

Appendix 1: Maps



Figure 1: Toa Alta Municipality, Puerto Rico (Google Earth, January 6, 2017)

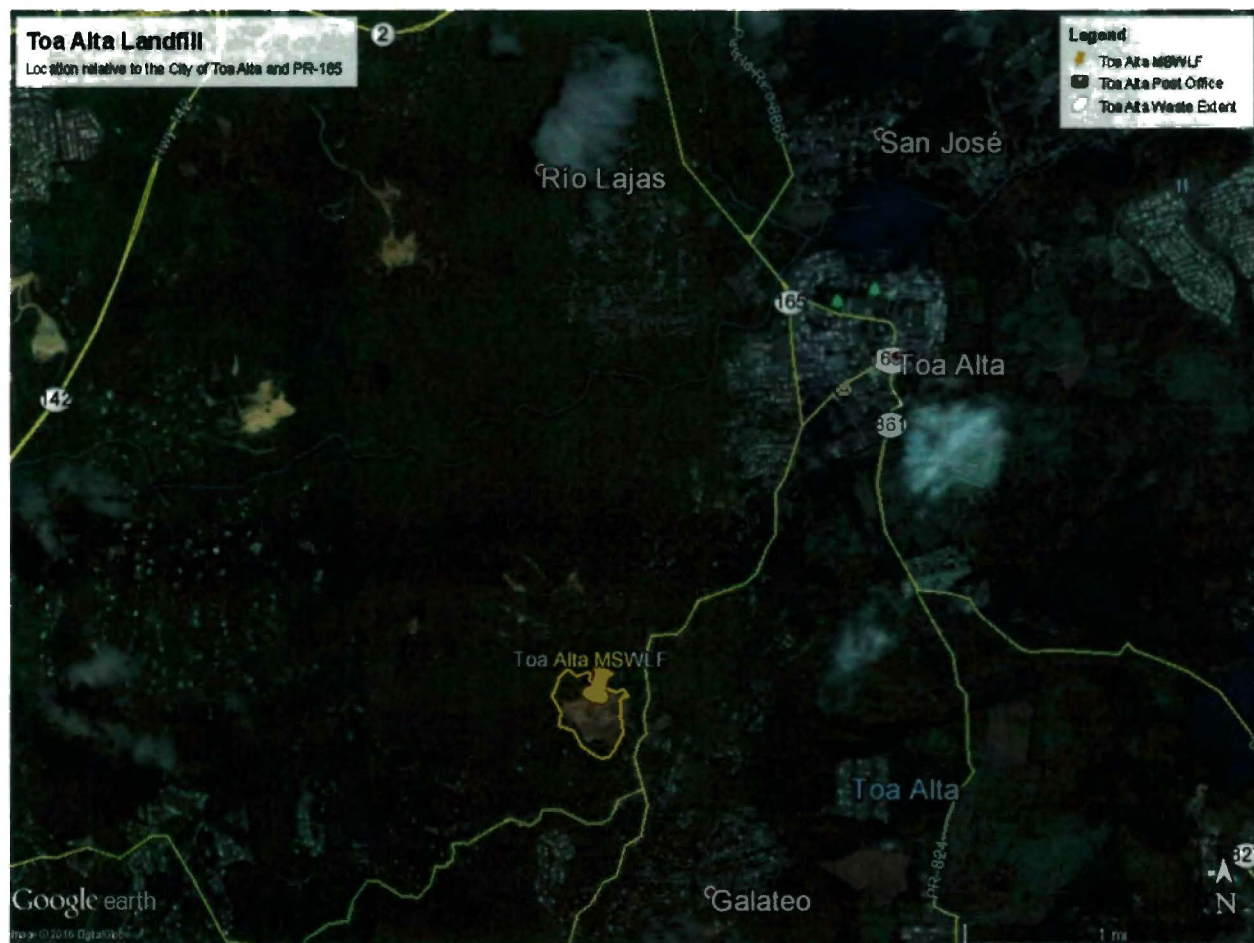


Figure 2: Toa Alta Landfill Location (Google Earth, December 1, 2016)

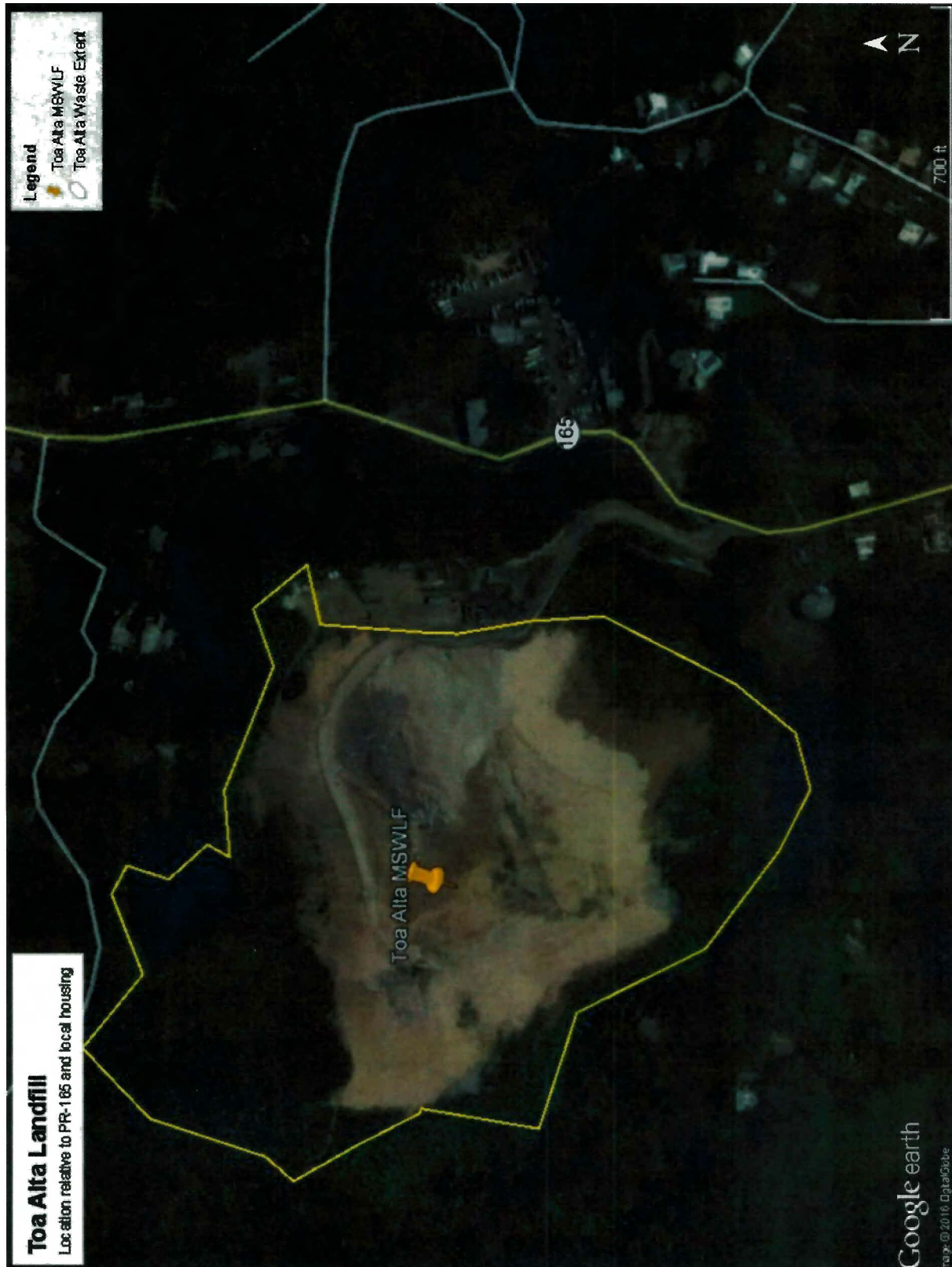


Figure 3: Toa Alta Landfill (Google Earth, December 1, 2016) (Landfill waste extent line, shown in yellow, was estimated by EPA based on historic aerial photography analysis)

Appendix 2: Operational Requirements

Unless otherwise indicated, the following provisions in this Appendix apply collectively to the Municipality and the Municipal Co. (e.g., the term “operator” applies to both the Municipality and to the Municipal Co.).

1. On the effective date of this Order, and continuing thereafter, the operator shall randomly inspect incoming loads of waste to be deposited at the Landfill so as to prevent the disposal of i) regulated hazardous wastes and PCBs prohibited under 40 C.F.R. § 258.20; and ii) liquid wastes prohibited by 40 C.F.R. § 258.28 at the Landfill. The Municipality and Municipal Co. shall maintain a log of incoming waste loads. The log shall contain the delivery date, name of the hauler or carter, a brief description of each load’s contents and an estimate of its volume, as well as details (similar to those just listed) regarding the receipt and rejection of any loads with unacceptable materials.
2. Within seven (7) days of the effective date of this Order, and continuing thereafter, the Municipality and Municipal Co. shall cause the following NOTICES to be posted in Spanish and English at the Landfill entrance in large lettering on two mounted signs, each at least four feet by five feet in size, as shown in *Figure 4* and *Figure 5*:

<u>NOTICE</u>
THIS LANDFILL IS SUBJECT TO A UNITED STATES ENVIRONMENTAL PROTECTION AGENCY UNILATERAL ADMINISTRATIVE ORDER WITH THE MUNICIPALITY OF TOA ALTA, EMPRESAS MUNICIPALES TOALTEÑA, CORP., CMA ENVIRONMENTAL, LLC, & LANDFILL TECHNOLOGIES OF TOA ALTA.
ESTE VERTEDERO ESTÁ SUJETA A UNA AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS ORDEN ADMINISTRATIVA UNILATERAL CON EL MUNICIPIO DE TOA ALTA, EMPRESAS MUNICIPALES TOALTEÑA, CMA ENVIRONMENTAL, Y LANDFILL TECHNOLOGIES OF TOA ALTA.

Figure 4: Order Notice

<u>NOTICE</u>
THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY HAS DIRECTED THIS LANDFILL FACILITY TO CEASE ACCEPTING WASTE BY NO LATER THAN DECEMBER 31, 2017.
LA AGENCIA DE PROTECCIÓN AMBIENTAL DE LOS ESTADOS UNIDOS HA DADO INSTRUCCIONES QUE ESTE VERTEDERO DEJARA DE ACEPTAR DESECHOS A MÁS TARDAR DEL 31 DE DICIEMBRE DEL 2017.

Figure 5: Cease Disposal Notice

3. On the effective date of this Order, and continuing thereafter, the Municipality and Municipal Co. shall ensure that security at the Landfill be sufficient to restrict unauthorized access to the Landfill so as to prevent scavenging, trespass, and unauthorized waste disposal. The security measures to be performed shall include maintenance of existing fencing, and ensuring that any entrance gate is locked during non-business hours, when the Landfill is otherwise not operating, and when the Landfill does not have someone controlling the entrance and inspecting incoming loads. Respondents shall report to EPA all trespass incidents they become aware of within seven (7) days of such incidents.
4. If EPA, the Municipality, or Municipal Co. determine that the security measures implemented are insufficient, the Municipality and Municipal Co. shall develop and implement a plan for additional steps to ensure that unauthorized access to the Landfill be prevented (“Enhanced Security Plan”). The additional security measures to be performed shall include, as

appropriate, additional security personnel and coverage (*i.e.*, additional hours and areas patrolled) and the installation and maintenance of additional fencing.

5. On the effective date of this Order, and continuing thereafter, the operator shall cover disposed solid waste with six inches of earthen material, and/or an alternative daily cover approved by EQB, at the end of each operating day, or at more frequent intervals if necessary, to control disease vectors, fires, odors, blowing litter, and scavenging.¹ Daily cover shall be maintained except for days in which a severe weather condition(s) makes it impossible to maintain daily cover. Daily cover must be graded and compacted to minimize ponding, a source of standing/stagnant water (See Appendix 8: *Zika Virus & Mosquito Control*).

6. Within thirty (30) days of the effective date of this Order, the operator shall provide and maintain vehicular access (*e.g.*, earthen or paved road) for physical inspection of: the Landfill slope base cover, any engineering controls that may be present such as stormwater channels and leachate interception systems, and the Facility and property perimeter.

7. On the effective date of this Order, the Municipality and Municipal Co. shall commence the installation of, and shall maintain thereafter, the following Stormwater Provisional Measures:^{2,3}

- a. A temporary dike or channel system to minimize stormwater run-on;
- b. Minimize the area of the exposed working face. The working face shall be only wide enough to accommodate vehicles discharging waste. Waste shall be spread in layers of approximately two feet in thickness and compacted to approximately one foot in thickness or as thin a layer as practical before the next layer is applied. No more than five layers may be placed in a daily cell, after which daily cover shall be applied. Additional wastes shall be placed in an adjacent daily cell;⁴
- c. Vegetative buffer strips, sediment traps/ponds, and diversion berms to manage runoff to reduce pollutant discharge;

¹ EPA Region 2 recommends consideration of spray-on cementitious cover materials as alternate daily cover in situations where the remaining airspace must be conserved or accessibility of suitable daily cover soil is problematic. See: *Review of the Use of Posi-Shell® as Landfill Alternate Daily Cover (ADC)*, EPA Region 2, RCRA Compliance Branch, 11 May 2015.

² See: <http://www.epa.gov/npdes/industrial-stormwater-fact-sheet-series>, *Industrial Stormwater Fact Sheet Series-Sector L: Landfills and Land Application Sites*. Covers the federally required and recommended landfill stormwater management measures.

³ This is only for reference: <http://des.nh.gov/organization/divisions/water/stormwater/manual.htm>. The New Hampshire Stormwater Manual was developed as a planning and design tool for the communities, developers, designers and members of regulatory boards, commissions, and agencies involved in stormwater programs.

⁴ Terms used as defined in: http://www.waste360.com/mag/waste_preparing_landfill_designs. The "working face" is the area presently being worked, with new refuse being deposited and compacted into it. Once the working face has been completed and daily cover material provided, it is a completed cell, or "daily cell." A "lift" is composed of the adjacent daily cells that form one layer of the landfill.

- d. Erosion control techniques such as mulching and matting, temporary check dams, filter fences, and straw bales;
 - e. Reduce standing/stagnant water, consistent with Appendix 8: *Zika Virus & Mosquito Control*;
 - f. Regularly inspect and maintain such Provisional Measures.
8. The Stormwater Provisional Measures shall be substantially installed and operational within thirty (30) days of the effective date of this Order, or by such other later deadline as is approved by EPA in writing, and thereafter must be maintained until supplemented or replaced under an EPA-approved Stormwater Pollution Prevention Plan.

Appendix 3: Safety and Health Program/Operational Oversight

- Safety & Health Program

1. Within ninety (90) days of the effective date of this Order, the Municipality and Municipal Co. shall develop, enforce, and maintain a facility-wide Safety and Health Program. This Program shall comply with applicable Commonwealth and applicable Federal Occupational Safety & Health Administration (“OSHA”) regulations.

- On-site Operator Requirement

2. Upon the effective date of this Order, the Municipality and Municipal Co. shall ensure that an on-site operator be present at the Landfill and supervising operations during all times of operation. The on-site operator must have at least one year of experience in operating a solid waste landfill.

Appendix 4: Leachate System

- Evaluation & Remediation

1. Respondent LandTech shall investigate, evaluate, and engage its best efforts to repair or rehabilitate the leachate and liner system at the Facility so as to provide a working leachate collection and management system to the Respondents Municipality and the Municipal Co. Such a working leachate collection and management system may be a temporary installation, designed to be replaced by a subsequent, permanent installation. LandTech shall comply with the following:

- a. Within thirty (30) days of the effective date of this Order, Respondent LandTech shall report to EPA on the status of the liner and leachate collection system of the SE Cell. LandTech's evaluation and report shall include:
- (1) Records review, including applicable plans and drawings, and a survey and evaluation of designer/worker recollections;
 - (2) Visual inspections of the SE Cell, remaining onsite equipment (*e.g.*, leachate tanks and riser pipes and access valves), exposed liner, and liner anchor trenches;
 - (3) Preliminary flushing and video inspection of the riser pipes, the leachate collection lines, and primary sump and sump pumps;
 - (4) Estimates of the leachate level and volume of leachate over the liner; and
 - (5) Results of preliminary pump test using existing or introduced sump pumps, including a leachate sampling report.

LandTech shall manage and provide for the proper storage of all recovered leachate, generated during LandTech's investigation, evaluation, and repair or rehabilitation efforts, employing its own equipment (including containers and/or tanks), onsite equipment, leased equipment, or a combination. LandTech shall leave in place, secured, a working leachate collection and management system, including pump(s), unless another course of action is approved by EPA.

- b. Within thirty (30) days of the effective date of this Order, LandTech shall report to EPA on the status of all Landfill leachate interception and collection systems located at areas of the Landfill in other than the SE Cell. LandTech's evaluation and report shall include:
- (1) Records review, including applicable plans, drawings, and land surveys, and a survey and evaluation of designer/worker recollections;
 - (2) Visual inspections of the Landfill and remaining onsite equipment; and
 - (3) Preliminary flushing and video inspection of the leachate collection lines and primary sump and sump pumps.

- c. Upon direction by EPA, LandTech shall undertake additional leachate system investigation, evaluation and repair or rehabilitation steps. These steps shall be completed according to a schedule established after consultation with the Respondents. Such steps may include, but be not limited to: hydraulic jetting, flushing, and mechanical cleaning; more extensive video inspection; additional pump tests; and follow-up reports to EPA.
 - d. Within thirty (30) days of the completion of the tasks, pursuant to “a” above, LandTech shall provide EPA, the Municipality, and the Municipal Co. with a proposed Operations Manual for the SE Cell Leachate Collection and Management System. LandTech shall confer, upon request, with EPA, the Municipality, and the Municipal Co. regarding the proposed Operations Manual. The Municipality and the Municipal Co. may propose revisions to the Operations Manual for consideration by LandTech and EPA. Upon direction by EPA, and according to the schedule established by EPA, LandTech shall revise the Manual and provide EPA, the Municipality, and the Municipal Co. with a revised Operations Manual.
 - e. The Operations Manual submission(s) and all reports to EPA by LandTech must comply with the requirements of the VI. CERTIFICATIONS paragraph of this Order.
- Operations
2. Unless otherwise specifically directed by EPA in writing, Respondents Municipality and the Municipal Co. shall operate all functional and partially functional leachate collection and management systems at the Landfill so as to collect leachate and minimize the release of leachate to the environment.
 3. Respondents Municipality and the Municipal Co. shall properly manage all collected leachate on-site. Collected leachate shall either:
 - a. Be subsequently transported and disposed off-site at a wastewater treatment plant permitted to receive such wastes, or
 - b. Treated on-site in a permitted wastewater treatment process meeting the National Pollutant Discharge Elimination System (NPDES) requirements under Section 402 of the Clean Water Act.
 4. The Municipality and the Municipal Co. shall comply with the following:
 - a. Provide site access, security, power, equipment and personnel staging areas, onsite earth moving and other heavy equipment (along with trained operators), facility records and other information sources (including employees), and any other assistance needed to enable LandTech to successfully complete the tasks set forth in this Appendix. This assistance shall include, if requested by LandTech or directed by EPA, manual labor needed to clear access to elements of the liner and/or leachate system.

- b. Provide health and safety oversight (including alteration of heavy equipment routes) and cooperate with LandTech to ensure safe operations (see Appendix 3: *Safety and Health Program/Operational Oversight*).
- c. Upon specific direction by EPA, undertake additional leachate system investigation, evaluation and repair or rehabilitation steps beyond those steps assigned to LandTech under this Order. Such steps may include, but need not be limited to: tank and pad installation, permanent sump pump installation; additional hydraulic jetting, flushing, and mechanical cleaning; more extensive video inspection; additional pump tests; system repairs, design and construction of system access (including manhole(s)), liner repairs, and follow-up reports to EPA.
- d. Within seven (7) days of receipt of the Operations Manual (or the revised Operations Manual if there are revisions) for the SE Cell Leachate Collection and Management System, or upon direction by EPA, begin continuous operation and ongoing maintenance of the SE Cell Leachate Collection and Management System.
- e. After consultation with and upon direction by EPA, begin continuous operation and ongoing maintenance of all other leachate management systems located at areas of the Landfill in other than the SE Cell.
- f. Until such time as the SE Cell's liner integrity can be demonstrated to EPA's satisfaction:
 - (1) No leachate recirculation shall be permitted at the Landfill; and
 - (2) The SE Cell's leachate collection system shall be operated to maintain less than a 15-cm (6-in) depth of leachate over the liner.
- g. All reports and other submissions to EPA by the Municipality and the Municipal Co. must comply with the requirements of the VI. CERTIFICATIONS paragraph of this Order.

Appendix 5: Waste Extent Determination

1. Within ninety (90) days of the effective date of this Order, CMA, in cooperation with the Municipality and Municipal Co., shall comply with the following:
 - a. Develop and implement a Solid Waste Delineation Plan (“Delineation Plan”). The Delineation Plan shall determine the full (*i.e.*, total, complete and comprehensive) extent of solid waste disposal or otherwise approved extent (in all past and current disposal areas). CMA shall use its best efforts to obtain existing surveys, identify property boundaries (including the identification of adjacent property owners), and past permitting information so that the Delineation Plan includes, to the extent possible, a clear delineation of the area that was permitted by EQB for solid waste disposal. The Delineation Plan shall include any supporting documentation, such as the Landfill’s past and most recent EQB permits. The Delineation Plan shall provide for the determination (including in areas where the waste extent is obscured by foliage, topography, or otherwise) of the actual extent of bulk waste disposal along the entire perimeter of the Landfill, through the use of soil borings, trenching, noninvasive geophysical exploration (*e.g.*, ground-penetrating radar or electromagnetic conductivity surveys), or other EPA approved methods. The line delineating the actual extent is hereafter referred to as the “Revised Waste Disposal Perimeter.” “Bulk Waste,” as used in this Appendix, shall mean the contiguous or mostly contiguous solid waste disposed anywhere in the Landfill area to a depth of 6 inches or more. CMA shall physically delineate the entire Revised Waste Disposal Perimeter by installing a series/system of highly visible markers and through the collection of a survey-grade, sub-meter GPS delineation by staff experienced in the use of such equipment.
 - b. After completion of the field work above, CMA shall provide to EPA, the Municipality, and the Municipal Co., documentation of the results of the waste extent determination that shall include the following:
 - i. establishment, with the best available field information, of the Waste Disposal Perimeter;
 - ii. identification of the type and location of physical markers placed;
 - iii. identification of the Revised Waste Disposal Perimeter to sub-meter accuracy, in an electronic format usable on ESRI ArcGIS 10.3 software, and on a map of sufficient scale for use in closure planning;
 - iv. identification of all adjacent property owners and areas of waste deposition beyond the facility property boundary; and
 - v. specific identification of any differences between the Revised Waste Disposal Perimeter and any previously identified waste disposal perimeter.
 - c. All submissions to EPA must comply with the requirements of the VI. CERTIFICATIONS paragraph of this Order.

2. The Municipality and the Municipal Co., in cooperation with CMA, shall comply with the following:
 - a. Provide site access, security, power, equipment and personnel staging areas, onsite earth moving and other heavy equipment (along with trained operators), Facility records, existing Facility and relevant property surveys, property ownership information, and other information sources (including employees), and any other assistance needed to enable CMA to successfully complete the tasks set forth in this Appendix. This assistance shall include, if requested by CMA or directed by EPA, manual and other labor needed to clear access to the Landfill perimeter.
 - b. Provide health and safety oversight (including alteration of heavy equipment routes) to CMA to ensure safe operations (see Appendix 3: *Safety and Health Program/Operational Oversight*).
 - c. Within fourteen (14) days of the effective date of this Order, provide CMA with all relevant existing surveys, property boundaries (including identification of adjacent property owners), and past permitting information so that the Delineation Plan can include to the extent possible a clear delineation of the area that was permitted by EQB for solid waste disposal. Include any supporting documentation, such as the Landfill's past and most recent EQB permits.
 - d. Maintain the series/system of highly visible markers delineating the Revised Waste Disposal Perimeter.
3. The Municipality and Municipal Co. shall incorporate the Revised Waste Disposal Perimeter into any required Landfill system surveys, designs and/or plans, including closure and gas collection and control system plans, that they, or their representatives, prepare.
4. If the Waste Extent delineation and property surveys indicate that waste has been placed on property not owned, leased, or otherwise under the control of the Municipality, CMA, the Municipality, and the Municipal Co. shall undertake such actions as may be required to ensure their activities are lawful. In the event Respondents are unable to obtain access to such property, Respondents shall follow the procedures required under Section XIV. "On-site and Off-site Access."

Appendix 6: Additional Landfill Requirements

- Intermediate Cover

1. Except as noted below, within ninety (90) days of the Effective Date, the Municipality and Municipal Co. shall complete application of Intermediate Cover on all areas of the Landfill where waste is not currently being deposited on a regular basis. All intermediate cover shall thereafter be maintained until a Final Cover is installed.
2. If there are past waste disposal areas owned by third parties, where waste is not currently being deposited on a regular basis, the Municipality and Municipal Co. shall obtain all necessary approvals and/or take any necessary legal steps prior to placing Intermediate Cover on such areas. In the event such that property ownership causes delays in the placement of Intermediate Cover, reasonable extensions to the above ninety-day requirement will be considered by EPA.
3. For purposes of this Order, Intermediate Cover is defined as a waste cover, more durable than daily cover, consisting of at least 12 inches of compacted soil (or other approved alternative cover material) with appropriate storm water erosion controls (*e.g.*, vegetated cover, temporary chutes, channels, berms, and/or swales).⁵ An Intermediate Cover is intended to further limit precipitation infiltration and to control disease vectors, fires, odors, blowing litter and scavengers until active disposal operations are resumed in the affected area and as a preliminary closure step prior to the installation of a final landfill cover. Intermediate cover must be graded and compacted to minimize ponding, a source of standing/stagnant water (See Appendix 8: *Zika Virus & Mosquito Control*).
4. Inactive portions of the existing landfill with substantial vegetative cover need not be disturbed, by the placement of intermediate cover, if no waste is exposed and the Municipality and Municipal Co. determine, at their discretion, that the existing, substantial vegetative cover offers equivalent or greater erosion controls and effectively limits precipitation infiltration, disease vectors, fires, odors, blowing litter, and scavenger access to underlying waste. This option to forgo the placement of interim cover will persist until superseded by EPA's written direction or by the requirements of Appendix 7: *Landfill Interim Closure*.
5. The Municipality and Municipal Co. may request that EPA review and EQB approve installation of an alternative form of Intermediate Cover that will provide equivalent or additional protection.

- Groundwater Monitoring

6. As part of the first or second Monthly RCRA Report (see Appendix 9: *RCRA Reports*), the Municipality and Municipal Co. shall submit to EPA a copy of the existing Groundwater Monitoring Plan for the Landfill. The Municipality and Municipal Co. shall also submit all

⁵ Intermediate cover can include existing daily cover to the extent it is compacted soil and consistent with the requirements for intermediate cover.

available information on its implementation of the plan, including the last three years of groundwater monitoring analytical results.

7. If EPA determines that information obtained through groundwater monitoring, or otherwise, indicates that measures and procedures are necessary to initiate a corrective action assessment and/or perform a corrective action remedy at the facility, as those terms are described in 40 C.F.R. §§ 258.56, 258.57, and 258.58, the Municipality and Municipal Co. shall undertake such measures or procedures as approved by EPA and, as appropriate, by EQB.

Appendix 7: Landfill Interim Closure

- Ceasing Waste Receipt & Disposal

1. The Municipality and Municipal Co. shall permanently cease waste disposal at the Landfill no later than December 31, 2017.
2. The Municipality and the Municipal Co. shall secure the Facility against all unauthorized, prohibited, and/or otherwise unlawful waste disposal by no later than December 31, 2017.
3. No later than September 30, 2017, the Municipality shall give written notice to carters serving customers of the Landfill specifying that waste may no longer be deposited at the Landfill after December 31, 2017. This notification shall be made earlier if contractual arrangements for waste disposal require more advance notification to carters.

- Interim Closure

4. The Municipality and the Municipal Co. shall, no later than January 7, 2018, apply and thereafter maintain Intermediate Cover throughout the entire Landfill, including any areas with substantial vegetative cover in which interim cover was not previously placed in accordance with the provisions of Appendix 6: *Additional Landfill Requirements*. Intermediate cover shall thereafter be maintained until a Final Cover is installed.
5. If there are waste disposal areas owned by third parties, the Municipality and Municipal Co. shall obtain all necessary approvals and/or take any necessary legal steps prior to placing Intermediate Cover on such areas. In the event such third party ownership causes delays in the placement of intermediate cover, reasonable requests for extensions to the above January 7, 2018 deadline will be considered by EPA.
6. For purposes of this Order, Intermediate Cover is defined as a waste cover, more durable than daily cover, consisting of at least 12 inches of compacted soil (or other approved alternative cover material) with appropriate storm water erosion controls (*e.g.*, vegetated cover, temporary chutes, channels, berms, and/or swales).⁵ An Intermediate Cover is intended to further limit precipitation infiltration and to control disease vectors, fires, odors, blowing litter and scavengers, and as a preliminary closure step prior to the installation of a final landfill cover. Intermediate cover must be graded and compacted to minimize ponding, a source of standing/stagnant water (See Appendix 8: *Zika Virus & Mosquito Control*).
7. The Municipality and Municipal Co. may request that EPA approve installation of an alternative form of Intermediate Cover that will provide equivalent or additional protection.

Appendix 8: Zika Virus & Mosquito Control

- Mosquito Control at Landfills

1. No later than seven (7) days after the Effective Date of this Order, the Municipality and Municipal Co. shall, in response to the increased risk to human health presented by the *Aedes* species mosquito and the Zika virus, provide EPA and EQB with a Disease Vector Control Plan, or an updated version of an existing Plan, for the Facility, including integrated pest management (IPM) procedures to remove mosquito habitats and prevent mosquito exposures and the provisions specified in the *Disease Vector Control Plan* section below.⁶

2. The Disease Vector Control Plan must, at a minimum, address and include measures, as set forth below, to reduce the potential for mosquito breeding in all standing waters on the property, including: those impacted by stormwater run on and run off, leachate seepage, surface ponding on and around the landfill, access and egress roadway drainage, sedimentation ponds, conveyance channels and ditches, and exposed waste rainwater catchment receptacles (*e.g.*, scrap tires). Implementation of the plan must commence no later than fourteen (14) days after the Effective Date of this Order.

3. The Disease Vector Control Plan must include the posting of signs in locations at the Facility frequented by employees, contractors, and visitors, which provide mosquito control and bite protection information. Under the Federal regulations for solid waste landfills, 40 C.F.R. Part 258, owners or operators of all municipal solid waste landfill (MSWLF) units must prevent or control on-site populations of disease vectors (*e.g.*, mosquitoes) using techniques appropriate for the protection of human health and the environment. The development, implementation and/or improvement of existing facility disease vector control plans will assist the Landfill owner and operator in controlling *Aedes* species (*A. aegypti* and *A. albopictus*) mosquitoes. The best mosquito control program is an integrated program that includes the elimination of breeding areas, routine larviciding in those breeding areas that cannot be eliminated, and adulticiding only when necessary. Traditional spraying or fogging of pesticides, such as Malathion, may, on occasion, represent a direct risk to human and environmental health.⁷

***Aedes* Mosquito Facts**

- *Aedes* species prefer to bite people, and live indoors and outdoors near people. They are aggressive daytime biters. They can also bite at night.
- These mosquitoes use natural and artificial water-holding containers (*e.g.*, plastic covers, bowls, used tires, bottle caps) to lay their eggs. After hatching, larvae grow and develop into pupae and subsequently into a terrestrial, flying adult mosquito.

⁶ EQB contact: José Roque Julia, Director, Land Pollution Control, 787-767-8181, ext. 3576, or JoseRoque@jca.gobierno.pr.gov

⁷ <http://www.epa.gov/mosquitocontrol/controlling-adult-mosquitoes> & <https://www.epa.gov/mosquitocontrol/malathion> *Malathion: Human Health Draft Risk Assessment for Registration Review*, EPA-HQ-OPP-2009-0317-0080

- About three days after feeding on blood, these mosquitoes lay their eggs over a period of several days. These eggs are resistant to desiccation and can survive for periods of six or more months. When rain floods the eggs with water, the larvae hatch. Generally, larvae feed upon small aquatic organisms, algae and particles of plant and animal material in water-filled containers. The entire immature or aquatic cycle (*i.e.*, from egg to larva to pupa to adult) can occur in as little as 7-8 days. The life span for adult mosquitoes is around three weeks.

Disease Vector Control Plan

The Disease Vector Control Plan must, at a minimum, address the potential for mosquito breeding in all standing waters on the property, including: those impacted by stormwater run on and run off, leachate seepage, surface ponding on and around the Landfill, access and egress roadway drainage, sedimentation ponds, conveyance channels and ditches, and exposed waste rainwater catchment receptacles (*e.g.*, scrap tires). The Plan must include each of the following elements:

1. **Daily Cover.** As required in Appendix 2: *Operational Requirements*, owners or operators must cover disposed solid waste with 6 inches of earthen material, or an approved alternative daily cover, at the end of each operating day, or at more frequent intervals if necessary, to control disease vectors, fires, odors, blowing litter, and scavenging. Frequent applications of cover will also serve to limit on-site bird, rodent, dog, and other potential mosquito-borne disease vectors and mosquito food (blood) supplies. Daily cover must be graded and compacted to minimize ponding, a source of standing/stagnant water. Frequent placement of soil cover will also eliminate exposed solid waste, such as discarded containers, that can serve as mosquito breeding grounds.
2. **Reduction of Standing/Stagnant Water.** Stormwater and leachate drainage chutes and channels shall be regularly inspected and maintained to ensure proper grading and surfacing as to prevent local ponding. Unneeded drainage ditches shall be filled in. Exposed tires, scrap metal piles, and scrapped vehicles (junkers) shall be reduced or eliminated as both may retain significant amounts of rainwater (consistent with the Stormwater Provisional Measures requirements established in Appendix 2: *Operational Requirements*).⁸ Covering with tarps, storing indoors, or shredding are options as is direct application of larvicides and adulticides (pesticides). Stormwater detention ponds should be engineered or reengineered to fully drain and remain dry after storm events and a larvicide program may be needed.
3. **Worker Protection.** Landfill workers (and contractors and visitors) may be exposed to mosquito vector-borne diseases. The Disease Vector Control Plan must include the posting of signs in locations at the Facility frequented by employees, contractors, and visitors, which provide mosquito control and bite protection information (see *Mosquito Control & Protection Information for Posting*, below). Owners or operators must supply workers with mosquito repellents that should be consistent with the U.S. Center for

⁸ Please contact the EPA Project Coordinator regarding any potential conflict with or other issue regarding the Stormwater Provisional Measures requirements established in Appendix 2: *Operational Requirements*.

Disease Control and Prevention, Mosquito Bite Prevention guidelines (also see *Mosquito Control & Protection Information for Posting*, below).

4. Larvicide Program. There are areas at most solid waste landfills, such as stormwater detention ponds, where mosquitoes breed that cannot or should not be eliminated or significantly altered. Mosquitoes breeding in permanent water areas or temporary floodwater areas can be controlled by using biological larvicides. Larvicides can effectively control mosquito larvae when applied as needed without killing the natural predators of mosquitoes. Permanent water areas generally harbor many species of fish and insects that feed on mosquito larvae. Liquid larvicide products are applied directly to water using backpack sprayers and truck or aircraft-mounted sprayers. Tablet, pellet, granular, and briquette formulations of larvicides are also applied by mosquito controllers to breeding areas (See Reference 2, *EPA: Larvicides for Mosquito Control*).

The Disease Vector Control Plan must include a Larvicide Program. Larvicides for consideration by the Municipality and the Municipal Co. include the following:

- a. Bacterial Larvicides. Mosquito larvae that are exposed to the *Bacillus* species have trouble digesting food they eat after the exposure. The larvae then die of starvation. Bacterial larvicides routinely employed for mosquito control include:
 - i. *Bacillus thuringiensis israelensis* (Bti) is a naturally occurring soil bacterium registered for control of mosquito larvae. Bti was first registered by EPA as an insecticide in 1983. There are 25 Bti products registered for use in the United States. Aquabac, Teknar, Vectobac, and LarvX are examples of common trade names for the mosquito control products.
 - ii. *Bacillus sphaericus* (Bs) is a naturally occurring bacterium that is found throughout the world. Bs was initially registered by EPA in 1991 for use against various kinds of mosquito larvae. VectoLex CG and WDG are examples of registered *B. sphaericus* products, and are considered effective for approximately one to four weeks after application.
- b. Water Surface Films.
 - i. Monomolecular films are chemicals that spread a thin film on the surface of the water that makes it difficult for mosquito larvae, pupae and emerging adults to attach to the water's surface, causing them to drown. Films may remain active for typically 10-14 days on standing water, and have been used in the United States in floodwaters, brackish waters, and ponds. They may be used along with other mosquito control measures. Examples are known under the trade names Arosurf MSF and Agnique MMF.
 - ii. Oils, like films, are used to form a coating on top of water to drown larvae, pupae and emerging adult mosquitoes. They are specially derived from petroleum distillates and have been used for many years in the U.S.

to kill aphids on crops and orchard trees, and to control mosquitoes. They may be used along with other mosquito control measures. Examples of trade names for oils used in mosquito control are Bonide, BVA2, and Golden Bear-1111 (GB-1111).

Note, under Commonwealth regulations, owners and operators need to keep an onsite record of all pesticide applications (larvicides, surface films, adulticides, etc.) at the Facility for a period of at least two years. Please contact the Puerto Rico Department of Agriculture for more information on larvicide vendors and larvicide application requirements.⁹ The Municipality and the Municipal Co. may also wish to contact the Puerto Rico Pest Control Association.¹⁰

Other Mosquito Disease Vector Controls

1. Mosquito Surveillance Program. In addition to the above four required Disease Vector Control Plan elements, EPA recommends that landfill owners and operators consider incorporating a Mosquito Surveillance Program. Mosquito surveillance is a key component of a complete Disease Vector Control Plan. The goal of mosquito-based surveillance is to quantify human risk by determining local vector presence and abundance. Reference 1, below, addresses, among other elements, the detailed development of Mosquito Surveillance Program.
2. Adulticides. Pesticide targeting the mosquito adult stage are employed to combat an outbreak of mosquito-borne disease or a very heavy, nuisance infestation of mosquitoes. Adulticide may also be useful where larvicide cannot be effectively applied, such as unstacked tire piles. The development of such a program is beyond the scope of this Order and Appendix. Please contact the Puerto Rico Department of Agriculture for more information on adulticide programs.⁹

In addition, the Puerto Rico Department of Natural and Environmental Resources (DNER) has designated the Puerto Rican harlequin butterfly (mariposa arlequín de Puerto Rico) as Critically Endangered (candidate species for listing under the Federal Endangered Species Act). As the application of adulticides may impact this species, the Municipality and the Municipal Co. should contact the Caribbean Field Office of the U.S. Fish & Wildlife Service prior to applying adulticides.¹¹

References

1. http://msdh.ms.gov/msdhsite/_static/resources/800.pdf

Setting Up a Mosquito Control Program, Jerome Goddard, Ph.D., Medical Entomologist, Bureau of General Environmental Services, Mississippi State Department of Health, Updated June 2003.

⁹ Puerto Rico Department of Agriculture contact:

Juan C. Muñoz Ruiz, Agronomist, 787-796-1735 ext. 276, jcmunoz@agricultura.pr.gov

¹⁰ Puerto Rico Pest Control Association, 787-764-1869, www.pestworldpr.com/

Francisco San Miguel, President

¹¹ U.S. Fish & Wildlife contact: Carlos Pacheco, U.S.FWS, Caribbean Field Office, 787 851 7297 x 221

2. <http://www.cmmcp.org/larvfs.pdf>

Larvicides for Mosquito Control, United States Environmental Protection Agency, Prevention, Pesticides and Toxic substances, May 2000, 735-F-00-002.

▪ Mosquito Control & Protection Information for Posting

1. U.S. Center for Disease Control and Prevention, Zika Virus Fact Sheets:
 - a. http://www.cdc.gov/zika/pdfs/control_mosquitoes_chikv_denv_zika.pdf
 - b. http://www.cdc.gov/zika/pdfs/control_mosquitoes_chikv_denv_zika_spanish.pdf
 2. U.S. Center for Disease Control and Prevention, Mosquito Bite Prevention Poster:
 - a. http://www.cdc.gov/chikungunya/pdfs/fs_mosquito_bite_prevention_us.pdf
 - b. http://www.cdc.gov/chikungunya/pdfs/factsheet_mosquito_bite_prevention_us_spanish.pdf
 3. La Autoridad de Desperdicios Sólidos (ADS), Zika Virus Fact Sheets/Posters:
 - a. <http://www.ads.pr.gov/files/2016/02/Virus-Zika-Final.pdf>
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▪ Detailed Aedes species Surveillance & Control Guidance

1. Surveillance and Control of *Aedes aegypti* and *Aedes albopictus* in the United States
U.S. Centers for Disease Control and Prevention
 - <http://www.cdc.gov/chikungunya/resources/vector-control.html>

Guidance for *Aedes aegypti* and *Aedes albopictus* surveillance and control in response to the risk of introduction of dengue, chikungunya, Zika, and yellow fever viruses in the United States and its territories. This document is intended for state and local public health officials and vector control specialists.

2. Arboviral Disease Weekly Reports
Puerto Rico Department of Health
 - <http://www.salud.gov.pr/Estadisticas-Registros-y-Publicaciones/Pages/Informe-Arboviral.aspx>

The Puerto Rico Department of Health collects the latest information on arthropod-borne viruses (e.g., mosquito-borne dengue, chikungunya and Zika). It includes cases reported to the respective surveillance systems and is published every Friday.

Appendix 9: RCRA Reports

1. Beginning within seven (7) days of the effective date of this Order, the on-site operator shall provide a weekly report to EPA on Landfill compliance and progress until EPA indicates it no longer requires such reports. Unless otherwise agreed to by EPA, such reports shall be short electronic mail messages and include Landfill photos (*e.g.*, on-site, end of the week reporting utilizing a “smart” cellular phone to send electronic mail messages and attached photos).
2. On or before the 1st of each month (starting after the first full month following the effective date of this Order), the Municipality and Municipal Co. shall submit to EPA a RCRA Report, including a certification pursuant to the requirements of Section VI. :Certifications.” At a minimum, the Monthly RCRA Report shall, to the extent applicable to the status of the Landfill at that time, include:
 - a. Documentation of compliance, or statement of and reason for non-compliance, with each of the *requirements* set forth in Appendices 2 through 8 of this Order; and
 - b. Permits and Approvals: A listing of all necessary permits and approvals required and a description of the status of each (including any anticipated, filed, pending, and/or finalized/approved/denied).

EPA may, at its discretion, specify the format, such as a specific Excel Spreadsheet, for the weekly and monthly reporting.