci standard applies to the outfalls.

Design Considerations - Option 3 depends on the acquisition of enough land near the Utulei plant to construct a trickling filter and two secondary clarifiers nearby. This would require a site of at least an acre. Option 3 would continue to use both ocean outfalls for disposal and all existing clarifiers for primary settling and anaerobic sludge digestion. The primary effluent from Utulei would have to be pumped to a new site for secondary treatment and then pumped back to discharge through the existing outfall. The high-rate plastic-media trickling filters at Tafuna and Utulei would need to be ~10 to 20 feet in depth and ~80 to 100 feet in diameter, with 3:1 recirculation, in order to handle dry-weather design capacities of 3.0 mgd each. The final secondary clarifiers would need to be ~15 feet in depth and ~70 to 80 feet in diameter. Secondary sludge produced would return to one or more of the clarifiers for anaerobic digestion and to provide sludge contact (which improves removals).

Self-Monitoring - Without 301(h) waivers, the self-monitoring of the secondary treated wastewaters could be streamlined to a minimum. There would be a nominal increase to add influent and effluent sampling of nitrogen and phosphorus.



6.4 Option 4 - Regional Secondary at Tafuna

Option 4 involves a single discharge of secondary treated wastewater from Tafuna through (1) the installation of high-rate plastic-media trickling filters, secondary clarifiers, and filter recirculation pumping at Tafuna, (2) the installation of a sewer main from Utulei to Tafuna, and either (3a) the conversion of the Utulei plant for sewage equalization, or (3b) the continued operation of Utulei to convey primary treated effluent to Tafuna. This option does not include the installation of anaerobic digestion or an expansion of the Tafuna outfall.

Option 4 - Project Elements (Utulei Raw to Tafuna)	Capital (<i>est</i>)	Annual O&M (<i>est</i>)
Trickling Filters at Tafuna (6.0 mgd)	\$ + 1,800,000	\$ - 0 -
Secondary Clarification at Tafuna (3 @ 3.0 mgd)	+ 3,300,000	- 0 -
Clarigesters at Tafuna (3 @ 1.0 mgd)	+ 650,000	- 0 -
Recirc / Return Pumps	+ 2,600,000	+ 300,000
24" Sewer Main from Utulei to Tafuna (10 miles)	+ 10,000,000	- 0 -
In-Line Sewer Pump Stations (3 @ 4.0 mgd)	+ 6,000,000	+ 450,000
Conversion of Clarigesters to Equalization	+ 500,000	- 0 -
Decommissioned Sludge Hauling	- 0 -	- 50,000
Adjusted Self-Monitoring Program	- 0 -	- 56,000
Totals	+ 25,000,000	+ 650,000

Option 4 - Project Elements (Utulei 1° to Tafuna)	Capital (<i>est</i>)	Annual O&M (<i>est</i>)
Trickling Filters at Tafuna (6.0 mgd)	\$ + 1,800,000	\$ - 0 -
Secondary Clarification at Tafuna (3 @ 3.0 mgd)	+ 3,300,000	- 0 -
Recirc / Return Pumps	+ 2,600,000	+ 300,000
24" Sewer Main from Utulei to Tafuna (10 miles)	+ 10,000,000	- 0 -
In-Line Sewer Pump Stations (3 @ 4.0 mgd)	+ 6,000,000	+ 450,000
Adjusted Self-Monitoring Program	- 0 -	- 56,000
Totals	+ 24,000,000	+ 700,000

Permit Limits - Option 4 does not depend on ASPA continuing to qualify and receive a 301(h) waiver from the Federal secondary treatment requirements. Secondary treatment should result in consistent compliance with the NPDES permit limits for Tafuna with certain adjustments made to the permits. In particular, the permit adjustments would have to include application of the water quality standards for nutrients and pH to the effluent discharges, and a reassessment of whether the enterococci standard applies to the outfall.

Design Considerations - Option 4 depends on conveyance of Utulei sewage to Tafuna for regional treatment. Option 4 would continue to use the Tafuna ocean outfall for disposal and all existing clarigesters at Tafuna for primary settling and anaerobic sludge digestion. If the Utulei plant is converted from a treatment plant to sewage equalization station, clarigester capacity would have to be added to Tafuna in order to accept increased flows of raw sewage. If the Utulei plant remains in operation, no clarigester capacity would have to be added to Tafuna since the sewer main between the plants would convey primary treated flows. The



dual high-rate plastic-media trickling filters would need to be ~10 to 20 feet in depth and ~80 to 100 feet in diameter, with 3:1 recirculation, in order to handle a total dry-weather design capacity of 6.0 mgd. The final secondary clarifiers would need to be ~15 feet in depth and ~70 to 80 feet in diameter. Secondary sludge produced would return to one or more of the clarifiers for anaerobic digestion and to provide sludge contact (which improves removals).

Self-Monitoring - Without 301(h) waivers, the self-monitoring of the secondary treated wastewaters could be streamlined to a minimum. There would be a nominal increase to add influent and effluent sampling of nitrogen and phosphorus.



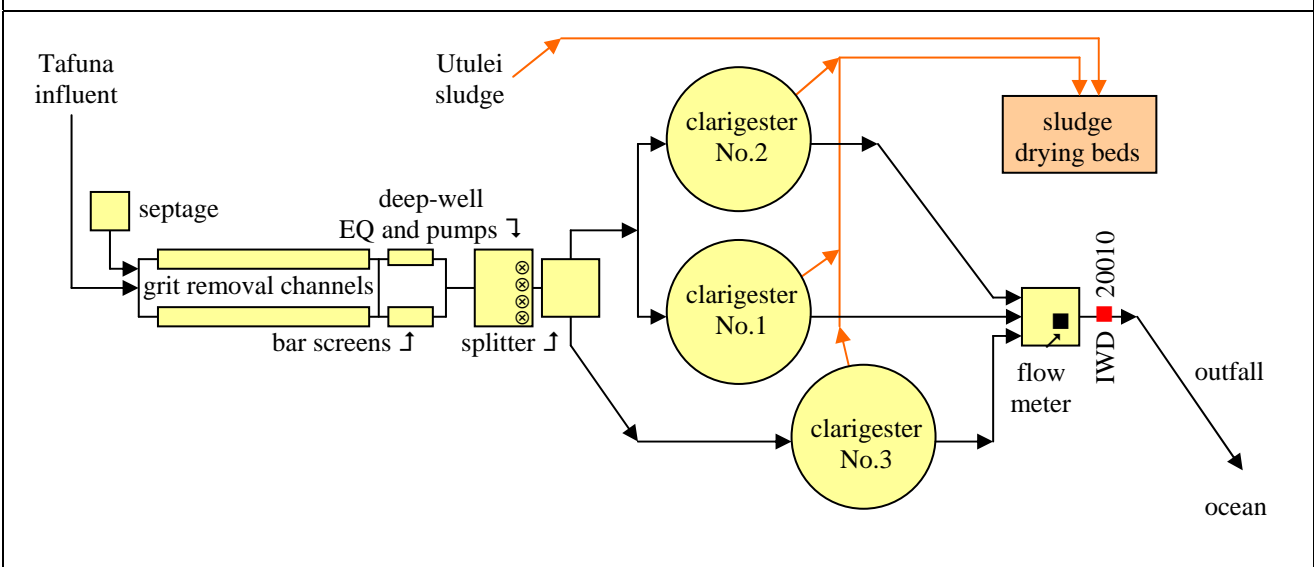
Appendix 1

Table 1.1 - Tafuna Sewage Treatment Plant - NPDES Permit Limits and Monitoring Requirements

Effluent Limits	mo-avg	7d-avg	d-max	discreet	geo-μ	sample freq	sample type
Flow (mgd)	-	-	-	-	-	continuous	continuous
BOD (mg/l)	100	150	200	-	-	once/week inf and eff	8-hr comp
BOD (lbs/day)	1669	2504	3338	-	-		
BOD (%removal)	>30%	-	-	-	-		
TSS (mg/l)	75	113	150	-	-	once/week inf and eff	8-hr comp
TSS (lbs/day)	1252	1878	2504	-	-		
TSS (%removal)	>30%	-	-	-	-		
Settleable Solids (ml/l)	1.0	-	2.0	-	-	once/day	grab
pH (s.u.)	-	-	-	6.5-8.6	-	once/week	grab
Oil and Grease (mg/l)	-	-	-	-	-	quarterly	grab
Toxicity (Tuc)	-	-	-	-	-	quarterly	24-hr comp
Water Column Limits	mo-avg	7d-avg	d-max	discreet	geo-μ	sample freq	sample type
Turbidity (NTU)	-	-	-	0.25	-	quarterly	metering
Total Phosphorus (μg/l)	-	-	-	15	-	quarterly	grab
Total Nitrogen (μg/l)	-	-	-	130	-	quarterly	grab
Chlorophyll a (μg/l)	-	-	-	0.25	-	quarterly	grab
Light Penetrate (ft-50%)	-	-	-	<130	-	quarterly	secchi disk
DO (mg/l)	-	-	-	5.5	-	quarterly	grab
pH (s.u.)	-	-	-	6.5-8.6	-	quarterly	grab
ΔpH (s.u.)	-	-	-	≤ 0.2	-		
Enterococci (cfu/100ml)	-	-	-	124	35	quarterly	grab

Appendix 1

Figure 1.2 – Tafuna Sewage Treatment Plant - Configuration and Layout





Appendix 1

Table 1.3 – Tafuna Sewage Treatment Plant Performance - Compliance with NPDES permit limits

pollutants and parameters (Jul 2006 - Jun 2007)	influent sample stats						viols	samp events
	mean	min	5th%	95th%	99th%	max		
Flow (mgd)	1.92	0.00	-	2.64	2.95	4.5	-	365
BOD daily-max (mg/l)	136.3	96	-	-	191.6	230	-	52
TSS daily-max (mg/l)	64.1	20	-	-	90.5	118	-	52
Settleable Solids (ml/l)	4.70	4.0	-	-	-	6.0	-	365

pollutants and parameters (Jul 2006 - Jun 2007)	effluent sample stats						viols	samp events
	mean	min	5th%	95th%	99th%	max		
BOD daily-max (mg/l)	66.3	24	-	-	91.7	120	0/52	52
TSS daily-max (mg/l)	34.4	20	-	-	49.3	55	0/52	52
Settleable Solids (ml/l)	0.14	0.1	-	-	-	7.4	1/365	365
BOD removal rates (%)	50.2	26	33.6	-	73.7	70	0/12	52
TSS removal rates (%)	46.1	25	31.6	-	66.6	61	0/12	52
pH min/max (s.u.)	-	6.9	-	-	-	7.3	0/365	365

pollutants and parameters (1Q 1999 - 1Q 2006)	receiving water column sample stats ²						viols ²	samp ² events
	ZID ¹ station A1		ZID ¹ station A2		reference ¹ sta C			
	mean	99th%	mean	99th%	mean	99th%		
Total Nitrogen (µg/l)	0.187	0.466	0.210	0.701	0.214	1.517	68/92	16
Total Phosphorus (µg/l)	0.019	0.033	0.019	0.038	0.016	0.030	66/91	16
Turbidity (NTU)	0.183	0.541	0.186	0.734	0.187	0.715	14/24	8
Chlorophyll-a (µg/l)	0.232	0.796	0.220	0.776	0.209	0.709	29/78	13
Dissolved Oxygen (mg/l)	6.33	4.27	6.29	4.55	6.33	4.68	13/98	17
pH min/max (s.u.) ³	8.1	7.8 / 8.7	8.1	7.9 / 8.4	8.2	7.6 / 8.5	1/50	17
Enterococci (CFR/100ml) ³	inconsistent or incorrectly determined sampling						-	-

¹ zone-of-initial-dilution and reference stations defined in §E(1a) of the NPDES permit for Tafuna

² stations sampled at the surface, mid-depth, and bottom - all stats are of sample aggregates

³ pH statistics are reported as median and min/max - enterococci as geometric-mean and max.

pollutants (1Q 1999 - 1Q2007)	Fed standards		sludge sampling stats ¹				viols	samp events
	Table-1	Table-3	mean	min	99th%	max		
Arsenic (mg/kg-dry)	75	41	-	-	-	4.8	0/1	1
Cadmium (mg/kg-dry)	85	39	-	-	-	2.8	0/1	1
Copper (mg/kg-dry)	4300	1500	-	-	-	168.9	0/1	1
Lead (mg/kg-dry)	840	300	-	-	-	32.3	0/1	1
Mercury (mg/kg-dry)	57	17	-	-	-	0.18	0/1	1
Molybdenum (mg/kg-dry)	75	-	-	-	-	-	-	1
Nickel (mg/kg-dry)	420	420	-	-	-	210.0	0/1	1
Selenium (mg/kg-dry)	100	100	-	-	-	4.3	0/1	1
Zinc (mg/kg-dry)	7500	2800	-	-	-	894.3	0/1	1

¹ Tafuna and Utulei sludge sampling results adjusted to dry weight basis - solids content of 68.1%



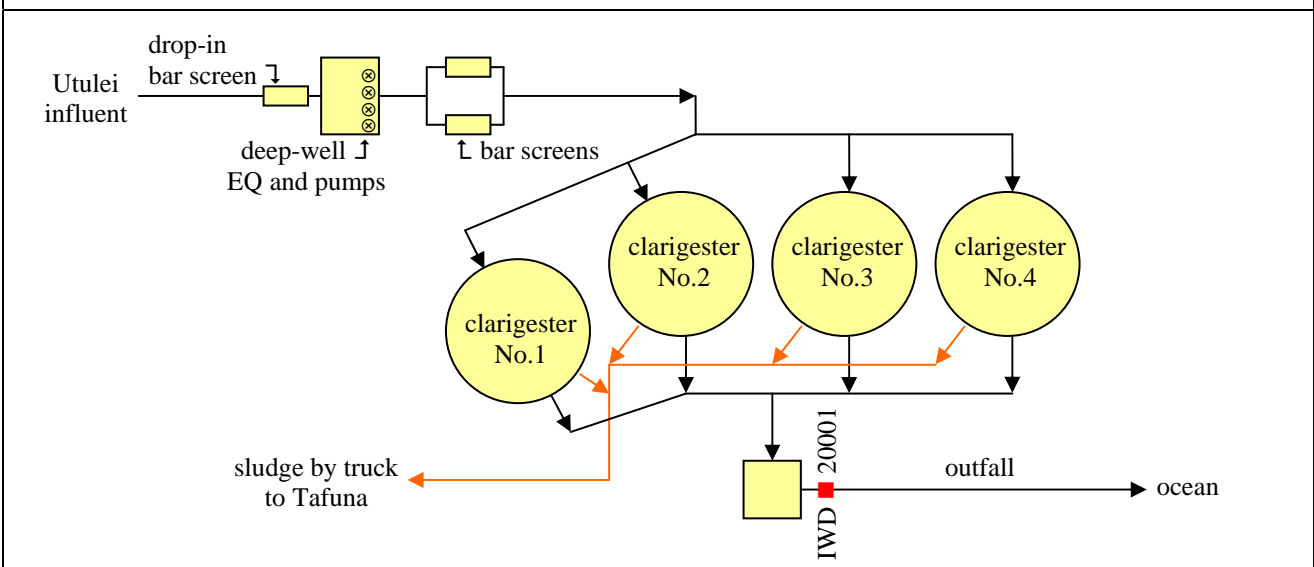
Appendix 2

Table 2.1 - Utulei Sewage Treatment Plant - NPDES Permit Limits and Monitoring Requirements

Effluent Limits	mo-avg	7d-avg	d-max	discreet	geo-μ	sample freq	sample type
Flow (mgd)	-	-	-	-	-	continuous	continuous
BOD (mg/l)	78.3	117	157	-	-	once/week inf and eff	8-hr comp
BOD (lbs/day)	1085	1628	2170	-	-		
BOD (%removal)	>30%	-	-	-	-		
TSS (mg/l)	75	113	150	-	-	once/week inf and eff	8-hr comp
TSS (lbs/day)	1377	2065	2754	-	-		
TSS (%removal)	>30%	-	-	-	-		
Settleable Solids (ml/l)	1.0	-	2.0	-	-	once/day	grab
pH (s.u.)	-	-	-	6.5-8.6	-	once/week	grab
Oil and Grease (mg/l)	-	-	-	-	-	quarterly	grab
Toxicity (TUc)	-	-	-	-	-	quarterly	24-hr comp
Receiving Water Limits	mo-avg	7d-avg	d-max	discreet	geo-μ	sample freq	sample type
Turbidity (NTU)	-	-	-	0.75	-	quarterly	metering
Total Phosphorus (μg/l)	-	-	-	30	-	quarterly	grab
Total Nitrogen (μg/l)	-	-	-	200	-	quarterly	grab
Chlorophyll a (μg/l)	-	-	-	1.0	-	quarterly	grab
Light Penetrate (ft-50%)	-	-	-	<65	-	quarterly	secchi disk
DO (mg/l)	-	-	-	5.0	-	quarterly	grab
pH (s.u.)	-	-	-	6.5-8.6	-	quarterly	grab
ΔpH (s.u.)	-	-	-	≤ 0.2	-		
Enterococci (cfu/100ml)	-	-	-	104	35	quarterly	grab

Appendix 2

Figure 2.2 – Utulei Sewage Treatment Plant - Configuration and Layout





Appendix 2

Table 2.3 – Utulei Sewage Treatment Plant Performance - Compliance with NPDES permit limits

pollutants and parameters (Jul 2006 - Jun 2007)	influent sample stats						viols	samp events
	mean	min	5th%	95th%	99th%	max		
Flow (mgd)	1.69	0.10	-	2.53	2.88	3.5	-	365
BOD daily-max (mg/l)	102.8	55	-	-	166.1	172	-	52
TSS daily-max (mg/l)	59.1	18	-	-	91.2	88	-	52
Settleable Solids (ml/l)	4.30	2.0	-	-	-	5.3	-	365

pollutants and parameters (Jul 2006 - Jun 2007)	effluent sample stats						viols	samp events
	mean	min	5th%	95th%	99th%	max		
BOD daily-max (mg/l)	53.8	19	-	-	86.0	78	0/52	52
TSS daily-max (mg/l)	31.5	13	-	-	50.2	48	0/52	52
Settleable Solids (ml/l)	0.14	0.1	-	-	-	2.1	1/365	365
BOD removal rates (%)	47.0	26	31.5	-	62.5	66	0/12	52
TSS removal rates (%)	46.4	15	37.0	-	61.6	67	0/12	52
pH min/max (s.u.)	-	7.0	-	-	-	7.4	0/365	365

pollutants and parameters (1Q 2004 - 1Q 2007)	receiving water column sample stats ²						viols ²	samp ² events
	ZID ¹ station A1 / ZID ¹ station B1			reference ¹ sta 5				
		mean	99th%	mean	99th%			
Total Nitrogen (µg/l)		0.163	0.295	0.273	0.923	7/35	6	
Total Phosphorus (µg/l)		0.022	0.077	0.015	0.034	2/35	6	
Turbidity (NTU)		0.109	0.344	0.067	0.212	0/30	6	
Chlorophyll-a (µg/l)		0.336	1.062	0.172	0.432	1/36	5	
Dissolved Oxygen (mg/l)		6.07	5.51	6.27	4.90	0/35	6	
pH min/max (s.u.) ³		8.16	7.9 / 8.3	8.19	7.9 / 8.3	0/35	6	
Enterococci (CFR/100ml)	inconsistent or incorrectly determined sampling						-	-

¹ zone-of-initial-dilution and reference stations defined in §E(1a) of the NPDES permit for Utulei

² stations sampled at the surface, mid-depth, and bottom - all stats are of sample aggregates

³ pH statistics are reported as median and min/max

pollutants (1Q 1999 - 1Q 2007)	sewage sludge sampling statistics						viols	samp events
	mean	min	5th%	95th%	99th%	max		

Tafuna and Utulei sludge handled together at Tafuna. See Table 1.3.