



Department of  
**Environment &  
Conservation**

**Office of External Affairs**

**Small Business Environmental Assistance Program**

**Guidance on Cannabidiol (CBD) Oil Extraction**

**Environmental Permitting in TN**



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## Introduction

Cannabidiol or CBD oil is an emerging industry in Tennessee. Extraction facilities have contracted with farmers to grow industrial hemp which is potentially a new cash crop in Tennessee in the way that tobacco and cotton have been in the past (and still are today). The extraction process is designed to extract the CBD oil from the flowers of the hemp plant and concentrate it into useful products. There are various methods used and some create air emissions, hazardous materials, or potential water issues. This guidance is designed to address the environmental permitting issues of this emerging industry. It will cover what permits may be necessary depending on their method of operation as well as environmental and areas of potential environmental concern that could occur depending on local requirements (such as with a Publically Owned Treatment Works or POTW facility).

This guidance is only related to the environmental permitting and regulation side of this industry. It is hoped that this guidance will help facilities be aware of their environmental permitting requirements and be in compliance from the start.



## Tennessee Small Business Environmental Assistance Program

The 1990 Clean Air Act Amendments established the framework for new regulatory permitting, operating, and control requirements that affected many small businesses. To help small businesses understand these new regulations, the federal legislation required each state to establish an assistance program. Tennessee's Small Business Environmental Assistance Program (SBEAP) was established in 1993 to assist small businesses.

To effectively meet the compliance assistance needs of small businesses, the SBEAP addresses all environmental media (air, land, and water). The program provides free, confidential, technical assistance on questions regarding regulations, compliance, and other environmental concerns.

The SBEAP serves as a liaison between the regulatory agency and the small business. The SBEAP does **not** have regulatory enforcement authority. Confidentiality is maintained when representing the interest of a small business. The types of assistance provided through the SBEAP include:

- Informing businesses of regulatory requirements that apply to them and the dates those requirements apply
- Working with small businesses to understand the regulations affecting them and assisting them with achieving compliance
- Development of materials such as this guidance and presenting workshops on environmental regulations and how to comply with those regulations.

### How to contact us

You can contact the SBEAP by mail, email, or through our toll free hotline:

**Mail:** Tennessee Department of Environment and Conservation  
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**Hotline:** 1-800-734-3619

The SBEAP website at <http://www.tn.gov/environment/section/sbeap-small-business-environmental-assistance> contains specific information about several industry sectors and provides a resource for small businesses looking for assistance.

## Definitions and Explanations of Abbreviations

**APC:** Division of Air Pollution Control. This is the regulatory division responsible for permitting and regulation of air emissions within the State of TN. There are four local air programs that have primary responsibility over Davidson, Hamilton, Knox, and Shelby Counties. See **Contacts and Web Pages for Reference** for contact information for the local air programs.

**CBD Oil:** Cannabidiol oil. This oil is extracted from the flowers of the hemp plant by various methods. There are a large number of components (CBD, THC, and terpenes) that are extracted from the hemp plant material. There are three general levels of CBD oil extraction and refinement. Full spectrum is often the oil initially extracted. Broad spectrum is a refinement of the CBD oil that removes some components of the CBD oil. Isolate refers to a further refinement of the extract that is often nearly pure CBD with few other components.

**Criteria Pollutants:** These are air pollutants that are commonly emitted and regulated by EPA and APC. They are particulates, ozone, sulfur dioxide, nitrogen oxides, carbon monoxide, and lead. Ozone is formed when nitrogen oxides and volatile organic compounds (VOCs) react in the atmosphere in the presence of heat and sunlight.

**DWR:** Division of Water Resources. This is the regulatory division responsible for permitting and regulation of water pollution, including storm water run-off.

**EFO:** Environmental Field Office. There are eight Environmental Field Offices in TN. These state offices allow inspectors and other regulatory staff to be able to better respond to issues on a regional basis. Some EFOs are located in counties with a local program.

**HAP:** Hazardous Air Pollutant. Specific chemicals which may cause, or contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness. Hexane is an example of a HAP.

**Industrial Hemp or Hemp:** Part of the plant genus Cannabis, hemp should contain less than 0.3% THC. THC contents above that level are prohibited by the Department of Agriculture. Growing hemp is licensed and regulated by the Dept. of Agriculture (Hemp Industry site at Dept. of Agriculture website: <https://www.tn.gov/agriculture/farms/hemp-industry.html>).

**LQG:** Large Quantity Generator. This refers to facilities that generate a certain amount of hazardous waste within a month. See Hazardous Waste section for details.

**POTW:** Publically Owned Treatment Works. This refers to the wastewater treatment plant for a municipality. POTWs may have different capabilities and some may require certain steps or actions to be taken.

**Processor:** Extractors are classified under this section. Processors are not required to be licensed or registered with the Dept. of Agriculture in the same way growers are. If making a product for human consumption (CBD Oil), the processor is required to be licensed as a food manufacturing facility. (See Food Safety site: <https://www.tn.gov/agriculture/consumers/food-safety/hemp-and-food-safety.html> for more information and Dept. of Agriculture contact information)

**PTE:** Potential to Emit. This is the term used to describe the amount of air emissions that could potentially be emitted by a facility operating at maximum capacity continuously all year. It is calculated as emissions at maximum production over 8760 hours of operation per year.

**SBEAP:** The Small Business Environmental Assistance Program.

**SQG:** Small Quantity Generator: This refers to facilities that generate a certain amount of hazardous waste within a month. See Hazardous Waste section for details.

**SWM:** Division of Solid Waste Management. This is the regulatory division responsible for permitting and regulation of solid and hazardous waste.

**TCLP:** Toxicity Characteristic Leaching Procedure. This is a test done on waste to determine if it is a hazardous waste due to the characteristic of toxicity and how much of the toxic material could be dissolved or otherwise leached into groundwater.

**THC:** Refers to delta-9 tetrahydrocannabinol. This is the active substance associated with marijuana and materials with certain concentrations of THC are regulated as narcotics.

**VOC:** Volatile Organic Compound. These are a general classification of organic compounds that are regulated by APC. Some VOCs are also HAPs (Hexane is both a VOC and a HAP).

**VSQG/CESQG:** Very Small Quantity Generator/Conditionally Exempt Small Quantity Generator. This refers to facilities that generate a certain amount of hazardous waste within a month. See Hazardous Waste section for details. CESQG is the term currently in use in TN. Future changes may result in a change to using VSQG to designate facilities that generate quantities below the Small Quantity Generator amounts.

## Air Permitting

Any facility that emits pollutants into the air is required to apply for an air permit unless specifically exempted. In terms of CBD extraction, the methods most commonly used are CO<sub>2</sub>, ethanol, and olive oil. Each method works differently and will extract different terpenes from the hemp or produce CBD oil with different characteristics. Ethanol extraction is the method that will produce the most emissions in terms of VOCs. Olive oil extractions can also produce VOCs, but is overall less volatile than ethanol so emissions would be less. CO<sub>2</sub>, while it is an emission, is not regulated at the scale that extraction facilities would emit. Because of this, most of the discussions will focus on ethanol extractions.



To provide some background, there are four broad categories of air emission sources. These are:

**Insignificant source of air emissions:** These facilities have the potential to emit less than 5 tons/year of any criteria pollutant and less than 1000 lbs./year of any single HAP. A specific request for determination as an insignificant source must be made. The request should also include calculations of emissions demonstrating that the facility does not have the potential to emit more than the listed thresholds. Most commonly, this is done as if the facility were applying for an air construction permit and using the standard forms for that type of facility along with the request. Even if determined to be insignificant, recordkeeping is still necessary to demonstrate that the facility has remained an insignificant source of air emissions.



**True Minor source of air emissions:** These facilities have the potential to emit between 5 and 100 tons/year of a criteria pollutant and up to 10 tons/year of a single HAP or up to 25 tons/year of a combination of HAPs. They must submit an application for an air construction permit 90 days prior to beginning construction. Following receipt of the air construction permit, generally the construction permit is valid for a year or two to build the facility and begin operation in accordance with the air construction permit. The facility would then be required to apply for an air operating permit and may also be required to submit a start-up certification within 30 days of start-up. If nothing has changed with the design of the facility from what was submitted on the application for an air construction permit, only the APC 100 Facility Identification form is required. The operating permit is usually valid for a 10 year period. New construction at a facility that would increase the potential emissions from the facility requires a new construction permit application. The facility should notify APC of other changes that may affect the facility, but do not cause an increase in emissions or violate the terms of their permit(s). This will help inform the inspectors about the changes.

**Conditional Major source of air emissions:** This is a facility that has the potential to emit pollutants at a rate higher than the thresholds of a true minor source, but has taken enforceable limits in their permit to reduce their potential to emit. For example, a facility can agree to only process a certain amount of material per day or month or year (depending on the facility and their recordkeeping) in order to reduce the overall potential emissions. These facilities often have reporting requirements in addition to recordkeeping.

**Major or Title V source of air emissions:** These are usually large facilities that emit pollutants at rates greater than 100 tons/year of a criteria pollutant. Even smaller facilities can be Title V sources because of HAP emissions that meet or exceed 10 tons/year of any single HAP or a combination of 25 tons/year of HAPs. An example would be a boat manufacturer as the majority of the emissions would be styrene which is a HAP. Having a PTE of greater than or equal to 10 tons/year of styrene would classify the facility as a Title V source.

This chart outlines the different categories and a general overview of the current fee structure (which may change in the future).

Category	Insignificant	True Minor	Conditional Major	Major or Title V
Criteria Pollutants	Less than 5 tons/year	Less than 100 tons/year	PTE more than true minor thresholds, but took specific limits to reduce potential	Emits 100 tons/year
HAPs	Less than 1000 lbs./year of any specific HAP	Less than 10 tons/year of any specific HAP and less than 25 tons/year of any combination of HAPS	PTE more than true minor thresholds, but took limits to reduce potential	Emits 10 tons/year or more of a single HAP or 25 tons/year or more of any combination of HAPs
Application?	Use application forms to provide information and request insignificant source determination	Yes	Yes	Yes. Use Title V forms
Permit received?	No	Yes	Yes	Yes
Recordkeeping?	Maybe	Yes	Yes	Yes
Reporting?	Maybe	Maybe	Yes	Yes
Cost	None	Usually \$100 to \$500 for construction. \$18.75 per ton annually (sources under combined 10 tons/year exempt from annual fee)	Usually \$100 to \$500 for construction. \$18.75 per ton annually. Annual Conditional Major review fee	Usually \$100 to \$5000 for construction. \$33.50 to \$75.00 per ton (depending on method of calculation) and minimum fee of \$7500. Additional fees may apply.

All this information is provided to give facilities an idea of what the different thresholds are and how it may affect their facility based on which category they are in.

Based on current research, most CBD oil extractors should fall within the Insignificant or true minor source categories. Typically the three main types of extraction involve carbon dioxide, ethanol, or olive oil. Extractions or other post extraction processes that involve hexane (commonly used to crystallize the CBD oil or produce an isolate), could result in a higher source category as hexane is considered a HAP and the thresholds are much lower for HAPs than criteria pollutants. The next step is to determine emissions to show which category the facility is in.



## Calculating Air Emissions

Two of the main types of extractions would result in emissions that may need to be permitted. Carbon dioxide extractions would not be regulated at the scale of the majority of extraction facilities for carbon dioxide emissions. What could be regulated at facilities using carbon dioxide extraction would be any other materials used (such as hexane) which would be considered a VOC or other type of emission. The discussion on calculating emissions will focus on ethanol extractions as this type of extraction uses a more volatile material than olive oil as the main extraction fluid and it would need to be removed either through evaporation or distillation. The examples given for ethanol can be applied to other types of extraction or use of volatile materials. In addition to volatile emissions, if the extraction facility also processes the hemp such as drying and then separating flowers from the plant, particulate emissions would be created. These would also need to be factored into the overall emissions.

Calculating air emissions is a necessary step for determining what type of air pollution control permit is needed and the amount of emissions from the facility. There are a couple of different methods, depending on the data that is available.



## Emission Factors

Emission factors are sort of a shortcut in calculations where testing and evaluation of several facilities either by EPA, states, or independent testing organizations have determined that a certain process would emit a certain amount of emissions per a certain amount of production. Emission factors can be developed by EPA and published through their AP-42 Compilation of Air Emission Factors or via the WebFIRE database. Another method is based on manufacturer's testing of their equipment. Emission factors can also come from the manufacturer of the extraction equipment if it is purchased as a unit and has been tested to determine emissions when used according to the manufacturer's instructions. Several extractors have stated an emission amount of 3 to 5% loss across each method. Test data would need to be presented to justify those numbers. Some parts of the process such as rotary evaporators and distillation columns have been in use in many other industries. The manufacturers of these parts should have emission information available for a variety of solvents.

At this time, there are no general emission factors established by the EPA for CBD oil extraction. Because of this, either manufacturer's testing of equipment or mass balance is likely the most common method that can be used by CBD oil extractors. Mass balance is a method of comparing the amount of starting material vs. the amount of material at the end and the difference is considered an emission. Records need to be kept for the amount of material used and the end amount to show the difference. This would include any amounts sent to a waste container.

Examples of emission factors could be 5 quarts of ethanol per 100 lbs. of hemp processed. This would need to be converted into pounds per hour of emissions. For example, if 100 lbs. of hemp were processed during a normal operating day and the operating hours are 8 hours/day, then 100 lbs. of hemp was processed in 8 hours, or 12.5 lbs. of hemp was processed per hour. Similarly, for the ethanol, the volume is converted into weight by multiplying the volume by the density in terms of lbs./gal. Ethanol has a density of 6.5965 lbs./gal.

1.  $5 \text{ quarts of Ethanol/day} * (1 \text{ gal./}16 \text{ quarts}) = 0.3125 \text{ gal./day}$
2.  $0.3125 \text{ gal./day} * (6.5965 \text{ lbs./gal}) / (8 \text{ hours/day}) = 0.2577 \text{ lbs./hour of ethanol emissions}$

This could also be developed into a ratio of ethanol to hemp for a production emission factor:

3.  $0.2577 \text{ lbs. of ethanol emissions} / 12.5 \text{ lbs. of hemp} = 0.0206 \text{ lbs. of ethanol emissions/lb. of hemp}$

This emission factor could potentially allow scaling up of production. For example, with the above emission factor if instead of 100 lbs./day of hemp was processed, 1000 lbs./day was processed, and then the emissions would be:

4.  $1000 \text{ lbs. of hemp/day} * (0.0206 \text{ lbs. of ethanol emissions/lb. of hemp}) / (8 \text{ hours/day}) = 2.5768 \text{ lbs. of ethanol emitted/hour}$

Once an emission factor is developed for a process, as long as the process is the same for each batch, then the emissions should be approximately the same. However, one thing to keep in mind is that this may only cover the emissions from the extraction unit. Later steps such as distillation to further remove ethanol from the CBD oil may not be factored into the emissions from the extraction unit. Mass balance can help

## Mass Balance

In the absence of manufacturer's test data on emissions, mass balance is another option to develop emission factors for your process. Mass balance refers to starting with a known amount of material and ending with another known amount of material. The difference would be considered an emission. This method does require recordkeeping to know how much material is used, how much was recovered, and the time period between. For example, during an 8 hour period of extraction, 8 gallons of ethanol were used. After the extraction, distillation and recovery, and other steps, 7.5 gallons of ethanol was put into hazardous waste containment or recovered for reuse after purification via distillation. This would indicate that 0.5 gallons of ethanol was emitted during an 8 hour period. Calculating a per hour basis would yield:

5.  $0.5 \text{ gallons of ethanol/day} * (6.5965 \text{ lbs./gal}) / (8 \text{ hours/day}) = 0.4123 \text{ lbs./hour ethanol emitted}$

Repeating this process should yield similar results and an emission factor could be developed from this either on a per hour basis or a per unit basis.

There should be two values developed for emissions from production. The average amount of emissions and the maximum amount of emissions, both in terms of lbs./hour. The average amount is the amount released under normal operation. The maximum amount is often a calculated amount based on the capacity of the equipment. For example, if an extractor is usually operated at 80 lbs. per extraction and three extractions per day are

usually done, the average amount processed per day is 240 lbs. or 30 lbs./hour for an 8 hour workday. If the equipment has a capacity of 100 lbs. per extraction and four extractions per day can be done, the maximum amount processed per day would be 400 lbs. or 50 lbs./hour for an 8 hour workday. If an emission factor such as developed in formula #3 above was used, the average emissions per hour would be:

$$6. \quad 30 \text{ lbs./hr. hemp processed} * 0.0206 \text{ lbs. of ethanol emitted/lb. of hemp processed} = 0.618 \text{ lbs. of ethanol emitted/hour}$$

The maximum emissions using the same emission factor would be:

$$7. \quad 50 \text{ lbs./hr. hemp processed} * 0.0206 \text{ lbs. of ethanol emitted/lb. of hemp processed} = 1.03 \text{ lbs. of ethanol emitted/hour}$$



If isolate is produced, often pentane, hexane, or heptane is used. Of these three, hexane is considered a Hazardous Air Pollutant (HAP). As such, the specific emissions of hexane would need to be calculated in addition to hexane being emitted as a VOC. The above formula would work with hexane as well, replacing the density of the ethanol with that of hexane which is 5.6613 lbs./gal (check Safety Data Sheet section 9 of the hexane being used for specific data from the supplier being used). As noted previously, if a facility has the

potential to emit more than 1000 lbs./year of a HAP, it would need to be permitted and would not be an insignificant source of air emissions.

### **Potential to Emit (PTE)**

Potential to emit is just that, the maximum possible amount of uncontrolled emissions that could be emitted by a facility. It is calculated by multiplying the maximum emissions for the facility by the number of hours in a year (8,760 hours/year). Using the above example in formula #7, the PTE for the facility would be:

$$8. \quad 1.03 \text{ lbs. of ethanol emitted/hour} * 8760 \text{ hours/year} = 9022.8 \text{ lbs. of ethanol emitted/year}$$

The average and PTE is usually also expressed in terms of tons/year on the APC permit application forms. To calculate the average or PTE in terms of tons/year, the lbs./year should be divided by 2000 lbs./ton. Using the results of formula #8:

$$9. \quad (9022.8 \text{ lbs. of ethanol emitted/year}) / (2000 \text{ lbs./ton}) = 4.5114 \text{ tons/year}$$

Because the PTE for the example facility is under 5 tons/year for ethanol, a VOC, unless there are more than 1000 lbs./year of a HAP such as hexane, the facility should be an insignificant source of air emissions. But a facility would need to do the calculations to show this and provide the information to APC. If the calculations show that the facility is an insignificant source, a request for determination as an insignificant source should be included when submitting information to APC.

### **Air Pollution Control Permit application process**

Air Pollution Control permit applications should be applied for 90 days prior to beginning construction at a facility. In the event that an existing structure is being used, construction would mean the installation of any permanent equipment or footers for such equipment. For example, construction would include the installation of the extraction equipment for a CBD facility. The application consists of several forms. For most facilities the following would be part of the application: APC 100 Facility Identification, APC 101 Emission Point, APC 102 Process or Fuel Burning Source, calculations of emissions, a diagram of the layout of the facility (a general sketch is acceptable), and a process flow diagram.

The APC 100 Facility Identification is for general information, especially contact information, and identifies the air emission source. The APC 101 Emission Point form collects the information from the calculations. Also, stack or emission point data is requested. For CBD



facilities, this might best relate to air flow from a hood or other similar exhaust point. The hood or fans should have air flow information available from the manufacturer either on the hood or fan or in the equipment manual. The APC 102 would mostly be used for the process and most facilities would enter the amount of hemp processed and the amount of solvent used. The process flow diagram is a general diagram of the process for the extraction method used. Use it to identify points where emissions may occur such as from the extraction equipment and the distillation equipment.

The application forms can be downloaded from <https://www.tn.gov/environment/program-areas/apc-air-pollution-control-home/apc/permits-air/permit-air-air-quality-construction-permit/apc-non-title-v-construction-permit.html>. Send the application forms and the associated calculations and diagrams to [Air.Pollution.Control@tn.gov](mailto:Air.Pollution.Control@tn.gov). All forms are developed as fillable PDF forms and can be signed digitally. Download the forms and save to a personal computer before filling them out. Trying to fill them out from the webpage may cause all the information to not be saved. If the facility is shown to be an insignificant source of air emissions, include in the email a request for determination as an insignificant source of air emissions.



Construction permit applications will then be reviewed by the APC permitting staff, and notice that an application was received will be posted on the TDEC website for public comment if a construction permit was required. Construction permits would also require newspaper publication. The public comment period is usually 30 days and any comments received during that time are reviewed and addressed. A draft permit will be shared with the facility and the APC staff in the EFO for review and comment prior to issuance. Do not hesitate to ask questions of APC or the SBEAP at this time, especially the facility believes they cannot comply with the permit or there are errors in it. The permit should be

considered the manual for what needs to be done by the facility in order to stay in compliance.

Construction permits are usually valid for two years as the facility is constructed. Within 30 days following startup, an operating permit should be applied for. If there have been no changes to the facility from the construction permit application, only the APC 100 may be submitted, changing the appropriate points of the application to apply for an operating permit as opposed to a construction permit. If there were changes that do not result in higher emissions than initially determined, the operating permit application should be used to update the calculations and information. If changes occur between construction and start up, or later in the life of the facility, that would cause an increase in emissions, a new construction permit application should be submitted. This also includes those facilities that were previously determined to be insignificant sources of air emissions as the increase in emissions may cause them to no longer be insignificant sources. For this reason, recordkeeping of air emissions is a necessity for all facilities, even if determined to be insignificant, in order to show that the facility continues to be insignificant or determine if there is an increase necessitating permitting.

The permit, both construction and operating, will have multiple conditions. Some are general conditions such as if the responsible person changes or how visible emissions will be evaluated that are common to all facilities. Others will be more specific to the facility being issued the permit and will contain limits or production values as a proxy to limits. For example, a facility may be limited to emitting 7 tons of VOCs/year based on the PTE of the facility. Increases above this would indicate an increase in overall capacity of the facility and require a new construction permit. The permit should also contain any recordkeeping or reporting requirements. Be sure that the required recordkeeping is understood and doable. If the facility has questions, please ask during the draft permit phase.

## **Potential Sources of Air Pollutant Emissions**

As has been discussed, the extraction of CBD using ethanol or other volatile solvents would result in emissions of VOCs and perhaps HAPs depending on the solvent. Even if ethanol is not used as a primary solvent, there may still be some solvent use. It is always advised that a construction permit application be submitted for a new source in order to provide APC the information needed to characterize a facility. For example, a facility using liquefied CO<sub>2</sub> would not have VOC emissions from the primary extraction, but it may use ethanol or other solvents at later stages. As such, there would be a minimal amount of emissions, but without some level of documentation and information, APC may request information at the time to verify that a permit is not required.

There may be additional sources of emissions present at a facility. Some facilities may have a boiler present to provide either general facility heating or heating for a process such as larger scale evaporation. These may be considered separate sources of air emissions and would be subject to permitting. Natural gas boilers of less than 10 MMBTU/hour in heat capacity may be considered exempt from permitting, but should be included in a permit application. This informs APC of the presence of the boiler and that it should be considered exempt. Because CBD oil extraction results in plant material following the extraction process, it could be used as a fuel source rather than disposing of it (see the Solid Waste Permitting section for more information on disposal options). However, burning the plant material may result in the boiler being subject to the National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers at Small/Area Sources (40 CFR Part 63, Subpart JJJJJJ), more commonly referred to as the 6J Boiler rule. The SBEAP has a webpage dedicated to the 6J Boiler rule at: <https://www.tn.gov/environment/program-areas/sbeap-small-business-environmental-assistance/sbeap-boilers.html>. The AP-42 Compilation of Air Pollutant Emission Factors has data on emission factors for both natural gas combustion and plant/wood combustion. The AP-42 publication can be found at: <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors>. Combustion emission factors are found in Chapter 1: External Combustion Sources.

Other sources may also be present (such as emergency engines) and would need to be included on a permit application, either as part of the overall source or as separately permitted sources. Remember that if a source has the potential to emit less than 5 tons/year of any criteria pollutant and less than 1000 lbs./year of a HAP, a request for determination as an insignificant source should be included with the permit application. In this manner, APC should have the information necessary to make a determination and either permit the source, or supply a letter indicating the source is an insignificant source of air emissions. In either case, the facility is doing its due diligence and helping keep itself in compliance.

## Solid Waste Permitting

Solid waste actually doesn't have to be solid, so waste solvent from extraction does count as a solid waste. There are two main types of waste that an extraction facility could generate: solid waste, which is required to be non-hazardous, or hazardous waste. Depending on the extraction method and also the level of extraction and distillation, it is possible that a facility would only have special waste and not generate any hazardous waste. Each type of waste and some of the permitting and handling requirements related to each will be discussed.

## Special Waste

Special wastes are a category of solid waste that can be difficult or dangerous to manage, but are not hazardous wastes. Examples include sludge, bulky wastes, pesticide wastes, medical wastes, and industrial wastes. These wastes would need to be disposed of at designated landfills. Alternatively, plant material waste, which would be the hemp following extraction, could be returned to the farm or another similar place and beneficially reused as a feedstock and is not a hazardous waste.



In terms of ethanol extraction, the most prominent issue would be how much ethanol is left in the plant material. If there is more than 24% ethanol content in the plant material, it would be considered a hazardous waste due to the flammability characteristic. If the plant

material or other wastes have less than 24% ethanol, it can be disposed of as a special waste. Potentially, if the plant material is shown to have low ethanol content and is returned to the same farm that produced it, there may not be a need for any permitting at all. Otherwise, if it is a special waste and sent elsewhere, a special waste application approval may be required.

Hemp that is not viable for sale as a product may be produced if it has become contaminated by some material or contains too high a THC content due to concentration from varieties of hemp that naturally come close to the 0.3% THC content mark. The type of waste this would be would need to be determined. If contaminated, a Toxicity Characteristic Leaching Procedure (TCLP) or potentially other tests would need to be done to determine if it is hazardous or non-hazardous. If non-hazardous, it may be classed as a special waste and disposed of accordingly. If higher than allowed levels of THC are detected, the Department of Agriculture would have procedures in place for proper destruction and disposal.

If the waste has been determined to be a special waste, the facility would need to obtain a Special Waste Approval from SWM. Information and forms for the approval can be found here: <https://www.tn.gov/environment/permit-permits/waste-permits1/special-waste-approval/special-waste-application.html>. The application fee is \$300 and the approval should be recertified every three years. Information on recertification can be found here: <https://www.tn.gov/environment/permit-permits/waste-permits1/special-waste-approval/special-waste-recertification.html>. If the process or a characteristic of the waste changes, then a new approval would be needed. The landfill where the special waste is to be disposed of would need to be determined and listed as part of the application. Contacting the regional EFO SWM or contracting with local waste haulers familiar with handling special waste would be resources for locating a landfill or special waste processing facility. Special waste approval will need to be obtained prior to disposal and would best be obtained shortly after generation.

Another option for plant material special wastes from CBD extraction would be obtaining a Solid Waste Permit-by-Rule for land application. This is where the plant material following the extraction is sent to a location that can spread it over a land area. This would allow the plant material to be used as a soil amendment or perhaps animal fodder. SWM allows that if the waste plant material is returned to the farm that produced the hemp, no permitting would be necessary. Plant material that is determined to be a hazardous waste could not be handled in this manner. Information on Solid Waste Permit-by-Rule can be found at: <https://www.tn.gov/environment/permit-permits/waste-permits1/solid-waste-management-permit-by-rule.html>. The fee for land application is \$100 annually.



## **Hazardous Waste**

Wastes such as plant material containing more than 24% ethanol, waste ethanol, or other chemicals such as hexane that are used to create isolates may be considered hazardous waste. Hazardous waste has certain requirements for storage, recordkeeping, retention times, and more. Any waste mixed with a hazardous waste is considered hazardous. Because disposing of hazardous waste is generally more expensive than non-hazardous, ensuring non-hazardous waste does not mix with hazardous waste will save money on disposal and generator fees.

There are three categories of generator status, based on the amount of hazardous waste generated per month. Because the amounts are considered on a monthly basis, recordkeeping to demonstrate when and how much of a material is put into hazardous waste containment is important to determine generator status. The three categories are Very Small Quantity Generators (also known as Conditionally Exempt Small Quantity Generators), Small Quantity Generators, and Large Quantity Generators. Very Small Quantity Generators (VSQG/CESQG) are those that generate 100 kg (220 lbs.) or less of hazardous waste or generate 1 kg (2.2 lbs.) or less of acutely hazardous waste per month. Small Quantity Generators (SQG) generate more than 100 kg (220 lbs.) of hazardous waste and less than 1 kg (2.2 lbs.) of acutely hazardous waste per month. Large Quantity Generators (LQG) generate equal to or greater than 1000 kg (2200 lbs.) of hazardous waste or more than 1 kg (2.2 lbs.) of acutely hazardous material each month.



Information on Hazardous Waste Activity can be found on this webpage: <https://www.tn.gov/environment/permit-permits/waste-permits1/notification-of-hazardous-waste-activity.html>. One of the links on this page goes to a series of EPA lists of hazardous wastes. Certain hazardous wastes are considered acutely hazardous, which means they are considered more dangerous because of toxicity or flammability characteristics. All P-listed waste and all dioxin containing F-listed wastes are acutely hazardous. Examples of P-listed wastes are some pharmaceuticals or pesticides such as those that contain sodium azide as the sole active ingredient.

There are specific requirements for hazardous waste storage. In addition to the quantity of hazardous waste generated each month, there are limits on the amount that can be stored at any one time and for how long. VSQGs can accumulate no more than 1000 kg (2200 lbs.) of hazardous waste at any time. If more than this is accumulated, the facility would be considered a SQG. SQGs can accumulate up to 6000 kg (13,200 lbs.) at any one time. Accumulating more would classify them as an LQG. VSQGs do not have a time limit as to how long hazardous waste can be accumulated, but it is advisable to have it disposed of in a timely manner, perhaps annually. SQGs may only store hazardous waste for a 180 day period. LQGs may only accumulate hazardous waste for a 90 day period before needing to have it removed from the facility.

Facilities generating hazardous waste would also need to have designated storage areas, records documenting when the waste was generated and how much is stored on an ongoing basis, and container management practices that are in compliance with the regulations. A certified hazardous waste transporter would be required for removing the hazardous waste. Often the transporter may provide hazardous waste containers for collection that may make it easier for containment or shipping. They may also be a source for information concerning hazardous waste handling regulations. However, it is recommended that if a facility has an environmental regulatory question they should contact either the SBEAP or the specific division within an EFO (such as SWM for hazardous waste questions). See the **Contacts and Webpages** section for how to contact the EFO for the county where the facility is located.

SWM should be notified of hazardous waste generation within 90 days of generation. Facilities would then need to notify SWM annually by March 1<sup>st</sup> of each year. Forms for notifying can be found on this website: <https://www.tn.gov/content/tn/environment/program-areas/solid-waste/hazardous-waste-management/hazardous-waste-and-used-oil-forms.html>. The first form is HN-CS which is the Unified Certification and Cover Sheet form. This form can also be used to apply for an EPA ID number which is required when dealing with hazardous

waste. Next is the HS-H form, the Hazardous Waste Registration and Notification. Section 6 (6, 6a, 6b, and 6c) is for Hazardous Waste Transporters only. The third form is the HN-H (contacts) form. This form gathers data on contacts associated with your facility. HN-EA is for Hazardous Waste Environmental Activity Notification. This indicates which type of generator your facility is. The form uses the term Conditionally Exempt Small Quantity Generator (CESQG) in place of Very Small Quantity Generator (VSQG). The WSR is the Hazardous Waste Stream Report. This form is where details about the hazardous waste are collected. If there are multiple waste streams, multiple WSRs may be needed. Analytical results from testing done to determine if a waste is a hazardous waste should provide the majority of information that the WSR requests. Finally, there is the NF or Hazardous Waste Notification Fees form which helps calculate the fees related to the hazardous waste activity for new facilities. Those that have notified concerning hazardous waste activity previously should use the GFDS form (Annual Hazardous Waste Generation Fee Determination). Generators should also submit the OSR, Hazardous Waste Offsite Shipping, form annually. This form reports how much hazardous waste has been shipped off and this information is supported by the associated hazardous waste manifests.

Transporters of hazardous waste that are working in TN can be found on a list on the SWM webpage: <https://www.tn.gov/environment/program-areas/solid-waste/hazardous-waste-management/haz-waste-transportation.html>. These companies will have an EPA ID number that is required to be on some forms such as the OSR. Also, be aware that some hazardous wastes are subject to universal waste requirements. Examples of universal waste include fluorescent lamps (contain mercury), certain batteries (such as those containing lead), and some pesticides. For more information on universal waste, see the SWM webpage on the subject: <https://www.tn.gov/environment/program-areas/solid-waste/hazardous-waste-management/sw-universal-waste.html>.





## Water Permitting and Other Water Issues

There are two main times when a water permit of different types would be necessary. The first would be during the construction phase and relates to the construction of the facility. The second would be related to once operations begin. Several of the water issues relating to CBD extraction may not be covered by a permit, but would instead be handled by discussion and agreement with the local POTW.

### Construction

There are two main water permits that may be needed during the construction phase. These are the Aquatic Resource Alteration Permit (ARAP) and the Construction Stormwater permit. Both are dependent on specific criteria to be necessary.

The ARAP would be required if there is a stream or wetland disturbed during the construction. Examples include water diversion, road or utility crossings of a stream, bank sloping or stabilization, or excavation in a stream or wetlands. This permit would need to be applied for 90 days prior to beginning the activity which would disturb the body of water. Some projects may affect waters of the U.S. and require an additional Federal permit from the U.S. Army Corps of Engineers. Information on ARAPs can be found on this webpage: <https://www.tn.gov/environment/permit-permits/water-permits1/aquatic-resource-alteration-permit--arap-.html>

More commonly, a Construction Stormwater National Pollutant Discharge Elimination System (NPDES) permit would be necessary. This permit is required if the construction will disturb an acre or more of land. Examples include subdivisions, industrial buildings, utility lines, roads, and land clearing activities. This permit should be applied for 30 days prior to beginning construction. If your facility is going to be located in an existing structure or when building a new building where the construction disturbs less than one acre of land, this permit is not needed. For more information, visit this webpage: <https://www.tn.gov/content/tn/environment/permit-permits/water-permits1/npdes-permits1/npdes-stormwater-permitting-program/npdes-stormwater-construction-permit.html>. Construction companies that are involved in projects that are an acre or more in size should be familiar with the requirements of Construction Stormwater permitting. Included should be a Stormwater Pollution Prevention Plan (SWPPP) and twice weekly inspections related to the Construction Stormwater permit. Once construction is complete, if an ARAP or Construction Stormwater permit was needed and coverage is no longer needed, a Notice of Termination for each should be submitted to [water.permits@tn.gov](mailto:water.permits@tn.gov).



## Operating

Once the facility begins operating, it should evaluate if an Industrial Stormwater NPDES permit is needed. The most commonly used form of this permit is the Tennessee Stormwater Multi-Sector General Permit and is the type that most CBD oil extraction facilities could obtain if necessary. Facilities that do not have materials (such as stored drums of ethanol or CBD) or activities exposed to stormwater can submit a No Exposure Certification. In other words, if everything is kept inside or under shelter, a No Exposure Certification would be needed to indicate that stormwater will not wash contaminants from your facility into the stormwater system or water ways. If an Industrial Stormwater NPDES is needed, it should be applied for five days prior to beginning operations. The general permit would require basic recordkeeping, monitoring, and reporting. Among these reports would be the Discharge Monitoring Report and the Annual Storm Water Monitoring Report. More information about the Industrial Stormwater NPDES and the forms for either the No Exposure Certification or the Notice of Intent to obtain an Industrial Stormwater NPDES permit can be found here: <https://www.tn.gov/content/tn/environment/permit-permits/water-permits1/npdes-permits1/npdes-stormwater-permitting-program/npdes-industrial-stormwater-general-permit.html>

## Other Water Issues

If the facility is located in an area where their sewer system would connect with a municipal sewer system, they will need to contact the local POTW to let them know when they are planning to begin industrial discharges to the sewer system. The POTW will likely need to be aware of any special characteristics for the discharge and may ask for certain items or restrictions. This is because each POTW has different capabilities, capacities, and treatment systems. Some are able to handle most industrial discharges because their volume is so high that the discharge of most individual facilities gets diluted to the point of non-detection. Others can be affected by certain chemicals that affect their Biological Oxygen Demand to the point where the whole plant cannot operate effectively. When such happens, the POTW may either refuse to accept discharges from a facility or ask for pre-treatment or other ways to reduce certain characteristics of a facility's discharge. If the POTW refuses a discharge, the facility may have to store their discharge on site and contract with a waste hauler to collect it and either haul it to a POTW that can accept the discharge or treat it at a facility designed for handling industrial discharges.

Based on discussions with another state agency that is familiar with CBD oil extraction, there were two other potential issues. One was the POTW requiring the discharge from a CBD oil facility to go into a side stream. This would effectively separate it out for more detailed testing and certain pre-treatment procedures prior to the discharge entering the main sections of the POTW. This was because, although industrial hemp contains 0.3% or less THC, the extraction process can concentrate the THC in some of the first passes or rinses. This may be due to cross contamination at the facilities where this was seen, but it is something to be aware of for TN CBD oil extractors. The other issue is that CBD oil is very viscous, almost like a thick syrup or grease. Because of the nature of CBD oil, reports have been received that some POTWs are requiring grease traps at CBD oil extraction facilities. The CBD oil recovered from the grease traps should be able to be handled as a special waste. Again, both of these issues would be dependent on discussions with the local POTW and what they may require and what their system can handle.

## Concluding Comments

As CBD oil extraction is a fairly new industry type in TN, there are likely going to be a lot of questions. The permitting process is designed to help characterize your facility and provide regulatory agencies with a clear understanding of the processes and emissions at your facility. The more clear and complete this information is, the better the regulatory agencies will understand what is occurring at your facility and what emissions can be expected from the facility. Similarly, this will help develop familiarity with the CBD oil extraction process from the regulatory side and enable accurate answering of questions from the industry as to what is required. This guidance was developed to begin answering those questions, but as each facility is unique, it cannot answer them all. However, it should be a guide to present steps needed to be considered and taken by CBD oil extractors to ensure environmental compliance. There are many resources on the TDEC website as well as through associations within TN and national wide. The SBEAP is also available to assist small businesses with helping them maintain environmental compliance.



## Contacts and Webpages for Reference

**SBEAP:** 1-800-734-3619, [BGSBEAP@tn.gov](mailto:BGSBEAP@tn.gov), <http://www.tn.gov/environment/section/sbeap-small-business-environmental-assistance>

**TDEC main page:** <https://www.tn.gov/content/tn/environment.html>

**EFO:** Chattanooga (Bledsoe, Bradley, Grundy, Hamilton, Marion, McMinn, Meigs, Polk, Rhea, and Sequatchie): 423-634-5745 (<https://www.tn.gov/environment/contacts/about-field-offices/field-offices/chattanooga.html>)

Columbia (Bedford, Coffee, Franklin, Giles, Hickman, Lawrence, Lewis, Lincoln, Marshall, Maury, Moore, Perry, and Wayne): 931-380-3371  
(<https://www.tn.gov/environment/contacts/about-field-offices/field-offices/columbia.html>)

Cookeville (Cannon, Clay, Cumberland, DeKalb, Fentress, Jackson, Macon, Overton, Pickett, Putnam, Smith, Van Buren, Warren, and White): 931-520-6688  
(<https://www.tn.gov/environment/contacts/about-field-offices/field-offices/cookeville.html>)

Jackson (Benton, Carroll, Chester, Crockett, Decatur, Dyer, Hardeman, Hardin, Haywood, Henry, Lake, Lauderdale, Madison, McNairy, Obion, and Weakley): 731-661-6283  
(<https://www.tn.gov/environment/contacts/about-field-offices/field-offices/jackson.html>)

Johnson City (Carter, Greene, Hancock, Hawkins, Johnson, Sullivan, Unicoi, and Washington): 423-854-5400 (<https://www.tn.gov/environment/contacts/about-field-offices/field-offices/johnson.html>)

Knoxville (Anderson, Blount, Campbell, Claiborne, Cocke, Grainger, Hamblen, Jefferson, Knox, Loudon, Monroe, Morgan, Roane, Scott, Sevier, and Union): 865-594-6035  
(<https://www.tn.gov/environment/contacts/about-field-offices/field-offices/knoxville.html>)

Memphis (Fayette, Shelby, and Tipton): 901-371-3000  
(<https://www.tn.gov/environment/contacts/about-field-offices/field-offices/memphis.html>)

Nashville (Cheatham, Davidson, Dickson, Houston, Humphreys, Montgomery, Robertson, Rutherford, Stewart, Sumner, Trousdale, Williamson, and Wilson): 615-687-7000  
(<https://www.tn.gov/environment/contacts/about-field-offices/field-offices/nashville.html>)

**Local Air Programs:** Davidson County – Metro Public Health Department: 615-340-5616  
(<https://www.nashville.gov/Health-Department.aspx>)

Hamilton County – Chattanooga/Hamilton County Air Pollution Control Bureau: 423-643-5971 (<https://apcb.org/>)

Knox County – Knox County Air Quality Management Division: 865-215-5900 (<https://knoxcounty.org/airquality/>)

Shelby County – Shelby County Health Department Air Pollution Control: 901-222-9599 (<http://www.shelbytnhealth.com/161/Pollution-Control-Programs>)

**Air Permitting webpages:** <https://www.tn.gov/environment/program-areas/apc-air-pollution-control-home/apc/permit-air-home.html> (Use Air Quality Construction and Non-Title V Operating Permit buttons)

### **Solid Waste Management Permitting**

**webpages:** <https://www.tn.gov/environment/permit-permits/waste-permits0.html> (Use Special Waste and Notification of Hazardous Waste Activity buttons)

**Water Permitting webpages:** <https://www.tn.gov/environment/permit-permits/water-permits.html> (Use NPDES Permits and Aquatic Resource Alteration Permit (ARAP) buttons)

### **TN Department of Agriculture Hemp Industry**

**webpage:** <https://www.tn.gov/agriculture/farms/hemp-industry.html>

**TN Hemp Industries Association:** <https://www.tnhia.org/>

### **Cannabis Environmental Best Management Practices**

**Guide:** [https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/EQ/MJ%20Sustainability/Cannabis\\_BestManagementPracticesGuide\\_FINAL.pdf](https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/EQ/MJ%20Sustainability/Cannabis_BestManagementPracticesGuide_FINAL.pdf) (please note that this guide is from Colorado and has a lot of focus on growers but has useful information for the TN hemp industry)