

Guidance Document On How Anaerobic Digestion Fits Current Board Regulatory Structure

Purpose of this Document

As municipalities and industry take on the challenge to reduce the disposal of organic waste into landfills and reduce our reliance on non-renewable energy, the use of anaerobic digestion to treat solid waste to produce compost and biogas will continue to increase in California.

Anaerobic digestion is one technology that is part of a system that includes the digester, feedstock handling process, equipment for the control and collection of off-gases from the digester, and management of digestate (liquid and/or solids) from the digester. This guidance document is intended to provide a basic outline of how the statutory and regulatory requirements of the California Integrated Waste Management Board apply to the permit/authorization of anaerobic digestion projects. The application of the CIWMB requirements must be applied on a case-by-case basis. This document provides an overview of how the Title 14 requirements for permit/authorization apply to anaerobic digestion with consideration of the feedstock, source of the feedstock, location and quantity involved.

The guidance focuses on the applicability for a solid waste facility permit (SWFP), compostable materials handling facility permit, enforcement agency notification and exclusions. It is not a comprehensive discussion of all CIWMB requirements that may apply. Likewise, it does not include a discussion of any approvals that may be required by other state agencies or local jurisdictions, such as the Regional Water Quality Control Board and local air pollution control agency.

The first determination affecting the applicable requirements for authorizing an anaerobic digestion activity is whether the feedstock is a compostable material. If the material is not compostable, then the activity may be treated as transfer and processing facility, subject to the 3-Part Test and volumes involved. The following provides guidance and specifics on how anaerobic digestion is regulated under the current regulatory structure, as charted in Attachment 1, Decision Diagram for Anaerobic Digestion and in Attachment 2, Excluded Activities for Anaerobic Digestion Handling Compostable Materials.

Brief Description of Anaerobic Digestion

Anaerobic digestion (AD) is a biological process that decomposes organic matter in an environment with little or no oxygen resulting in a biogas and liquid/solid stream called digestate. This process occurs in nature in anaerobic environments, as well in landfills. Engineered AD systems have been used in Europe, Canada, Japan, Australia and the U.S. to reduce the biodegradable content of organic solid waste and to produce energy. The decomposition occurs in a four-step process: hydrolysis, acidogenesis,

acetogenesis, and methanogenesis to break down organic matter into methane, carbon dioxide, water, and digestate/residuals.

The biogas contains mostly methane and carbon dioxide but frequently carrying impurities such as moisture, hydrogen sulfide (H₂S), ammonia, siloxane, and particulate matter. Anaerobic digestion can be conducted in lagoons (covered or not), controlled reactors, digesters and landfills. Biogas, primarily methane and carbon dioxide, is the principal energy product from AD processes. Biogas can be burned directly for heat or steam or converted to electricity in reciprocating or gas turbine engines, steam turbines, or fuel cells. Biogas can be upgraded to biomethane and used as a vehicle fuel, injected to the natural gas transmission system, or reformed into hydrogen fuel.

AD systems are employed in many wastewater treatment facilities for sludge degradation and stabilization, and used in engineered anaerobic digesters to treat high-strength industrial and food processing wastewaters prior to disposal. In Europe, AD systems are used to treat the biodegradable fraction of solid waste prior to landfilling in order to reduce future methane and leachate emissions and recover some energy. As a consequence of the European Commission Landfill Directive, installed AD capacity in Europe has increased sharply and now stands at more than 4 million tons annual capacity.

A facility using AD to handle solid waste will have a system comprise of the following units: feedstock handling/storage, preprocessing, digester, collection and storage of the biogas, dewatering of the digestate, and handling/storage of the dewatered digestate. There are several designs for digesters, single-stage (wet or dry), two-stage, and batch systems. The dewatered digestate still contains organic matter and may need to be further treated to stabilize usually through aerated composting or it can be disposed of in a landfill. A digestate that meets the definition of compostable material, but fails the standards set for metals or pathogens set in Title 14 California Code of Regulations Sections 17868.2 and 17868.3, should continue to be considered to be a waste material. The storage and use of biogas generated from anaerobic digestion is not viewed a part of the solid waste handling activities discussed in this guidance.

Information on AD systems and their use is contained in the March 2008 CIWMB report, “Current Anaerobic Digestion Technologies Used for Treatment of Municipal Organic Solid Waste”, can be viewed or downloaded at <http://www.ciwmb.ca.gov/publications/default.asp?pubid=1275>.

Anaerobic Digestion Handling Compostable Material Is Regulated As a Compostable Material Handling Facility

Anaerobic digestion fits within the statutory definition of composting. PRC section 40200(b)(3) and the 3-part test do not apply to the handling of compostable material as the definition assumes that the material being handled has already been separated. Sites using Anaerobic Digestion would potentially be regulated under the CIWMB compostable material handling regulations depending upon the nature of their feedstock and how it is being handled (14 CCR 17850 et seq.).

PRC 40116. "Compost" means the product resulting from the controlled biological decomposition of organic wastes that are source separated from the municipal solid waste stream, or which are separated at a centralized facility. "Compost" includes vegetable, yard, and wood wastes which are not hazardous.

PRC 40200. (a) "Transfer or processing station" or "station" includes those facilities utilized to receive solid wastes, temporarily store, separate, convert, or otherwise process the materials in the solid wastes, or to transfer the solid wastes directly from smaller to larger vehicles for transport, and those facilities utilized for transformation.

(b) "Transfer or processing station" or "station" does not include any of the following:

(1) A facility, whose principal function is to receive, store, separate, convert, or otherwise process in accordance with state minimum standards, manure.

(2) A facility, whose principal function is to receive, store, convert, or otherwise process wastes which have already been separated for reuse and are not intended for disposal.

(3) The operations premises of a duly licensed solid waste handling operator who receives, stores, transfers, or otherwise processes wastes as an activity incidental to the conduct of a refuse collection and disposal business in accordance with regulations adopted pursuant to Section 43309.

Anaerobic digestion of compostable material is regulated under the CIWMB Compostable Materials Handling Operations and Facilities Regulatory Requirements, Title 14, CCR 17850 et seq. The regulations take into the consideration the type of feedstock, location of the activity, the volumes involved, and purpose. If the feedstock is not compostable material, the required permit or authorization will be dependent on the feedstock, size and location as illustrated in the Decision Diagram for Anaerobic Digestion. Mixtures of feedstock may require a case-by-case determination

Title 14, section 17852(a) (8) "Anaerobic Decomposition" means the biological decomposition of organic substances in the absence of oxygen.

Title 14, section 17852(a) (17) "Enclosed Composting Process" means a composting process where the area that is used for the processing, composting, stabilizing, and curing of organic materials, is covered on all exposed sides and rests on a stable surface with environmental controls for moisture and airborne emissions present.

Title 14, section 17852 (a) (12) "Compostable Material Handling Operation" or "Facility" means an operation or facility that processes, transfers, or stores compostable material. Handling of compostable materials results in controlled biological decomposition. Handling includes composting, screening, chipping and grinding, and storage activities related to the production of compost, compost feedstocks, and chipped and ground materials. "Compostable Materials Handling Operation or Facility" does not include activities excluded from regulation in section 17855. "Compostable Materials Handling Operation or Facility" also includes:

(A) agricultural material composting operations;

- (B) green material composting operations and facilities;
- (C) research composting operations; and
- (D) chipping and grinding operations and facilities.

A Tiered Regulatory Structure

CIWMB has implemented regulations which exclude some activities from permitting requirements, allow others to operate after making a notification to the LEA. The tiers that are applicable for anaerobic digestion are the Full Permit, Registration Permit, Enforcement Agency Notification and Excluded Solid Waste Handling tiers. The determination of how anaerobic digestion fits into the tiers is made by the LEA. The type of feedstock, location, and size of the activity determines which tier is applicable for a specific anaerobic digestion project. If the feedstock is not compostable material, the activity is subject to the requirements for a transfer station and solid waste handling. As mentioned above, the regulations have specific provisions and requirements for compostable materials. The regulations for compostable materials provide the criteria for activities that are excluded, subject to requirements for notification or a permit.

How do I determine if the feedstock is compostable?

Anaerobic digestion may be accepting compostable or non-compostable materials. If any portion of the feedstock meets the definition of compostable material, then the activity is subject to the compostable handling requirements of Title 14, Chapter 3.1, Compostable Materials Handling Operations and Facilities Regulatory Requirements. However, if the feedstock is not a compostable material, then the activity may be subject to the requirements of Title 14, Chapter 3, Article 6, Transfer/Processing Operations and Facilities Regulatory Requirements.

Compostable material is any organic materials that when accumulated will rapidly decomposed and is unstable, generating temperatures of at least 50 degrees Celsius (122 degrees Fahrenheit) during decomposition, or is releasing carbon dioxide at a rate of at least 15 milligrams per gram of compost per day, or the equivalent of oxygen uptake. Compostable materials may include vegetable, yard, food, agricultural, biosolid, wood wastes, and digestate.

Again, if the anaerobic digestion is not handling compostable materials, the activity will not be subject to the Compostable Materials regulations, but may be subject to the transfer station regulations.

Title 14, section 17852 (a) (11) "Compostable Material" means any organic material that when accumulated will become active compost as defined in section 17852(a) (1).

Section 17852. Definitions.

(a) For the purposes of this Chapter:

(1) "Active Compost" means compost feedstock that is in the process of being rapidly decomposed and is unstable. Active compost is generating temperatures of at least 50 degrees Celsius (122 degrees Fahrenheit) during decomposition; or is releasing carbon dioxide at a rate of at least 15 milligrams per gram of compost per day, or the equivalent of oxygen uptake.

Anaerobic Digestion Handling Feedstock that is Not Compostable Material

Anaerobic digestion that is handling a solid waste that does not meet the definition of a compostable material may be subject to the requirements for a transfer station.

Activities that only handle material that has been separated for reuse and the 3 Part Test found in Title 14 section 17402.5 (d) would be considered a recycling and would be excluded from regulation. All others could be considered a transfer station and should be examined using Title 14 section 17400 et seq.

There are anaerobic digestion systems that are designed to operate at low temperatures. Several manufacturers that have designed operating temperatures at 95 degrees Fahrenheit are listed in Table 1 of the March 2008 CIWMB report, "Current Anaerobic Digestion Technologies Used for Treatment of Municipal Organic Solid Waste". If all of the compostable materials on-site do not reach a temperature of 122 degrees Fahrenheit, then the activity is not handling compostable material (Title 14 section 1782(a) (11). In this situation, the anaerobic digestion systems will not be considered a compostable material handling activity and may be subject to the requirements for a transfer station

PRC 40200. (a) "Transfer or processing station" or "station" includes those facilities utilized to receive solid wastes, temporarily store, separate, **convert, or otherwise process** the materials in the solid wastes, or to transfer the solid wastes directly from smaller to larger vehicles for transport, **and those facilities utilized for transformation.**

(b) "Transfer or processing station" or "station" does **not** include any of the following: ...

(2) A facility, whose principal function is to receive, store, Convert or otherwise process wastes which **have already been separated for reuse and are not intended for disposal.**

The "3-Part Test"

In order to qualify for this exclusion from the permitting requirements, (1) the site must be receiving material that has been source separated (by the generator) or separated for reuse (at a centralized facility – such as a MRF) prior to receipt at the site; (2) less than 1% of the material must be putrescible and not causing a nuisance as determined by the LEA; and, (3) less than 10% of the residual leaving the site is being sent to disposal or further processing.

14 CCR 17402.5... (d) A "Recycling Center" means a person or business entity that meets the requirements of this subdivision. A recycling center shall not be subject to the requirements of Articles 6.0, 6.1, 6.2, 6.3 and 6.35 of this Chapter.

(1) A recycling center shall only receive material that has been **separated for reuse prior to receipt**.

(2) The **residual** amount of solid waste in the separated for reuse material **shall be less than 10%** of the amount of separated for reuse material received by weight.

(A) The residual amount is calculated by measuring the outgoing tonnage after separated for reuse materials have been removed.

(B) The residual amount is calculated on a monthly basis based on the number of operating days.

(3) The amount of **putrescible wastes** in the separated for reuse material **shall be less than 1%** of the amount of separated for reuse material received by weight, and the putrescible wastes in the separated for reuse material **shall not cause a nuisance**, as determined by the EA.

(A) The amount of putrescible wastes is calculated in percent as the weight of putrescible wastes divided by the total incoming weight of separated for reuse material.

(B) The amount of putrescible wastes is calculated on a monthly basis based on the number of operating days.

(4) The only separation that may occur at the recycling center is the sorting of materials that have been separated for reuse prior to receipt.¹

Title 14 section 17402.5 (b)(1) "Residual" means the solid waste destined for disposal, further transfer/processing as defined in section 17402(a)(30) or (31) of this Article, or transformation which remains after processing has taken place and is calculated in percent as the weight of residual divided by the total incoming weight of materials.

However, if the activities fail the 3 Part Test, then the activity is subject to the requirements for a transfer and processing facility Title 14, Chapter 3, Article 6. The type of authorization or permit that is required is dependent on the quantity of waste received as stated below.

Enforcement Agency Notification, if the volume received is less than 60 cubic yards per day or 15 tons per day.

Registration Permit, if the volume is equal to or greater than 60 cubic yards per day or 15 tons per day, but less than 100 tons per day.

Full Solid Waste Facilities Permit, if equal to or greater than 100 tons per day.

When is an anaerobic digestion activity handling compostable material excluded from any requirement under the solid waste regulations?

The use of anaerobic digestion under specific conditions will be considered an excluded activity and not be subject to permitting or notification requirements. There are provisions addressing agricultural material, small quantity of green material (if no more than 500 cubic yards is on-site at any one time), location, non-commercial composting, and within-vessel composting.

The activities listed below are excluded activities and do not constitute compostable material handling operations or facilities, and are not subject to the Compostable Materials Handling requirements. Nothing in this section precludes the EA or the board from inspecting an excluded activity to verify that the activity is being conducted in a manner that qualifies as an excluded activity or from taking any appropriate enforcement action.

Agricultural Material

Title 14 section 17855 (a)(1) An activity is excluded if it handles agricultural material derived from an agricultural site, and returns a similar amount of the material produced to that same agricultural site, or an agricultural site owned or leased by the owner, parent, or subsidiary of the composting activity. No more than an incidental amount of up to 1,000 cubic yards of compost product may be given away or sold annually.

Title 14, section 17852 (a)(5) "Agricultural Material" means material of plant or animal origin, which result from the production and processing of farm, ranch, agricultural, horticultural, aquacultural, silvicultural, floricultural, vermicultural, or viticultural products, including manures, orchard and vineyard prunings, and crop residues.

Small Quantity of Green Material

Title 14 section 17855 (a) (4) Handling of green material, feedstock, additives, amendments, compost, or chipped and ground material is an excluded activity if 500 cubic yards or less is on-site at any one time, the compostable materials are generated on-site and if no more than 1,000 cubic yards of materials are either sold or given away annually. The compostable material may also include up to 10% food material by volume.

Location At Existing Solid Waste Facilities

Title 14 section 17855 (a) (5) The handling of compostable materials is an excluded from having to comply with the Compostable Materials Handling requirements if:

(A) the activity is located at a facility (i.e., landfill or transfer/processing facility) that has a tiered or full permit as defined in section 18101,

1. has a Report of Facility Information which is completed and submitted to the EA that identifies and describes the activity and meets the requirements of Titles 14 or 27; and,
2. will only use the material on the facility site, or

(B) the activity is solely for the temporary storage of biosolids sludge at a Publicly Operated Treatment Works (POTW), (see section on POTW), or

(H) the activity is part of an animal food manufacturing or rendering operation.

Non-commercial

(6) Non-commercial composting with less than one cubic yard of food material is excluded provided that all compostable material is generated and used on-site.

Within-vessel Small Quantity

(8) Within-vessel composting process activities with less than 50 cubic yard capacity are excluded.

When is anaerobic digestion required to comply with the Enforcement Agency Notification

If an activity meets the requirements for a compost material handling activity, the next step is to determine what type of compostable material handling activity it fits under.

Agricultural Material Composting Operation

When anaerobic digestion is used to process only agricultural material in a manner that does not meet the provisions for the exclusion (Title 14 section 17855 (a)(1)), pursuant to Title 14 section 17856, the operations must comply with the notification requirement.

Title 14, Section 17852 (a)(5) "Agricultural Material" means material of plant or animal origin, which result from the production and processing of farm, ranch, agricultural, horticultural, aquacultural, silvicultural, floricultural, vermicultural, or viticultural products, including manures, orchard and vineyard prunings, and crop residues.

(6) "Agricultural Material Composting Operation" means an operation that produces compost from green or agricultural additives, and/or amendments.

25) "Manure" is an agricultural material and means accumulated herbivore or avian excrement. This definition shall include feces and urine, and any bedding material, spilled feed, or soil that is mixed with feces or urine.

Green Material

A green material composting operation that has up to 12, 500 cubic yards of feedstock, compost or chipped and ground material onsite at any one time needs, to comply with the requirement for Enforcement Agency Notification. (section 17857.1) Green material with any quantity of food material will be subject to a full permit.

Title 14, section 17852 (a)(21) "Green Material" means any plant material that is separated at the point of generation, contains no greater than 1.0 percent of physical contaminants by weight, and meets the requirements of section 17868.5. Green material includes, but is not limited to, yard trimmings, untreated wood wastes, natural fiber products, and construction and demolition wood waste. Green material does not include food material, biosolids, mixed solid waste, material processed from commingled collection, wood containing lead-based paint or wood preservative, mixed construction or mixed demolition debris.

Title 14, section 17852 (a)(32) "Physical Contamination" or "Contaminants" means human-made inert products contained within feedstocks, including, but not limited to, glass, metal, and plastic.

Title 14, section 17852 (a)(22) "Green Material Composting Operation" or "Facility" is an operation or facility that composts green material, additives, and/or amendments. A green material composting operation or facility may also handle manure and paper products. An operation or facility that handles a feedstock that is not green material, manure, or paper products, shall not be considered a green material composting operation or facility. "Green Material Composting Operation" or "Facility" does not include activities excluded from regulation in section 17855.

POTWs

If a Publicly Operated Treatment Works (POTW) is using anaerobic digestion for biosolids on-site as a part of the process to treat biosolids they would be excluded under 17855 (a) (5) (B).

If compostable wastes (material that would typically be received at the site through the sewer system) are added to biosolids undergoing anaerobic digestion at a POTW, the activity shall comply with the EA notification under Title 14 17859.1 For example food waste received by truck and processed on site before being added to the biosolids anaerobic digestion process would require a Notification level tier under Title 14 17859.1.

For activities where anaerobic digestion of other wastes, completely separate from biosolids treatment, is proposed to be conducted at a POTW. These activities may be subject to the requirements for a compostable materials handling activity or transfer station depending on the specifics of the activity.

Research Operations

Research operations for anaerobic digestion with no more than 5,000 cubic yards of feedstock, additives, amendments, chipped and ground materials, and composted on-site at any one time shall comply with the EA notification. A research operation using within-vessel with more than 5,000 cubic yards, may be allowed only if the LEA determines that the increase volume will not pose additional risk to public health and the environment.

Title 14, section 17862. Research Composting Operations.

(a) An operator conducting research composting operations shall not have more than 5,000 cubic-

yards of feedstock, additives, amendments, chipped and ground material, and compost on-site at any one time, and shall comply with the EA Notification requirements set forth in Title 14, California Code of Regulations, Division 7, Chapter 5.0, Article 3.0 (commencing with section 18100), except as otherwise provided by this Chapter.

(b) An operator conducting research composting operations utilizing within-vessel processing, may exceed 5,000 cubic-yards of feedstock, additives, amendments, chipped and ground material and compost, if the EA determines that such increased volume will not pose additional risk to the public health, safety and the environment.

(c) In addition to the EA Notification requirements set forth in Title 14, California Code of Regulations, Division 7, Chapter 5.0, Article 3.0, section 18103.1 (a)(3), the operator shall provide a description of the research to be performed, research objectives, methodology/protocol to be employed, data to be gathered, analysis to be performed, how the requirements of this subchapter will be met, and the projected timeframe for completion of the research operation.

(d) The EA Notification for a research composting operation shall be reviewed after each two-year period of operation. Review criteria shall include the results and conclusions drawn from the research.

(e) Research composting operations that will be using unprocessed mammalian tissue as a feedstock for the purpose of obtaining data on pathogen reduction or other public health, animal health, safety, or environmental protection concern, shall satisfy the following additional requirements:

(1) Unprocessed mammalian tissue used as feedstock shall be generated from on-site agricultural operations, and all products derived from unprocessed mammalian tissue shall be beneficially used on-site.

(2) The operator shall prepare, implement and maintain a site-specific, research composting operation site security plan. The research composting site security plan shall include a description of the methods and facilities to be employed for the purpose of limiting site access and preventing the movement of unauthorized material on to or off of the site.

(3) The EA Notification for the research composting operation using unprocessed mammalian tissue as feedstock and documentation of additional requirements of this section shall be reviewed after each six month period of operation.

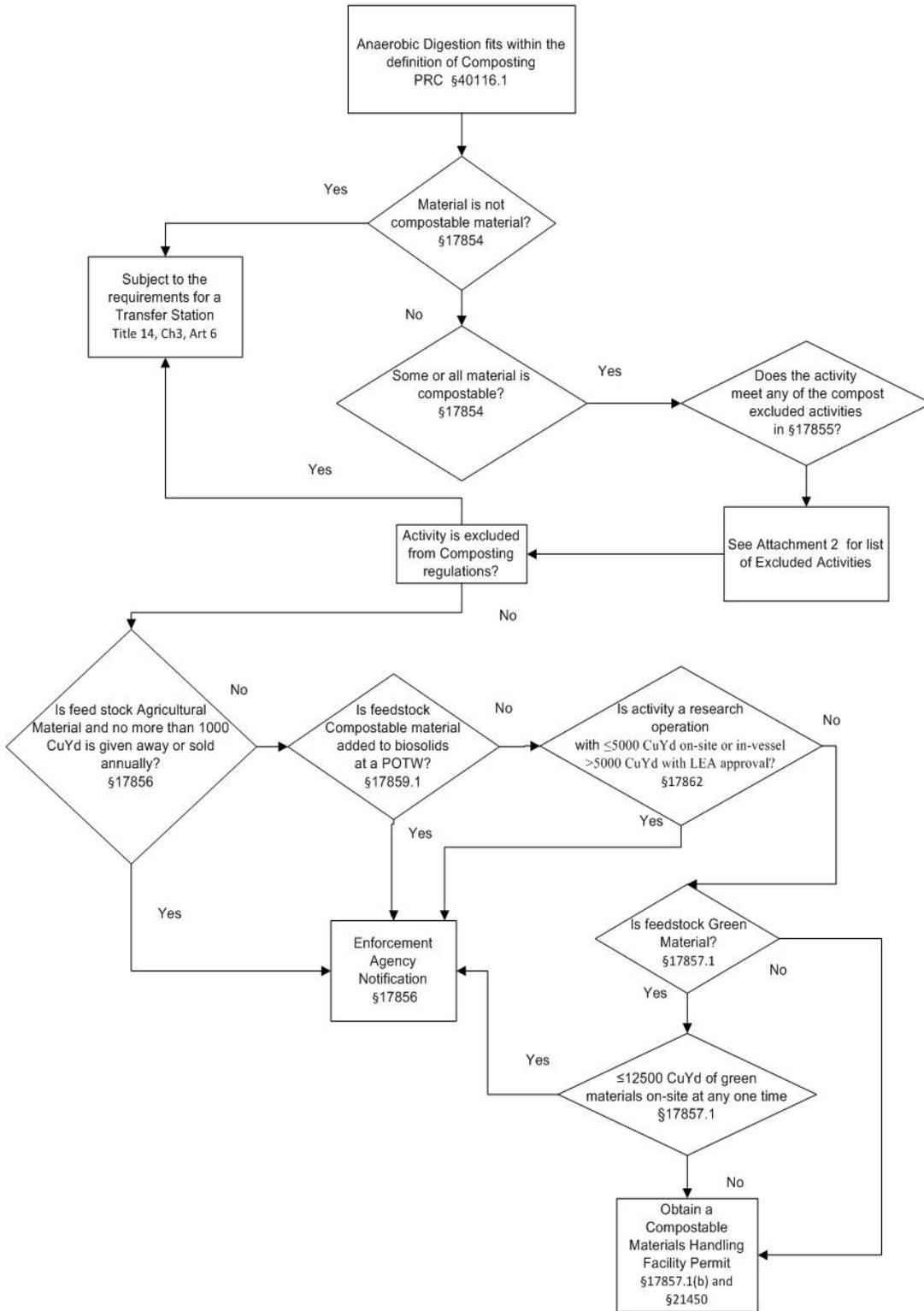
Large Volume of Green Material

An anaerobic digestion of green material at a volume that is more than 12, 500 cubic yards of green materials on-site at any time, is required to obtain a Compostable Materials Handling Facility Permit pursuant to the requirements for a full solid waste facility permit, pursuant to Title 14, sections 17854 and 17857.1 (b).

All Other Material as a Feedstock

Anaerobic digestion of all other material is considered compostable material requires a full permit.

Attachment 1
Decision Diagram for Anaerobic Digestion
 Draft June 30



Attachment 2

Excluded Activities For Anaerobic Digestion Handling Compostable Materials

Tile 14 Section 17855 (a) The activities listed below do not constitute compostable material handling operations or facilities and are considered excluded activities. Nothing in this section precludes the EA or the board from inspecting an excluded activity to verify that the activity is being conducted in a manner that qualifies as an excluded activity or from taking any appropriate enforcement action.

(1) An activity is excluded if it handles agricultural material derived from an agricultural site, and returns a similar amount of the material produced to that same agricultural site, or an agricultural site owned or leased by the owner, parent, or subsidiary of the composting activity. No more than an incidental amount of up to 1,000 cubic yards of compost product may be given away or sold annually.

(4) Handling of green material, feedstock, additives, amendments, compost, or chipped and ground material is an excluded activity if 500 cubic yards or less is on-site at any one time, the compostable materials are generated on-site and if no more than 1,000 cubic yards of materials are either sold or given away annually. The compostable material may also include up to 10% food material by volume.

(5) The handling of compostable materials is an excluded activity if:

(A) the activity is located at a facility (i.e., landfill or transfer/processing facility) that has a tiered or full permit as defined in section 18101,

1. has a Report of Facility Information which is completed and submitted to the EA that identifies and describes the activity and meets the requirements of Titles 14 or 27; and,
2. will only use the material on the facility site, or

(B) the activity is solely for the temporary storage of biosolids sludge at a Publicly Operated Treatment Works (POTW), or

(C) the activity is located at the site of biomass conversion and is for use in biomass conversion as defined in [Public Resources Code section 40106](#); or

(D) the activity is part of a silvicultural operation or a wood, paper, or wood product manufacturing operation; or

(E) the activity is part of an agricultural operation and is used to temporarily store or process agricultural material not used in the production of compost or mulch; or

(F) the activity is part of an operation used to chip and grind materials derived from and applied to lands owned or leased by the owner, parent, or subsidiary of the operation; or

(G) the activity is part of an agricultural operation used to chip and grind agricultural material produced on lands owned or leased by the owner, parent, or subsidiary of the agricultural operation, for use in biomass conversion; or

(H) the activity is part of an animal food manufacturing or rendering operation.

(I) the activity is the storage of yard trimmings at a publicly designated site for the collection of lot clearing necessary for fire protection provided that the public agency designating the site has notified the fire protection agency; or

(J) the materials are handled in such a way to preclude their reaching temperatures at or above 122 degrees Fahrenheit as determined by the EA.

(6) Non-commercial composting with less than one cubic yard of food material is excluded provided that all compostable material is generated and used on-site.

(7) Storage of bagged products from compostable material is an excluded activity provided that such bags are no greater than 5 cubic yards.

(8) Within-vessel composting process activities with less than 50 cubic yard capacity are excluded.

(9) Beneficial use of compostable materials is an excluded activity. Beneficial use includes, but is not limited to slope stabilization, weed suppression, alternative daily cover, and similar uses, as determined by the EA; land application in accordance with California Department of Food and Agriculture requirements for a beneficial use as authorized by [Food and Agricultural Code section 14501](#) et seq.; and reclamation projects in accordance with the requirements of the Office of Mine Reclamation of the Department of Conservation as authorized by [Public Resources Code section 2770](#) et seq.