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R. M. TOWILL CORPORATION
SINCE 1930

Planning
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Environmental Services
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Construction Management

Letter of Transmittal

To Ms. Kathy Sokugawa, 768-8000

Address Department of Planning & Permitting
City and County of Honolulu
650 S. King Street, 7th Floor
Honolulu, HI 96813

Attention Mr. Raymond Young, 768-8049

Date August 16, 2017

Fax Number

Project SUP No. 2017/SUP-2(JL)
Honouliuli WWTP Expansion -
Supplemental Information

RMTC Project Number 122440-31

Sending

☒ Attached ☐ Under Separate Cover ☐ Via Facsimile

☐ Drawing Prints ☐ Drawing Originals ☐ Specifications ☐ Other Bound Material ☐ Originals will be mailed

☐ Cost Estimate ☐ Change/Field Order ☐ Digital Files

Pages sent including cover she

Number of Copies	Description
1	Special Use Permit (SUP) No. 2017/SUP-2(JL) - Honouliuli Wastewater Treatment Plant Secondary Treatment and Support Facilities - Supplemental Information for Odor Control Systems.
1	Modernization of the Honouliuli WWTP Odor Control System Memorandum by R.M. Towill Corporation, dated July 27, 2017.

Action

☐ Approval ☐ Review and Comment ☒ Your Use

☐ Signature and Return To This Office ☐ As Requested ☐ Appropriate Action

Remarks

Hello Raymond,

The Supplemental Information for Odor Control Systems for the SUP No. 2017/SUP-2(JL) is enclosed for review. Please let me know if you have any questions.

Thanks,

Jim Niermann
748-7463

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2017 AUG 16 P4:34
DEPT OF PLANNING AND PERMITTING
CITY & COUNTY OF HONOLULU

Copies to

cc Cindy Masuoka, DDC
Jaime Nishikawa, RMTC

By Roxanne Lee

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August 15, 2017

Ms. Kathy Sokugawa, Acting Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street 7th Floor
Honolulu, Hawai'i 96813

Attention: Mr. Jeffrey Lee, Planner, Policy Planning Branch
Mr. Raymond Young, Planner, Community Planning Branch

Dear Ms. Sokugawa,

Supplemental Information for Odor Control Systems
Special Use Permit (SUP) No. 2017/SUP-2(JL)
Honouliuli Wastewater Treatment Plant Secondary Treatment and Support Facilities
91-1000 Geiger Road, Ewa Beach; Tax Map Key (TMK) [1] 9-1-69: Por. 003 (por.) and 004

On behalf the City and County of Honolulu, Department of Environmental Services (ENV) and the Department of Design and Construction (DDC), we are providing the enclosed supplemental information for the Honouliuli Wastewater Treatment Plant (WWTP) Secondary Treatment and Support Facilities SUP application:

- Modernization of the Honouliuli WWTP Odor Control System Memorandum by R.M. Towill Corporation, July 27, 2017.

Should there be any questions regarding this submittal, please contact the undersigned or Roxanne Lee at 842-1133.

Very truly yours,

James Niermann, AICP, LEED AP
Planning Project Coordinator

Enclosures

JAN:rl
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cc: Raj Rath, P.E., DDC
Jaime Nishikawa, P.E., RMTC

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Memorandum

Project: Honouliuli WWTP Secondary Treatment Special Use Permit
Subject: **Modernization of the Honouliuli WWTP Odor Control System**
Issue Date: July 27, 2017
Prepared by: Carol Zuerndorfer MS, PE
R.M. Towill Corporation
Checked by: Lee Tom Lum, PhD, PE
R.M. Towill Corporation
RMTC Ref: 1-22440-XXW

Background

With the enactment of the Clean Water Act (CWA) in the 1970's came the construction of many new wastewater treatment plants (WWTP) throughout the United States. At this time, the wastewater treatment industry was in its infancy and thus the primary focus of these WWTPs was liquid stream treatment in order to meet the newly mandated discharge permit limits. Odor control was more of an afterthought.

Since odor control was not an essential part of the wastewater treatment process, the focus of wastewater treatment remained on the development of liquid treatment, and subsequently solids handling technologies. However, near the turn of the century (1990-2000) advances in odor control began to accelerate. Specifically, significant improvements were made in the understanding of odor control in the following areas:

- Odor generation
- Odor (foul air) containment and ventilation; and
- Odor treatment technologies and appropriate application of each

Nearly all odor control systems (OCS) currently in use at the HLIWWTP were constructed prior to this period of odor control development. A major goal of the HLIWWTP Secondary Treatment project is to streamline and modernize the control of all odors emanating from the HLIWWTP by reducing its generation, by encapsulating all of the offensive odors and by implementing state-of-the-art and most appropriate odor treatment technology for each source.

Current Odor Control Technology

The major elements to consider in odor treatment include: expected odor generation quantity and quality, odor encapsulation and ventilation requirements and the appropriate odor treatment technology for each source. The current state-of-the-industry of each of these elements is discussed below.

Odor Generation

Hydrogen sulfide (H_2S) is the main odor-causing compound in wastewater; thus, its generation and treatment is now very well understood. It is a toxic gas which produces the characteristic "rotten egg" smell associated with sewage. Additionally, H_2S is the cause of most corrosion within wastewater facilities. Other agents of odor including secondary nuisance (non-corrosive and non-toxic) odor compounds, such as organic reduced sulfides and volatile organic compounds (VOCs), are becoming targeted for treatment.

The mechanism behind H_2S generation has significantly advanced and as a result sewers and other wastewater facilities can be designed to minimize odor release as much as possible. Additionally, this knowledge can be used to determine how the configuration of existing sewers contributes to odor release and what can be done to address it.

Advances in odor measurement technologies now allow for accurate, ongoing measurement of odors (i.e. H_2S) being emitted from existing wastewater facilities. This data is used to precisely design a new OCS for that facility or a future facility with similar characteristics.

Odor (Foul Air) Containment and Ventilation

With the understanding of the odor compounds comes the understanding of the corrosion mechanism by which these compounds deteriorate different materials used in wastewater facilities. Materials that withstand corrosion include marine-grade aluminum, a high-quality fiberglass reinforced plastic (FRP) and 316 stainless steel. These materials are all now commonly used in areas subject to high concentrations of H_2S. Additionally, the improvement of corrosion protection with modern lining and/or coating systems allows concrete structures to maintain their integrity even while being exposed to the harshest environments.

The study of air movement in sewers has contributed to the development of ventilation models to better predict ventilation requirements and eliminate accidental emissions of foul air. These ventilation models are used to predict the size of an OCS. More recently, techniques for field measuring ventilation requirements of new OCS have been developed to even more accurately predict airflows needed for treatment.

Odor Treatment Technologies

Initial odor control technology used either chemical or physical (adsorption) processes to remove odor compounds from the air stream. Chemical scrubbers chemically oxidize H_2S with the use of hazardous chemicals and require complex pumps and piping to operate reliably. Operations staff dislike handling these hazardous chemicals and maintenance on these systems is often not kept up. Additionally, chemicals are very expensive to purchase on a continuous basis due to costs of shipping to the islands.

Physical odor removal with carbon-based media is less operation intensive but is not well suited for highly concentrated airstreams, since the compounds are physically loaded onto the media. When installed in these situations, the media is used up quickly and requires frequent media change outs to be effective. Replacement of media is expensive and is labor intensive. Thus, a low-maintenance system becomes a high maintenance system when inappropriately applied.

Since the turn of the century, easy-to-operate, low cost, biologically-based systems have been fully developed. These systems treat foul air naturally, using bacteria to consume odor compounds. With

biologically-based technology, micro-organisms consume the odor compounds, thus preferring highly concentrated odors, and results in a much more cost-effective system in treating high concentrations. Advances in biologically-based treatment systems have minimized the need for maintenance-intensive chemically based systems. These biological systems are simple to operate, very reliable and are now considered the preferred technology for treatment of high concentrations of certain types of odor.

Biological odor control premiered in Hawaii in 1993 when the R.M. Towill Corporation (RMTC) routed foul air through the Trickling Filter secondary treatment units at the Waianae WWTP. RMTC's work also resulted in the premier of the first modern bioscrubber in Hawaii at the Sand Island WWTP (SIWWTP) in 2005. After over a decade of reliable odor control, the SIWWTP is now the showcase in Hawaii for the modern biologically based OCS.

Odor Control at Honouliuli WWTP

The strategy for odor control at the HLIWWTP is presented in this section. A site plan of the future HLIWWTP is presented in **Figure A**.

Wastewater (Liquid) Treatment Facilities

- Influent Screens and Influent Pump Station (IPS)
    - This location is a significant source of odors within HLIWWTP since it is handling untreated raw sewage and is located adjacent to the south property line.
    - The current OCS is ineffective and undersized for this location. Modern biologically-based odor control will be implemented for this facility in the near future. This project has gone out to bid and construction is forthcoming.
- Existing Grit Removal System and Pre-aeration Tank (Conversion to High Rate Biological Contactor)
    - The existing grit removal system and pre-aeration tank will be converted to an entirely different treatment process involving biological adsorption of organic material followed by aerated flotation clarification, referred to as the High Rate Biological Contactor (HRBC). There will be no grit removal or grit handling equipment with this new process.
    - There will be much less odor generated by this new HRBC process. These odors will be contained by new tank covers and the tank interior will be coated for protection.
    - Negative pressure (suction) will be maintained underneath the covers with odor control fans. The negative pressure will prevent fugitive emissions. The fans will convey the foul air to an OCS where the odors will be treated by a new biological-based OCS.
- New Grit Removal System
    - An entirely new grit removal facility will be constructed adjacent to the existing grit removal facility. This will be a fully enclosed, brand-new concrete structure.
    - There will be much less odor generated from this new grit removal facility. This is because the new grit removal system will utilize centrifugal force (i.e. spinning the wastewater) rather than aeration, which causes the release of odors, to settle out incoming grit. The new grit system will also be covered to contain any generated odors.

- Unlike the present situation, the associated grit collection/concentration equipment will be enclosed and contained within a building, ventilated, and treated.
- A negative pressure (suction) will be maintained underneath the covers with odor control fans. The negative pressure will prevent fugitive emissions. The fans will convey the foul air to an OCS where the odors will be treated by a biological-based system.

- Primary Clarifiers and Gravity Thickeners
  - The existing Primary Clarifiers (PCs) are a significant source of odor. In the upgraded HLIWWTP they will be re-purposed to wet weather storage basins and will only be used during peak flow (rainstorm) events. Therefore, the existing PCs will not be an odor source in the future.
  - Because the PCs will no longer be used, the Gravity Thickeners will also not be needed, thereby eliminated yet another source of odors.
- Secondary Treatment Facilities
  - Wastewater entering secondary treatment facilities has gone through preliminary and primary treatment so that the largest organic matter has been removed.
  - Secondary treatment involves fully aerating the incoming wastewater and using "good" bacteria to breakdown any organics remaining in the wastewater. This aeration fully oxidizes the reduced sulfides and other odor-causing compounds. Secondary treatment facilities are not a source of nuisance odors within a WWTP.

<u>Sludge (Solids) Treatment Facilities</u>

- Dewatering Building
  - The existing dewatering building will be demolished in its entirety and replaced with a new Dewatering Building. The new dewatering process is a closed system contained within the new dewatering building. Unlike the current dewatering facility, trucks will not need to enter the building to remove dewatered sludge so doors and bins can remain closed.
  - Dewatering removes water from digested sludge to create "cake" sludge. Cake sludge is fed to the new dryer facility to create sludge pellets for land application or other re-use.
  - All dewatered cake sludge will be fully enclosed within a bin inside the new Dewatering Building. Since the cake is digested it is expected to have a minimal level of nuisance odors. Any foul air from this bin will be sent to a new biologically-based OCS.
  - Temporary Cake Discharge System
    - Cake will be temporarily hauled away by dump trucks after construction of the new Dewatering Building but prior to completion of the Dryer Building.
    - A pipe will discharge cake sludge to the dump truck, minimizing emissions.
    - This system will be decommissioned when the Dryer Building is complete.
- Transported Sludge

- The Cake Receiving Facility will accept cake sludge from other WWTP to be sent to the Dryer Building. The receiving facility consists of two large bins where the trucks will dump. Pumps at the bottom of the bins will pump the cake sludge to the dewatered cake bin.
- This sludge will have been digested and dewatered prior to transport, minimizing their odor potential. Appropriately digested and dewatered sludge typically has minimal nuisance odors.
- The Cake Receiving Facility bins are fully enclosed and will have odor suction ducts near the retractable bin doors which only open to allow trucks to dump. While trucks are dumping, the emissions will be drawn in by ducts located adjacent to the doors (see **Figure B**). Foul air will be sent to the same biological-based OCS as for the Dewatering Building.
- The trucks will take roughly 5 minutes to discharge. This is the only time during the cake receiving process that the cake bins will not be fully closed. It is expected there will be no more than 14 loads of cake brought to the HLIWWTP per week.

- Dryer and Auxiliary Pellet Storage Building
  - The sludge dryers have exhaust air with a mild, musty odor. Most of the air is recycled with waste air sent to a two-stage OCS consisting of a water scrubber followed by a carbon media scrubber. The dried sludge itself is not a source of odors.
  - There will also be an Auxiliary Pellet Storage building to stockpile the dried pellets in an emergency event that the pellets cannot be re-used or disposed of for extended periods of time. This facility is located in the center of the treatment plant and will only contain dried pellets so no odors are expected.

Figure A. The HLIWWTP with Future Upgrades

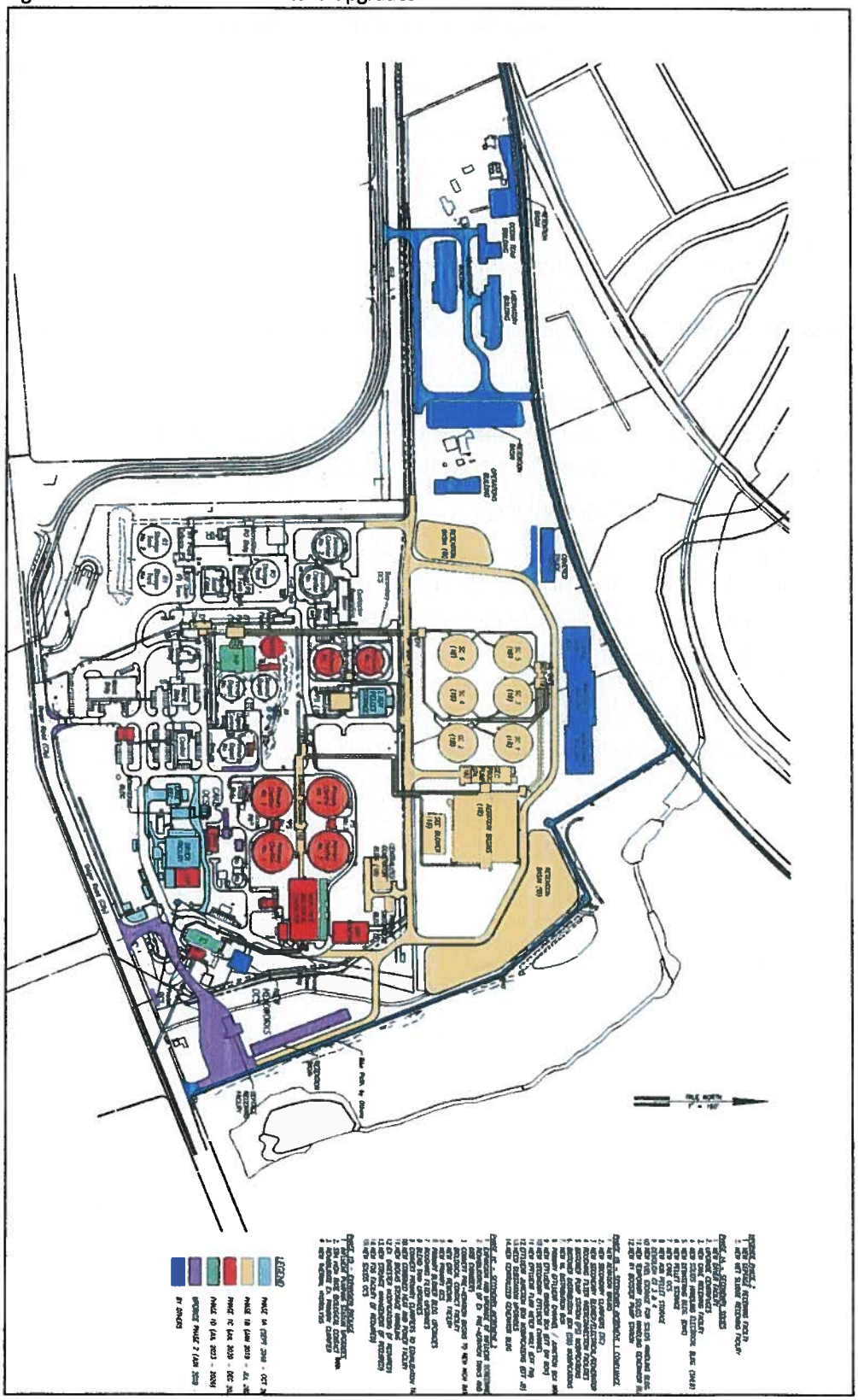

Figure B. Cake Receiving Facility