Dry Cleaners Environmental Certification Workbook

For use with MassDEP's Environmental Results Program

Revised 2015

Important Notice

If you have questions regarding this workbook or other Dry Cleaner ERP related questions, please contact: baw.edep@state.ma.us or call the ERP Help Line at 617-556-1097.

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INTRODUCTION

WHAT IS THE ENVIRONMENTAL RESULTS PROGRAM?

We at the Massachusetts Department of Environmental Protection (MassDEP) have fundamentally redesigned environmental regulation to be less costly and more effective. We have replaced the 25 year-old system of prescriptive case-by-case permits with comprehensive compliance certifications, industry wide performance standards and streamlined regulation.

This new, common sense approach to regulation is the Massachusetts Environmental Results Program (ERP), a regulatory system that we believe holds great promise for making it easier to meet — and exceed — Massachusetts' environmental standards. This new approach gives you the flexibility and information you need to do the job, while improving accountability to the public for environmental performance.

ERP streamlines existing pollution control requirements for your dry cleaning company by combining duplicative, and at times conflicting, federal and state requirements into one unified document. ERP is a performance-based regulatory program designed to focus on results and outputs. This workbook provides you with the information you need to understand and meet your environmental obligations.

You are required by MassDEP to comply with environmental regulations that apply to you, standards within this workbook and the information contained within ERP Certification Forms. By answering the questions in the ERP Certification form you certify that you comply with the requirements of 310 CMR 7.26(10) – (16) and 310 CMR 70.03 (Air Quality), 310 CMR 72.00 (Industrial Wastewater Standards for Dry Cleaners), and 310 CMR 30.0000 (Hazardous Waste). Regulatory citations are displayed for your information in ["brackets"].

You are required to submit a Certification Form to MassDEP when requested to do so by MassDEP. Annual submittal of the ERP Certification form is required under 310 CMR 70.00 (Environmental Results Program Certification) and 310 CMR 72.05 (Industrial Wastewater Standards for Dry Cleaners). Failure to comply with these standards (submit the forms or submit the ERP fee) will require correction and possible enforcement action by MassDEP.

Please read each standard and the information carefully and ask questions!

MassDEP is here to assist you in understanding and complying with environmental protection rules.

WHY IS MASSDEP INTERESTED IN DRY CLEANING?

Professional dry cleaners are an essential part of our communities; your services save us time and keep our clothing in the best possible condition. Most dry cleaners are family-owned businesses, which have been good neighbors for decades. Dry cleaning has become such a routine part of our lives that we rarely think about it.

But growing evidence that the primary chemical used to dry clean clothes, perchloroethylene (perc), can cause damage to our health and the environment is making people think more about dry cleaning. For example, although most dry cleaners recycle and reuse perchloroethylene within the dry cleaning system, it is possible to lose significant amounts of perchloroethylene from each facility each year. Perchloroethylene is released into the dry cleaning stores, and may be released into the homes of your customers, into your own homes and into the air we breathe.

Perc and other cleaning chemicals, if improperly stored and managed, can also be released into the soil and groundwater. Half the people in this country use groundwater (public and private wells) for drinking and many dry cleaners use chemicals that could pollute groundwater if improperly handled. The continuing awareness of environmental risks and the need for protecting public health has resulted in the enactment of more and more laws. The United States Congress has decided that perchloroethylene is one of the toxic air pollutants that must be regulated under the Clean Air Act. This federal law and its regulations are implemented by the United States Environmental Protection Agency (EPA) and state environmental agencies. MassDEP is responsible for implementing air quality protection laws, water protection and waste management laws. This is why MassDEP is interested in improving the ability of dry cleaners to comply with environmental rules.

Perc has both acute and chronic adverse health effects. Acute effects can include skin, eye and respiratory irritation, depression of central nervous system function, headache, dizziness, nausea, incoordination, unconsciousness, and for very high exposures, death. The International Agency for Research on Cancer (IARC) classifies perc in Group 2A (probably carcinogenic to humans) and the US National Toxicology Program classified perc as "reasonably anticipated to be a human carcinogen; other chronic effects may include liver, kidney or central nervous system damage. The developing fetus and children may be particularly vulnerable to the toxic effects of perc.

A. FACILITY INFORMATION

This section provides guidance to those questions found in Section A of the ERP certification form. Corresponding questions from the ERP form are noted in **red**.

FTE guidance and sample calculation **(A1m)**

Number of Full-Time Employee Equivalents (FTEs):

On the first page of the certification form under Section A (Facility Information), you will find item 1.m. The following description and example below will help you to provide the answer:

What is a full-time employee equivalent (FTE)? An FTE is defined as 2,000 hours worked. The total number of FTEs at your facility depends only on the total number of hours worked by all employees and not the number of persons working. The total number of hours worked should include all paid vacation, paid holiday, and sick leave hours used by each employee. An FTE calculation should include the time spent by all employees doing work related to the facility location where perc is used; it should not include the time spent by employees relating to work at other separate locations (e.g., store fronts at other locations).

To calculate the total number of FTEs at your facility, add up all of the hours worked by all your employees, including your (the owner's) time, and divide by 2,000. For example:

Owner: (50 hrs/week) X (52 weeks/year) = 2,600 hrs/year

Part-time help: (15 hrs/week) X (52 weeks/year) X (4 part time employees) = 3,120 hrs/year

Bookkeeper: (2 hrs/week) X (52 weeks/year) = 104 hrs/year

Presser: (24hrs/week) X (52 weeks/year) X (2 pressers) = 2,496 hrs/year

Tailor/seamstress: (12 hrs/week) X (52 weeks/year) = 624 hrs/year

Delivery truck driver: (20 hrs/week) X (52 weeks/year) = 1,040 hrs/year

Total hours = 9,984 hrs/year

Total full-time employee equivalents = 9,984 hrs/year divided by 2,000 hrs/FTE = 4.992 or 5 FTEs

Definitions and supporting information on co-residential and co-located facilities (A5 and A6)

Co-Residential Facility – If your dry cleaning business is located in a building with an apartment or other residential space, even if vacant when you submit your certification, then your business is considered to be co-residential, as defined by the USEPA.

Co-Located Facility - If your dry cleaning business is located in a building without a residence, but with one or more of the following, then your business is considered to be co-located, as defined by the MassDEP: [310 CMR 7.26(11)]

- Children's pre-school
- Health care facility
- Licensed day care center
- Prison
- School (elementary, middle, or high)
- Youth or senior center

Impacts if your dry cleaning business is co-residential or co-located:

Co-residential –

- **Installation of a perc machine is prohibited after September 5, 2008.** [310 CMR 7.26(12)(a)5]
- **Operation of any perc machine is prohibited after December 21, 2020.** [310 CMR 7.26(12)(a)6]

Please note: if your business is co-residential and you installed a perc machine between December 21, 2005 and July 13, 2006, you are subject to federal requirements. Information is available from the US EPA at: http://www.epa.gov/region1/contact/index.html

Co-located –

- **Installation of a perc machine is prohibited after November 5, 2008.** [310 CMR 7.26(12)(a)4]
- **Operation of any perc machine is prohibited after December 21, 2020.** [310 CMR 7.26(12)(a)6]

B. CHANGE IN STATUS GUIDANCE

If you operate a perc machine, do NOT complete the Change in Status section.

If you cease using perc as the dry cleaning solvent in your store, you must notify MassDEP of the change within 60 days. [310 CMR 7.26(15)(c)]

Check B1 if you cease all dry cleaning in your store (become a drop-off store), and enter the date of the change.

Check B2 if you cease **all** perc dry cleaning and use only perc-alternative solvent(s) and/or professional wet cleaning.

Enter the date of the change, the new cleaning method, the number of new systems, and an estimate of the quantity of alternative solvent you plan to use annually.

Check B3 if you change your business to only coin-operated dry cleaning machines.

Please note: If you check B1 or B2 and you have operated as a small quantity generator (SQG) of hazardous waste, you should review your generator status. Otherwise, once your ERP classification is closed your remaining SQG classification will result in a $525 annual compliance fee. To avoid a greater annual compliance fee: you can, if applicable, change your generator status to VSQG, or if checking B2a "hydrocarbon", you may change your status to VSQG or SQG for waste oil. *If you have any questions about your generator status, call Mike Hurley at 617-292-5633*.

C. COMPLIANCE AND POLLUTION PREVENTION GUIDANCE

This section provides guidance to those questions found in Section C of the ERP certification form. Corresponding questions from the ERP form are noted in **red**.

Air Quality (Sections C1 through C16) [Regulations at: 310 CMR 7.26(10) – (16)]

Definitions/Key Concepts

Air contaminant is any substance or man-made physical phenomenon in the open air space and includes dust, gas, mist, odor, smoke, vapor, heat, sound, or any combination of these.

Air Emission is any discharge or release of any air contaminant to the open air space. For dry cleaners, air emission come from perchloroethylene, dry cleaning machines, boilers, spotting solvents or other contaminants to open air.

Compliance Assistance & Forms

(C1) The dry cleaning machine information items (a) (machine manufacturer and model) and (b) (serial number) can be obtained from the machine nameplate or from the manufacturer's literature. Items (c), (d), or (e) (installation date) should be available in your records. Item (g) (control devices) - Your machine(s) is most likely equipped with a refrigerated condenser (3rd generation machine) or both a refrigerated condenser and a carbon adsorber (4th or 5th generation machine). If you are not sure, call the manufacturer or the person who maintains your equipment.

(C2) All transfer machines were required by the ERP program to cease operation after July 27, 2008. [7.26(12)(b)]

(C3a) If you installed a dry-to-dry machine after December 21, 2005, it must be equipped with a refrigerated condenser and a secondary carbon absorber (a 4th or 5th generation machine). The secondary carbon absorber (sometimes called a vapor absorber) reduces the perc vapor in the drum just before the end of the cool-down cycle. [7.26(12)(a)3]

(C7) All dry-to-dry machines installed before December 9, 1991 must have either a carbon absorber that was installed before September 22, 1993 or a refrigerated condenser. [7.26(12)(a)1]

(C8) If you have a refrigerated condenser installed on a dry-to-dry machine, you may not vent or release perchloroethylene contained within the dry cleaning machine to the air. If air is pulled through the door when the door is opened after the cycle, then a diverter valve must be used. *Avoiding the release of perchloroethylene to the air minimizes the amount you must purchase each year to replace that which escaped. [7.26(13)(c)3]*

(C9) You are required to check the refrigerated condenser at least once per week to be sure it is operating properly. [7.26(13)(c)] and [7.26(14)(a)1 or 2] You have 2 options:

1. The best way is to check the refrigeration system high pressure and low pressure gauges. During the drying cycle, the high and low pressures should be in the range specified in the manufacturer's operating instructions. If you can't find the gauges, refer to the operating manual or ask the manufacturer's representative. You should post the correct high and low pressure ranges near the gauges for convenience.

2. The second option is to monitor the temperature on the outlet side of the refrigerated condenser. It should be equal to or less than 45°F (7.2°C) at the end of the cycle. This is probably the method you have been using to check the refrigerated condenser on your system.

Remember to record the date and result (acceptable temperature or high and low pressures) in your log. See Forms C-1 and C-2 for examples of forms you can use to keep weekly monitoring records. [7.26(15)(d)5]

FORM C-1
Example: Equipment Monitoring Log Form — Refrigerated Condenser
High and Low Pressure Option

Observe the refrigeration system high and low pressure gauges during the drying cycle on a weekly basis. The high and low pressures must be within the normal ranges specified in the manufacturer's operating manual.

Note the normal range specified in the manual here:_____

Date	Inspector's Initials	Machine No.	High Pressure	Low Pressure	Are Both Pressures within Normal Range
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No
					Yes/No

If the high or low pressure was outside the normal range, attach a completed corrective action report.

FORM C-2
Example: Equipment Monitoring Log Form — Refrigerated Condenser Temperature Option

Measure the temperature on the outlet side of refrigerated condenser on a weekly basis.

Date	Inspector's Initials	Machine No.	Temperature	Is Temp. <45°F/7.2°C?
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No
				Yes/No

If the temperature was greater than 45° F/7.2 °C attach a completed corrective action report.

(C10) If the temperature at the outlet of the refrigerated condenser does not fall to or below 45 F at the end of the cool-down cycle, before the machine door is opened, or if the high and low pressures are not within normal ranges, the system needs to be fixed. [7.26(13)(e)]

(C11) You should fix problems within 24 hours, if possible. If parts need to be ordered, they must be ordered within 2 days after finding the problem, and repairs completed within 5 days after receiving the parts. If your refrigerated condenser and/or carbon adsorber have not had a problem, check the not applicable box. Use the corrective action log form C- 4 to document the repair. *Identifying and addressing problems in a timely manner minimizes the amount of perchloroethlyene that you have to purchase each year to replace emissions to the air.*

(C12) Conduct the weekly leak checks with the machine operating. In addition to using the leak detection device, you should use your senses (smell, sight, and touch) to detect leaks. Places to check for leaks include: seals, gaskets, hose/pipe fittings and valves. The information below can be used to assist you in performing your weekly leak checks, using the appropriate methods and equipment. [7.26(13)(h) and (i)]

(C13) You should try to fix leak problems within 24 hours, if possible. If parts have to be ordered, they must be ordered within 2 days after finding the problem, and repairs completed within 5 days after receiving the parts. If your dry cleaning machine has not had a leak, check the "not applicable" box. *Prompt leak detection and repair saves you money by minimizing the need to purchase virgin perchloroethylene [7.26(13)(j)]*

How to Conduct a Leak Check

Step 1 Get checklist (Form C-3 below) and leak detection equipment.

Note: The Department of Environmental Protection (MassDEP) requires each facility to use one of the following types of device to detect leaks at dry cleaning facilities. Leak detection equipment must be operated and calibrated in compliance with manufacturer's specifications.

1) a halogenated-hydrocarbon detector
2) a portable gas analyzer
3) an alternative device approved by the Department

In addition, you must check for perceptible leaks, that is, you must use your senses (e.g. sight, smell or touch) to detect leaks. NOTE: continuous exposure to perc and other chemicals can cause de-sensitivity to odor; therefore it is recommended that you have someone not continuously exposed to the solvent in use assist you with the assessment.

Step 2 Go to machines and locate proper leak detection points.

Required: Proper leak detection points are hose & pipe connections, fittings, couplings, valves, door gaskets & sealings, pumps, solvent tanks & containers, water separators, muck cookers, stills, exhaust dampers, diverter valves, filter gaskets & sealings and cartridge filter housings.

Step 3 Record readings from the leak detection equipment and record readings on the form for that machine. See the Equipment Leak Check Inspection Log (Form C-3), below.

Note: A vapor leak is an emission of perchloroethylene vapor from unintended openings in the dry cleaning system. Leaks waste perchloroethylene and your money. It is important for you to fix leaks promptly.

If you find a leak, you must complete steps 4 or 5

Step 4

- Record the leak detection
- Repair the leak within 24 hours.
- Record the activity you used to repair the leak in your corrective action log Form C-4.

Step 5

- If it is necessary to order a new part, order the part within 48 hours of leak detection.
- Fix leak within 5 days after receiving parts.
- Record the activity you used to repair the leak.

Step 6

- Keep all records of leak checks and repairs.

FORM C-3

Example: Multiple Equipment Leak Check Inspection Log Form

Date _____ Inspector _____

Inspection done by: _____ (monitoring instrument)

Inspect the following items for leaks. Circle Yes or No.

	Signs of Leaking		
	Machine No.	Machine No.	Machine No.
Hose & Pipe Connections, Fittings, Couplings, Valves	Yes/No	Yes/No	Yes/No
Door gaskets & Sealings	Yes/No	Yes/No	Yes/No
Pumps	Yes/No	Yes/No	Yes/No
Solvent Tanks & Containers	Yes/No	Yes/No	Yes/No
Water Separators	Yes/No	Yes/No	Yes/No
Muck Cookers	Yes/No	Yes/No	Yes/No
Stills	Yes/No	Yes/No	Yes/No
Exhaust Dampers	Yes/No	Yes/No	Yes/No
Diverter Valves	Yes/No	Yes/No	Yes/No
Filter Gaskets & Sealings	Yes/No	Yes/No	Yes/No
Cartridge Filter Housings	Yes/No	Yes/No	Yes/No

If Yes was answered to any of the above, attach a completed corrective action report.

Halogenated Leak Detector Options

Perc is a chlorine-based chemical, and so can be detected by instruments that detect halogenated hydrocarbons. Based on information provided by leak detector manufacturers and tests conducted by other states or groups, the following units are expected to meet EPA guidelines. ***This is not an endorsement.*** *Please note that this is not an exhaustive list. Further research is recommended to find the best leak detector for your dry cleaning facility. The first seven detectors below are available for$200±. The Aeroqual detector is available for $800±.*

Product	Manufacturer	Model	Sensitivity
	Inficon Inc	Tek-Mate	<25 ppm
	Inficon Inc	The Compass	<25 ppm
	Nova Systems Products	BOLO Green	5 ppm
	TIF Instruments	TIF8800A	1 ppm
	TIF	TIFXP-1A	<25 ppm
	TIF	TIFRX-1A	<25 ppm
	TIF	TIFXL-1A	<25 ppm
	Aeroqual	Aeroqual 200	1 ppm

FORM C-4
Example: Corrective Action Log

Date of initial inspection _____
Machine No._____
Inspector _____
Describe Problem:

Are Parts Needed Yes No
(Circle One)

Date Ordered _____
Date Received _____
Date Installed _____

Date problem corrected _____

Explain:

(C14) You are required to maintain the following records in your files for three (3) years: [7.26(13)(k)] and 7.26(15)(d)]

- Copy of design specifications and operating manuals for dry cleaning systems
- Perchloroethylene purchase receipts, purchase log, and yearly perchloroethylene consumption
- Weekly equipment monitoring records
- Weekly leak check records
- Repair logs

To assist you with maintaining all required air quality management records the forms C-1 through C-4 in this section of the workbook, are provided for your use. Make copies of the example forms and keep them together in a binder.

- Perc purchases - keep receipts/invoices and monthly log (Form C-5)
- Weekly leak checks – (Form C-3)
- Weekly emission control monitoring – (Form C-1 or C-2)
- Repairs – keep receipts/invoices and repair log (Form C-4)
- Keep the dry cleaning system operating manual in the shop.

(C16) The following (Form C-5) is an explanation of how to track your perc purchases during the previous 12-month period. Remember to keep all purchase records and receipts. [7.26(15)(d)1 and 2]

FORM C-5

Steps to Calculate the Amount of Perchloroethylene You Purchased in the Last 12 Months

1) Use the chart below.
2) Add all perchloroethylene purchases made in each of the prior 12 months based on receipts.
3) Enter the correct amount purchased next to the correct month.
4) For the month(s) that you did not purchase Perchloroethylene, the gallons purchased is zero.
5) Add up all the months for a total amount purchased in the last 12 months.

1. _____ (Month)	_____ (Amount)
2. _____ (Month)	_____ (Amount)
3. _____ (Month)	_____ (Amount)
4. _____ (Month)	_____ (Amount)
5. _____ (Month)	_____ (Amount)
6. _____ (Month)	_____ (Amount)
7. _____ (Month)	_____ (Amount)
8. _____ (Month)	_____ (Amount)
9. _____ (Month)	_____ (Amount)
10. _____ (Month)	_____ (Amount)
11. _____ (Month)	_____ (Amount)
12. _____ (Month)	_____ (Amount)
TOTAL	**_____ (Amount)**

Air Quality Best Management Practices

These best management practices are offered as ways that you can further improve the efficiency and safety of your facility, beyond required compliance items above.

Operation & Maintenance

- Leaks should be repaired immediately and keep parts on hand. Leaks cost you money, expose workers and contribute to air pollution.
- Regularly check air vents for drips.
- Replace faulty/worn gaskets on button trap and around cleaning machine door.
- Drain all filter cartridges in their housings or in another sealed container for at least 24 hours before properly handling them as a hazardous waste.
- Make sure additives you put in the solvent are dissolved before the solvent goes through the filter.
- Be sure bulky items are completely dry before removing them from the dryer. Do not finish-dry them outside the dryer.

Worker Protection

- Involve employees in pollution prevention and safety. All workers should understand and follow rules and regulations.
- Avoid skin contact with perc. Perchloroethylene can cause skin irritation if it comes into contact with skin repeatedly or for long periods of time.
- If splashed into the eyes, perchloroethylene can cause burning and irritation of the eyes. It is a good idea to periodically monitor your employees' exposure to perchloroethylene at work by having them wear personal exposure badges.
- Perchloroethylene may cause reproductive effects and be absorbed in breast milk. Pregnant women and nursing mothers should take precautions to minimize exposure to perchloroethylene as much as possible.
- Perchloroethylene may be absorbed by certain foods such as dairy products, meat, fish, poultry, fats, and oils. You should not store food or eat and drink in areas where perchloroethylene is stored or used.
- Testing of air in dry cleaning shops has indicated that perchloroethylene levels can be quite high especially for workers who operate or do maintenance work on dry cleaning machines. Dry cleaning workers should wear respirators when they do maintenance work such as cleaning out button traps, lint traps and stills and replacing filters. For complete information from the Occupational Safety and Health Administration (OSHA), see their document titled "Reducing Worker Exposure to Perchloroethylene (perc) in Dry Cleaning" here: http://www.osha.gov/dsg/guidance/perc.html
- Minimize the opening of button traps and lint baskets.
- Minimize the time that the door of the dry cleaning machine is open.

Materials Management

- Consider replacing hazardous pre-spotters with water-based, non-chlorinated pre-spotter.
- Use good record keeping practices to keep track of how much material is purchased, delivered and sent off-site as waste.
- Supervise your deliveries to ensure everything you ordered is delivered and is in good condition.
- Recycle if possible by segregating: cardboard and cardboard boxes; plastic containers and plastic film or wrap; metal and aluminum objects such as hangers; glass which is clean; or used lubricating oil.
- Keep updated copies of Material Safety Data Sheets for all chemicals at the facility and update yearly. This contains important health information.

General

- State governmental agencies such as economic development and small business assistance organizations can help your business with understanding business regulations, financial assistance and access to helpful business information.

Industrial Wastewater (Sections C17 through C24) [Regulations at: 310 CMR 72.00]

Definitions/Key Concepts

Industrial Wastewater is any wastewater resulting from any process of industry, manufacturing, trade or business, regardless of volume or pollutant content. For dry cleaners, industrial wastewaters include: separator water, vacuum water, washing machine water, compressor water, non-contact cooling water, and boiler blowdown.

Discharge is the release of industrial wastewater to the waters of the Commonwealth from any source through pipes, sewers, or other means.

All cleaners should include separator water in industrial wastewater discharged to the sewer, container, holding tank, evaporator, or have a federal or state discharge permit. Dry cleaners should be aware that local agencies may have additional discharge requirements that have to be met. Discharges to surface water (e.g. streams, lakes, rivers) require a federal NPDES discharge permit. Discharges to groundwater or ground require a MassDEP groundwater discharge permit. Separator water may not be discharged to septic systems, cesspools, or leach fields.

Groundwater permits are often difficult to obtain and conditions of these permits are difficult to maintain. You may choose to collect wastewater in a tank or container and dispose of it accordingly instead of obtaining a permit.

Compliance Assistance & Forms

(C17) You are allowed to dispose of separator water by evaporation. Since separator water contains a small amount of perc, it is best to vent the vapor from the evaporator to the outside, and away from windows, doors or air intakes of adjacent buildings. You can minimize the amount of perc being evaporated by passing the separator water through carbon filters before evaporation. See the BMP Fact Sheet in Appendix A for the best way to manage separator water. [310 CMR 72.04(6)]

(C18) This question refers to machines that use water and detergent/bleach for cleaning - no organic solvents.

(C19) If you do not know if your facility is connected to a sewer, you can ask your landlord, local Department of Public Works (DPW), or Board of Health.

(C19c) The discharge of hazardous substances to the local POTW can cause serious issues, and is, therefore, prohibited. [72.04(3)(b)]

- If perchloroethylene were discharged to the sewer, it could leach out to the ground through leaks in the sewer pipes.
- Flammable materials create fire and explosion hazards to the sewer workers.

- Corrosive materials include materials which have a pH lower than 5.0 or greater than 10.0. Corrosive materials, such as acids, "eat up" the pipes and pumps in the sewer system that will contribute to leakage into the ground.
- Solids, such as lint, can cause blockage and damage to residential and commercial piping and treatment systems.
- Heated wastewater has a temperature equal or greater than 104°F/40°C.

(C20a) Discharge of industrial wastewater, including separator water and laundry water, to surface water (river, lakes, storm drains) is not allowed without a federal NPDES permit issued by the EPA. Please note that storm drains discharge directly to surface water such as river, lakes and other water bodies. For information, call the EPA at (617) 918-1111 (Customer Service Center). [72.04(1)]

(C21) If you do not know if your facility is connected to a septic system, you can ask your landlord, local Department of Public Works (DPW), or Board of Health.

(C21a) Discharge of any industrial wastewater, including separator water and laundry water, to a septic system, cesspool, or leach field is prohibited. [72.04(1)]

(C22) Discharge to groundwater or directly on the ground requires a groundwater discharge permit issued by MassDEP. Information can be obtained on the MassDEP website at: http://www.mass.gov/eea/agencies/massdep/water/approvals/wastewater-forms.html [72.04(1)]

(C23) If you store separator water in container(s) and ship it off-site, it must be handled as hazardous waste. See Hazardous Waste Requirements beginning at question C25.

(C24) If you store laundry wastewater in *containers* and haul it off-site you must comply with the following items. (Note: If you store separator water in *containers* and have it hauled off-site, it must be stored and shipped as Hazardous Waste.) [72.04(5)]

- Keep records of wastewater analysis;
- Keep disposal manifests or bills of lading on site, for a period of three years;
- Use containers that are in good condition;
- Make sure containers are placed on a surface that does not have any cracks;
- Provide a spill containment system if containers are stored outdoors;
- Restrict entry to the general public into the storage areas; and
- Label all containers with the words "Industrial Wastewater" or "Non-Hazardous Waste".

If you store laundry wastewater in *permanent tanks* and haul it off-site you must comply with the following items. (Note: If you store separator water in *permanent tanks* and have it hauled off-site, it must be stored and shipped as Hazardous Waste.) [72.04(5)]

- Have a containment structure with 110% capacity of the total volume of all above ground tanks.
- Have a bell and light alarm in a conspicuous location if they are remotely/automatically filled tanks. The alarm is activated when the level of wastewater reaches seventy-five (75) percent capacity of the tank and the alarm signal is transmitted to a staffed location. Manually filled tanks are provided with visual or sight glass type of level measurement;
- Locate tank(s) to provide year round access for emptying;
- Have odor control as necessary;
- Tanks are made of, or lined with, materials that will not react with, and otherwise be compatible with the industrial wastewater to be stored;
- Locate tank(s) in a secured storage area which is free of cracks and gaps that is sufficiently impervious to contain leaks and spills; and,
- Have a label on tank(s) indicating contents are non-hazardous.

Industrial Wastewater Best Management Practices

These best management practices are offered as ways that you can further improve the efficiency and safety of your facility, beyond required compliance items above.

Operations & Maintenance

- Please be sure to check all pipes that lead outside your building. If the pipe(s) empty to a street drain it may lead to a stream, river, pond, or the pipe(s) may just lead to the ground. These situations typically require permitting.
- Consider waste management costs when buying new dry cleaning equipment. Sometimes, a more technologically advanced machine will save in operating expenses.
- Improperly maintained equipment could lead to air releases of perchloroethylene that could raise the perchloroethylene air levels around your dry-cleaning shop. Perchloroethylene could also leak from improperly stored waste or chemical containers that could lead to a groundwater contamination problem.
- Often dry cleaning supply companies can supply trays made of plastic or other materials that are put beneath containers to catch leaks or spills.
- Weekly checks for leaks and prompt repairs will save you money and benefit the environment.
- Tightly seal all bungs and lids on chemical containers.
- If dry detergents cause clogging in your cleaning systems and industrial wastewater discharges, you might consider the use of liquid soap. You should note, however, that liquid soap, being heavier, takes more energy and costs more to transport.
- Some suppliers or vendors can provide you with proper labels and manifests.
- Select reputable chemical suppliers and authorized waste transporters only.
- Drain all cartridge filters in closed containers.
- Do not underload or overload machines. Underloading can cause less efficient solvent use and loss of solvent. Overloading can cause loose belts and make drying difficult.
- Place saturated lint from lint baskets in sealed hazardous waste containers.
- Inspect waste storage containers for leaks.

Materials Management

- Change operating procedures to reduce accidental and material losses. These procedural improvements will also improve productivity.
- Make sure chemical containers are placed on a surface that does not have any cracks.
- Use chemical containers that are in good condition.
- Label all chemical containers regardless of the size. Even label "spot" dispensers and other small containers.
- Use non-drip dispensing, such as spigot pumps, and funnels when transferring wastes to storage containers.

- Consider the cost of waste management before buying new chemicals, materials, or accepting samples from vendors.
- Make sure chemical containers won't leak or be damaged by contents such as solvents and perchloroethylene.

Worker Protection

- Both the known and potential adverse health effects resulting from perchloroethylene exposure are cause for concern. As a result, proper handling of perchloroethylene and steps to eliminate environmental releases and to minimize human exposure are essential.
- Make sure outside contractors who may be spending time in dry cleaning establishments are aware of emergency procedures.
- Read and understand information on Material Safety Data Sheets and use them to educate workers who may come in contact with the material. It is important to determine how a hazardous substance should be handled.
- To minimize exposure to perchloroethylene in the workplace, make sure that your dry cleaning shop complies with MassDEP storage and use requirements and that it is adequately ventilated.
- Develop an Emergency or "Contingency" plan for your dry cleaning facility so that you prevent accidents and respond efficiently.
- Post emergency numbers by telephones and exits.
- Train all workers on what to do in an emergency.
- Make sure wall space where emergency signs and posters are located is uncluttered. It may be helpful to remove all other posters that are posted to the walls.

General

- Heated wastewater kills the "bugs" that treat the wastewaters in treatment plants allowing the discharge of untreated wastes to the river. Make sure your discharge is cooled.
- Industry associations for dry cleaners can assist your business through information sharing, technical support, understanding government, finding good suppliers and other valuable services.
- Pollution can contaminate groundwater and render it undrinkable for years. There are cases of public and private wells being closed because of perc contamination.
- Dry cleaners may want to combine the various checklists and logs into one or two forms with all of the required information on them. Check with your supplier, industry association or other dry cleaners for examples.

Hazardous Waste (Sections C25 through C39) [Regulations at: 310 CMR 30.0000]

Definitions/Key Concepts

Hazardous waste is a chemical waste intended to be discarded or needing to be reclaimed to be useful again for its original purpose that is dangerous to life and the environment when not handled properly. For dry cleaners, hazardous waste includes waste perchloroethylene, muck, filters for perchloroethylene, saturated rags/wipes/lint, etc.

Compliance Assistance & Forms - See http://www.mass.gov/eea/agencies/massdep/recycle/regulations/fact-sheets.html#5 for additional information on hazardous waste requirements, based on your generator status.

(C25) Your identification (ID) number must be 12 characters. If your generator status is:

- Very Small Quantity Generator (VSQG) your ID# is self-assigned and it is [MV + 10 digit telephone number].
- Small Quantity Generator (SQG) your ID# is assigned by DEP. You may use a temporary number until you receive your permanent number. The temporary ID number is [MP + 10 digit telephone number.

If you do not have a hazardous waste generator identification number, or if you have not registered with MassDEP, registration forms are available on MassDEP's website at: http://www.mass.gov/eea/agencies/massdep/recycle/approvals/hazardous-waste-forms.html#5

You must complete the form and submit it to the appropriate MassDEP regional office.

(C26) The following FormC-6 will help you determine your status as a Very Small Quantity Hazardous Waste Generator (VSQG), a Small Quantity Hazardous Waste Generator (SQG), or a Large Quantity Hazardous Waste Generator (LQG). Dry Cleaners will most likely be VSQGs or SQGs. [30.061(1) and 30.353(5)].

FORM C-6
Are you a Very Small, Small, or Large Quantity Hazardous Waste Generator?

Step 1. From your Hazardous Waste manifest copies; confirm your status as a Hazardous Waste Generator by completing the following:

Facility Name_____ Year_____

Amount of Waste Perchloroethylene Shipped on a Hazardous Waste Manifest

My Actual		*Example*	
Month	**Pounds**	**Month**	**Pounds**
January	_____ LBS.	January	0 LBS.
February	_____ LBS.	February	150 LBS.
March	_____ LBS.	March	0 LBS.
April	_____ LBS.	April	240 LBS.
May	_____ LBS.	May	0 LBS.
June	_____ LBS.	June	150 LBS.
July	_____ LBS.	July	0 LBS.
August	_____ LBS.	August	150 LBS.
September	_____ LBS.	September	0 LBS.
October	_____ LBS.	October	150 LBS.
November	_____ LBS.	November	0 LBS.
December	_____ LBS.	December	150 LBS.

Example:
In the above example, there are 6 shipments, the largest shipment is 240 lbs, generated over the shortest period of time which was 2 months, so the maximum generation rate may be considered to be 120 lbs. per month of HW.

(continued)

Step 2. Use your largest shipment generated over the shortest period of time, and divide it by the time it took to generate that amount, as above.

Example:

My largest shipment was **240** LBS, and
It took **2** Month(s) to generate that amount of waste Generation Rate = Lbs. divided by month(s) = LBS/Month(s). My maximum generation amount as determined above is **120** per month.

Step 3. Use the chart below to find out if you are a Large Quantity Generator (LQG), Small Quantity Generator (SQG) or a Very Small Quantity Generator (VSQG).

	If Yes...	***If No...***
Step 3a Is the amount you determined more than 2200 lbs. per month?	You are a Large Quantity Generator (LQG). Contact MassDEP and Consult 310 CMR 30. As an LQG you are required to store hazardous waste less than 90 days.	Go to the next question
Step 3b Is the amount you determined more than 220 lbs. per month but less than 2200 lbs. per month?	You are a Small Quantity Generator (SQG). As an SQG you are required to store less than 4,400 lbs of hazardous waste and always store it less than 180 days.	Answer next question
Step 3c Is the amount you determined less than 220 lbs. per month?	You are a Very Small Quantity Generator (VSQG). As a VSQG you are required to always store less than 2,200 lbs of hazardous waste at any one time.	

(C27) The amount of perc waste can be found in your copies of the Hazardous Waste Manifest. You should record the amount in pounds. If the amount of hazardous waste on the manifest is shown in other units, you must convert using the following formulas:
Gallons: (# of gallons) X (13.5 lbs/gal) = lbs of perc
15 gallon Drums: (# of drums) X (15 gals/drum) X (13.5 lbs/gal) = lbs of perc

(C28) VSQGs – No limit on how long you can store hazardous waste before shipping. SQGs – You cannot store hazardous waste longer than 180 days without shipping. Once you begin accumulating waste in a drum, you must ship that drum's waste within 180 days. [30.351(6)(7) and 30.353(3)(4)]

(C29) If you are a VSQG, you must store less than 2,200 pounds of waste at a time.[30.353(3)(4)]

(C-30) You must be shipping hazardous waste to a licensed hazardous waste treatment storage or disposal facility or to a permitted hazardous waste recycler. You must also be using a licensed hazardous waste transporter for this task. A listing of licensed transporters is available at: http://www.mass.gov/eea/docs/dep/recycle/hazardous/hwtran.pdf
You must maintain your logs, shipping records, and hazardous waste manifests on-site for at least three years. [30.351(10)(d) & (e) and 30.353(8) & (12)]

(C31) An area for storage of only hazardous wastes must be designated at the facility; it must be separated from other areas of operation and clearly marked by a visible line, floor tape or fence. You must also post a sign with the words "HAZARDOUS WASTE" in this area and the sign must have letters that are at least one inch high. See the example below. [30.351(8) and 30.353(6)]

(C33) Waste containers that are dented, leaking or very rusty are considered not in good condition. They must be replaced. Different wastes must be segregated into separate containers. Waste oil must not be mixed with other waste. [30.351(8)(a) and [30.353(6)(g)]

(C34 and C39) All hazardous waste containers must be labeled and marked with the words HAZARDOUS WASTE, the name of the waste and type of hazard (e.g., toxic, flammable) and unless you are a VSQG, the date you started storing. See example labels below. Same as (C33).

In most instances the type of waste is perchloroethylene and the hazard type is toxic.

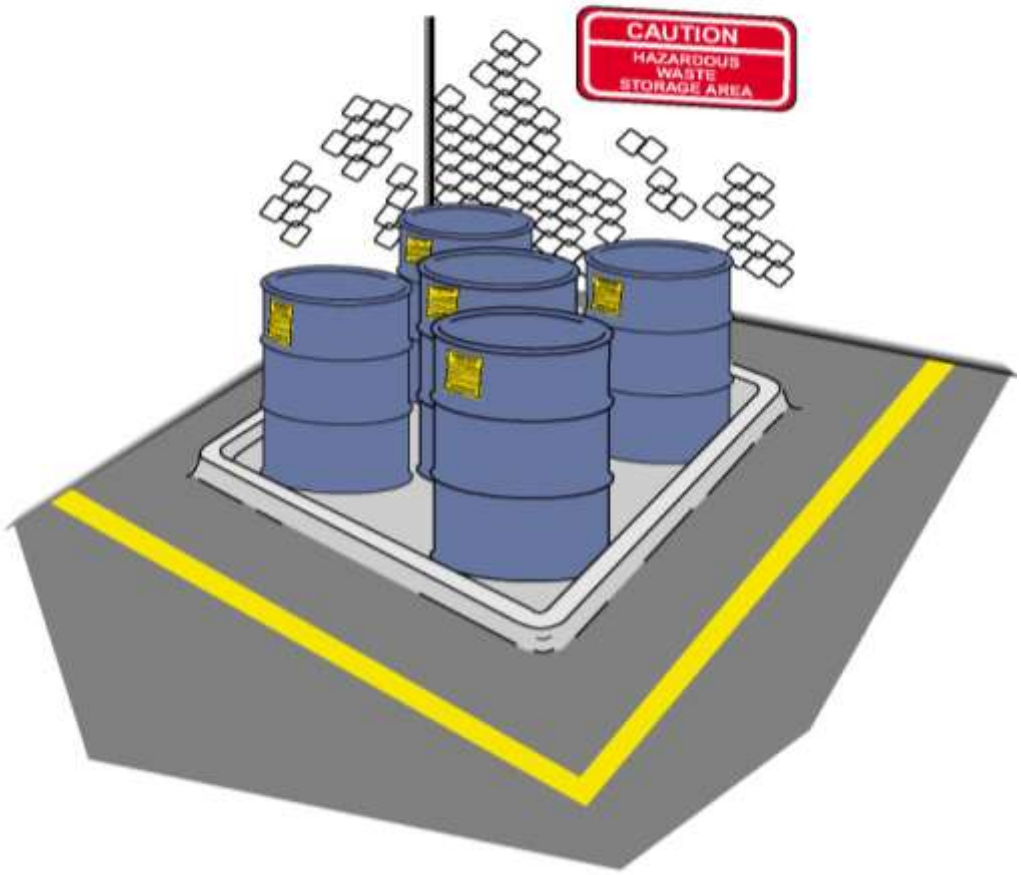
Shipping Label

Accumulation Label

(C35) Containers must be stored on a surface that does not have any cracks and that will contain leaks and spills. Generally, intact concrete will contain leaks or spills. [30.351(8)(b)] and 30.353(6)(h)]

Waste containers or tanks stored outdoors, must have a spill containment system. See example of spill containment system below. Spill containment must hold either 10% of the maximum volume that can be stored and/or 110% of the volume of the largest single container (whichever is greater).

Example of Secondary Containment System



(C36) Spills or leaks of perchloroethylene must be reported to MassDEP if:

1. it is greater than 10 lbs of material (equivalent to 0.7 gallons of perc), and
2. it is released to the environment (for example – released outside the building, to the air, to the ground, or to a storm drain, or to unlined trenches or sumps).

Notify MassDEP of the spill/leak verbally within 2 hours, and follow up with a written report within 60 days.

In the event of a spill or leak that may threaten personnel or the environment you must notify the local fire department, police department and the appropriate MassDEP Regional Office during normal working hours (8:45 AM to 5:00 PM) M-F and ask for the Emergency Response Section at (617) 556-1133.

(C37 and C38) Emergency response preparedness.

Be prepared for emergencies by having procedures to notify all of the proper agencies immediately.

- MassDEP at 1-888-304-1133
- State Police at 508-820-2121
- National Response Center at 1-800-424-8802

If you are a Small Quantity Generator (SQG) or a Large Quantity Generator (LQG) be prepared for emergencies by: [30.351(9)]

- Having an alarm or other communication system to notify employees.
- Having a telephone, two-way radio or other device which can summon emergency response agencies.
- Having portable fire extinguishers and spill control equipment.
- Having adequate supply and water pressure, automatic sprinklers or other fire suppression equipment.
- Having a program to periodically test emergency equipment
- Having a program to train employees for emergencies.
- Having adequate aisle space and clearly marked exits.
- Having a program to familiarize and obtain agreements from the local emergency response agencies such as the police department, fire department, hospital, etc.
- Having a designated emergency coordinator.
- Having posted names and telephone numbers of emergency coordinators: location of fire alarms and extinguishers; telephone numbers of the fire department; and evacuation routes for that location by the telephone.
- LQGs should consult 310 CMR 30.341(1) for additional standards.
- In a fire emergency, you should either attempt to extinguish the fire or call the local fire department.

Please note: If you are a SQG, you must inspect your storage area once per week for leaking containers, and have enough aisle space to conduct inspections and keep a log of your inspections.

Hazardous Waste Best Management Practices

These best management practices are offered as ways that you can further improve the efficiency and safety of your facility, beyond required compliance items above.

Operations & Maintenance

- Keep records on all environmental management or safety related activities.
- Clean lint filters often to maintain equipment efficiency, extend equipment life and reduce maintenance requirements in other parts of the dry cleaning system.

Worker Protection

- Studies have shown that dry cleaners can carry perchloroethylene home on their hair, clothes and breath. As a result, workers and their families can breathe air at home that has much higher concentrations of perchloroethylene than the typical "background" perchloroethylene concentration in the homes of non-dry cleaners.
- Occasionally, move caution and emergency posters to different locations so they will be noticed and read.
- Make sure you have personal protective equipment for emergencies (such as: goggles, gloves, masks, etc.) and all of your employees known when and how to use it.
- Use decals describing the hazards of perc by placing them on dry cleaning machines and other appropriate areas.
- Make sure the fire department knows about your emergency and evacuation plans.

Materials Management

- You may want to keep manifests and shipping records indefinitely so you can always prove that you handled your waste properly.
- Make sure all old chemicals that are no longer needed are disposed of properly.
- Keep hazardous wastes separated from non-hazardous wastes to decrease risk of contamination.
- Use spill response preparation to engage facility staff in an accident prevention program to prevent leaks and spills from occurring.

D. COMMENTS

Use the Comments section to provide any additional information that you think is important for MassDEP to understand your certification.

E. NON-PERC MACHINE INFORMATION

Please note that E1 through E3 are mandatory. If you operate a perc machine and a non-perc machine and/or professional wet cleaning system you must answer E1 through E3.
Please note: Do not include standard laundry machines used to clean shirts, bed sheets or other traditional laundered items.

(E1) Check "Yes" if you operate one or more non-perc solvent machine(s) and/or professional wet cleaning systems. Enter the machine information in E2.

Check "No" if you do not operate non-perc machines and skip to Section F.

(E2) Use Table E2 to supply the required information on your non-perc dry cleaning and/or professional wet cleaning machine(s). Items:

a. (machine manufacturer and model) can be obtained from machine nameplate or manufacturer's literature
b. (serial number) also from the machine nameplate or from the manufacturer's literature
c. (type of solvent or process) select the solvent or process you use from the drop-down list
d. (other process description) if the solvent or process is not on the list, enter the solvent name here
e. (installation date) should be available in your records
f. (date removed) fill in the date the machine is removed

(E3) To the best of your ability, estimate the percentage of all materials cleaned in your store during the previous 12 months that are cleaned with perc and with other solvents and/or professional wet cleaning. For example:

In 2012, I cleaned: 70% with perc and 30% with wet cleaning OR
In 2012, I cleaned: 20% with perc and 80% with hydrocarbon, etc.

F. PERC ALTERNATIVE INFORMATION

Please note that answers to F1 – F6 are voluntary. These questions are designed to help you understand the alternatives to perc when you consider purchasing a new cleaning machine.

Additional information on perc alternatives can be found in Appendix B.

APPENDIX A: BEST MANAGEMENT PRACTICES FOR SEPARATOR WATER DISPOSAL FROM PERC DRY CLEANING MACHINES

The purpose of this fact sheet is to provide you, the owner/operator, with guidance for managing and disposing of separator water generated in the normal operation of your perc dry cleaning machines.

Separator water with a perc concentration of 0.7 parts per million (ppm) or more is considered to be hazardous waste. Separator water accumulated in a properly operated perc/water separator contains perc at concentrations up to 150 ppm, and therefore, is a hazardous waste.

To minimize the amount of perc in your separator water, you should maintain and operate the water separator as recommended by the manufacturer, including keeping it clean and operated within the proper temperature range. A well maintained water separator minimizes the exposure of your customers, staff and the environment to a toxic chemical.

There are two basic options for disposal of separator water:

1. Store your separator water in drum(s)/container(s) with a tight fitting lid(s), label as *Hazardous Waste*, Separator Water, Toxic and with the date accumulation began in the container(s) and ship them to a licensed treatment, storage and disposal (TSD) facility (310 CMR 30.000).
2. Evaporate the separator water. *Please Note*: The Department's Hazardous Waste regulations prohibit heating unfiltered (not passed through a carbon filter) separator water. (310 CMR 30.353(10))

<u>Best management practices when evaporating separator water</u>

- The use of a "mister" is not recommended.
- None of the perc recovered in the separator can be evaporated. A properly operated and maintained separator will eliminate this worry.
- An evaporator equipped with carbon filters in series to reduce the perc concentration in the wastewater to below the level of hazardous waste prior to evaporation is recommended.
  - > To minimize spills, vapor odors, and to simplify the process, the water separator should be hard-piped to the evaporator, if feasible. Small quantity generators (SQG) are required to hard-pipe the separator to the evaporator.
  - > If the water separator is not hard-piped to the evaporator, the container used to collect separator water must be kept closed and labeled as "Perc Separator Water". You must be careful not to spill separator water when transferring it to the evaporator.
- The evaporator should be vented to the outdoor air, not indoors.
  - > The evaporator should be vented as high into the outside air as feasible. A well designed stack will allow for effective dispersion of the vapors.
  - > Do not vent the evaporator near a window or air intake of the facility or an adjacent building.
- Spent carbon filters from the evaporator must be stored and shipped as hazardous waste (310 CMR 30.000).
- Keep records of the maintenance, repairs and filter changes to the evaporator to show you are operating and maintaining the unit in accordance with the manufacturer's requirements.

APPENDIX B: INNOVATIVE TECHNOLOGIES FOR DRY CLEANERS

As in many other industries, technology advances are being pursued in garment cleaning to make cleaning processes faster, better and less expensive. Sound management practices would encourage dry cleaners to stay abreast of new technology advances since they may offer opportunities for you to do garment cleaning in new and effective ways, with reduced environmental impacts and improved health and safety for business owners, employees and customers. Talk to your suppliers and vendors, your trade associations and environmental agencies.

Traditional dry cleaning with perc has served the industry well for more than fifty years and technological improvements continue to reduce the danger from perc exposure or contamination. Perc was introduced as a non-flammable alternative to the highly flammable hydrocarbon solvents that were the industry standard at the time. However, while perc cleans well and is non-flammable, the chemical may cause damage to your health and the environment and in recent years there has been increasing pressure from a number of sources to reduce the use of perc. Exposure to operators, customers and residents near perc dry cleaners is a growing concern. Fortunately, the garment cleaning industry has a growing number of technologies to choose from for reducing perc. Some of these technologies include new, more efficient perc dry cleaning machines, while other technologies completely eliminate perc. For those interested in exploring alternatives to perc, a brief summary of current commercial technologies is listed below. Appearance on this list does not indicate that the cleaning method is safer than perc cleaning regardless of manufacturer claims. Each of these technologies, like traditional dry cleaning, has strengths, weaknesses and limitations.

Further information on these and other technologies is available from your environmental agencies (including MassDEP, OTA, and TURI), trade associations, vendors, and suppliers. In 2012 TURI conducted an assessment of seven common alternatives to perc to find technically viable and environmentally preferred methods for professional garment cleaning. The alternatives evaluated were: professional wet cleaning, liquid carbon dioxide, high flash hydrocarbons, acetal, propylene glycol ethers, cyclic volatile methyl siloxane, and n-propyl bromide. The full report and a four page summary can be found at www.turi.org/drycleaning under the resource section.

This section is included in the workbook to provide cleaners with current and un-biased information about alternatives to perc used in dry cleaning. For more detailed worksheets to use when conducting an analysis for your facility, please refer to Appendix C for Comparative Analysis forms.

APPENDIX B 1.0 DESCRIPTION OF ALTERNATIVES

- ### PROFESSIONAL WET CLEANING

Professional wet cleaning is a water-based cleaning process, which uses computer-controlled washers and dryers along with biodegradable detergents and specialized finishing equipment to process delicate garments that would otherwise be dry cleaned. Detergents used in wet cleaning are typically supplied by a detergent (or soap) supplier and injected into the washer through a computer-controlled and programmable pumping system. There are currently at least twelve dedicated wet cleaning facilities in Massachusetts, and many others who process some portion of their garments using wet cleaning.

- ### LIQUID CARBON DIOXIDE

Carbon dioxide (CO_2), as either a liquid or a supercritical fluid, can be used to clean garments in specialized equipment. The most common process uses liquid carbon dioxide at a pressure of 700 pounds per square inch and uses detergents specifically designed for this process. The CO_2 method of garment cleaning combines liquid carbon dioxide with cleaning agents in a traditional basket-style machine. Currently, this method is not in use in Massachusetts, and is not a widely available option in the US. Equipment is currently available from Cool Clean Technologies, Inc.

- ### HIGH FLASH HYDROCARBONS

High flash hydrocarbons are a class of low-odor petroleum-based dry cleaning solvents characterized by a flash point greater than 140^{o}F (combustible liquids). This technology is the most widely used alternative to perc dry cleaning. The most common high flash point hydrocarbon solvent in use in Massachusetts is DF-2000^{TM}.

- ### ACETAL

Acetals are halogen-free combustible solvents. A new acetal-based dry cleaning solvent system came onto the US market in 2010, manufactured and distributed by Kreussler Inc. using the name Solvon K4. Solvon K4's main ingredient is 1-(butoxymethoxy) butane, also referred to as butylal or formaldehyde dibutyl acetal. Several Massachusetts cleaners have switched or are considering switching from perc to Solvon K4.

- ### PROPYLENE GLYCOL ETHERS

Glycol ethers are a class of petroleum solvents that were introduced as an alternative to perc in dry cleaning in the late 1990s. Glycol ether systems can typically be used with a hydrocarbon machine after minor modifications. Some commercially available products are also hybrid systems, combined with hydrocarbons or liquid CO_2. Several glycol ether systems have been commercially available, and several cleaners in Massachusetts reportedly use these systems.

- CYCLIC VOLATILE METHYL SILOXANE

The current volatile methyl siloxane used in dry cleaning is the cyclic VMS decamethylcyclopentasiloxane (D5). Using D5 in dry cleaning is trademarked as the GreenEarth® dry cleaning system. It is an odorless, combustible liquid used in multi-solvent machines. GreenEarth® Cleaning claims that most 4th and 5th generation machines currently being used with hydrocarbons can be modified for use with D5. Many cleaners in Massachusetts use D5, though an exact number is not known.

Other toxic chemicals used in dry cleaning:

- N-PROPYL BROMIDE

N-Propyl bromide (nPB) is considered a "drop-in" replacement for perc in dry cleaning applications, which indicates that it can be used in existing (generation 3 or higher) perc dry cleaning equipment. nPB could be used in hydrocarbon equipment as well, although this would require more extensive modifications, including corrosion resistance. Several cleaners in Massachusetts have switched or are considering switching their perc systems to nPB.

n-Propyl Bromide (nPB) Warning: nPB is listed as a Toxic or Hazardous Substance under the Massachusetts Toxics Use Reduction Act (TURA) and is not considered a safer alternative to perc. nPB is associated with cancer, reproductive/developmental toxicity, and effects on the central nervous system.

APPENDIX B 2.0 ECONOMIC ANALYSIS OF ALTERNATIVES

Dry cleaners are typically small operations where capital equipment costs can dictate decision-making. The table below provides a summary of costs associated with the seven alternatives as compared with perc.

Based on the available financial data presented in the table, the following highlights are apparent:

- Wet cleaning requires the least amount of energy of the other systems, both in electricity and in natural gas usage. Studies conducted by the Massachusetts Toxics Use Reduction Institute (Onasch 2010) indicate that significant energy reductions can be associated with the use of wet cleaning over perc-based dry cleaning systems, when it is the sole system used at a facility, eliminating the use of solvent recovery systems.
- The Acetal system shows promise of energy use reduction as it reportedly has a much lower energy requirement for solvent distillation, requiring only half the BTUs of a perc system.
- Wet cleaning has comparable equipment and operational costs to perc, although detergent costs are higher than perc, and more detergent is required for the process.
- The capital costs for the acetal system are somewhat higher than perc, but facilities may see payback on their investment through lower steam heat costs. As this chemistry is new to the market, it is expected that additional studies will reveal how the costs play out for facilities using the acetal chemistry.
- Costs for nPB are significantly higher than for perc based on the cost per gallon of the chemistries. In addition, as noted in the regulatory section of this report, nPB use may result in additional Massachusetts regulatory requirements if facilities exceed TURA reporting and planning thresholds.
- The carbon dioxide option is cost-prohibitive for many small shops due to the high upfront capital cost of equipment. However, if installed, the chemical costs may be lower for a facility.
- In addition to the information presented in Table 4, cleaners may find it helpful to know that existing higher generation (4^{th} generation and higher) perc or hydrocarbon systems could be retrofitted for use with nPB, siloxane or acetal.

DRY CLEANING ALTERNATIVES – FINANCIAL DATA (SEE SECTION IV, PAGE 32 OF PERC ALTERNATIVES ANALYSIS)

Assessment Criteria	Perc	Wet Cleaning	Carbon Dioxide	High Flash Hydro-carbons	Acetal	Propylene Glycol Ethers	Siloxane	n-Propyl Bromide
Equipment costs (ranges relate to capacity, quality and features of machines)	$40,000 to $65,000	$36,000 to $61,000	$100,000 to >$150,000	$38,000 to $75,000	$50,000 to $100,000	$56,000	$30,500 to $55,000	$40,000 to $60,000 (or retrofit costs for existing perc equipment)
Solvent costs (per gallon)	$17	$.007/gal (water use fee) + $25-$31/gal (detergent)	$0.18/lb CO_2 + $40/gal detergent	$14-$17	$28-$34	$25-$30	$22-$28	$40-$64
Total cost per pound cleaned (range and average)[1]	$0.63 - $1.94 Avg: $1.02	$0.57 - $1.32 Avg: $1.10	$1.40	$0.73 - $1.02 Avg: $0.88	Unavailable	$1.14	$1.08 - $2.33 Avg: $1.71	Unavailable
Estimated electricity usage for equipment operation (kWh/100 lbs)	26.6	9.3	30.9	35.5	Assumed to be similar to hydrocarbon	Unavailable	54.2	Unavailable
Estimated natural gas usage for hot water and steam heat used for drying, distillation, and pressing (therms/100 lbs)[2]	12	9	7.3-14.2	13.1	Natural gas use for solvent distillation more energy efficient than HC or perc	Unavailable	13.4	Unavailable

[1] The cost per pound cleaned, based on case study facilities in California, includes capital, solvent, licensing, detergent, electricity, gas, spotting labor, finishing and maintenance labor, maintenance of equipment, compliance, and hazardous waste disposal costs (IRTA 2005). For technologies with multiple case study facilities, both the range and average cost are shown.

[2] Sinsheimer 2009

APPENDIX B 3.0 TECHNICAL ANALYSIS OF ALTERNATIVES

Key technical parameters for dry cleaners include cycle time, load capacity, and quality of cleaning. Additional considerations include pre-spotting and maintenance requirements, additional finishing or control equipment, equipment availability and vendor support, solvent odor issues, and waste management. The table below provides a summary of several technical performance assessment criteria important to dry cleaners. It should be noted that individual cleaner's experience with each of the systems varies, and depends on their mix of garments and soils, as well as their choice of detergent and spotting chemistries.

Observations about the technical performance of the alternatives as summarized in the table include:

- Wet cleaning cycle times are typically shorter than other systems – using a separate washer and dryer allows the two cycles to overlap, thereby saving time. Massachusetts cleaners that have converted to dedicated wet cleaning claim that they have significantly reduced their time at the spotting board. This is at least in part because most of the stains on clothes are well suited to removal by the water and detergent chemistries and technology. Wet cleaning exhibits better cleaning results for most fabric types, including the fact that clothes are less dingy than when cleaned with a recycled solvent. Massachusetts cleaners have stated that "whites are whiter and brights are brighter."
- Hydrocarbon systems exhibit similar productivity to that of perc-based systems, and are said to produce a cleaner garment overall than some of the other solvent-based systems.
- CO_2 systems exhibit better productivity than perc-based systems, but may require more spotting for sufficient cleaning.
- According to the manufacturer, the acetal system has a similar cycle time to perc, a wide range of load capacities and is able to clean a wide range of fabrics with minimal pretreatment.
- Performance of nPB is expected to be similar to that of perc-based systems. It is reported that nPB systems would have similar difficulty with certain fabrics, and excessive color "bleed," as perc-based systems.
- Longer cycle times and smaller load capacities in propylene glycol ether and siloxane-based systems make them less productive than perc-based systems.
- The spotting requirements for propylene glycol ether systems are reported to be less demanding than for perc. Propylene glycol ether systems are compatible with a wider range of fabrics and garments than perc-based systems.
- Siloxane systems are reported to require more pre-spotting than perc systems.

DRY CLEANING ALTERNATIVES - TECHNICAL DATA (SEE SECTION IV, PAGE 30 OF PERC ALTERNATIVES ANALYSIS)

Assessment Criteria	Perc	Wet Cleaning	Carbon Dioxide	High Flash Hydrocarbons	Acetal	Propylene Glycol Ethers	Siloxane	n-Propyl Bromide
Cycle time (min)	45	20-40	35-45	60-75	60-65	> 45	53-58	45
Load capacity (lbs)	50	20-75	60	35-90	40-90	43	55	50
Cleaning capability	Aggressive[3]	Less aggressive	Less aggressive	Less aggressive	Unclassified	Unclassified, but gentle on fabrics	Less aggressive	Aggressive
Fiber/garment types that are difficult for this alternative	Leather, suede, beads, delicates	Leather, suede and fur	Triacetates, specially dyed acetates	Vinyl appliqués	Appliqués or decorations glued to fabric	None identified	None identified	Leather, suedes, beads, delicates
Time required for pre-spotting	Medium	Low	High	Medium	Low	Low	High	Low
Equipment compatibility	Perc equipment	Wet cleaning equipment	CO_2 equipment	Hydrocarbon	Retrofit hydrocarbon or new acetal system	Retrofit 4th Gen or higher hydrocarbon	Retrofit perc or hydrocarbon 4th Gen or higher	Retrofit perc or hydrocarbon 4th Gen or higher
Special equipment	Vapor recovery equipment	Additional finishing equipment and training required	High pressure equipment	Combustible – must meet fire safety codes	Combustible – must meet fire safety codes	Combustible – must meet fire safety codes	Combustible – must meet fire safety codes	New seals, gaskets and doors may be required
Waste management concerns	Handle spent solvent and solids as hazardous waste	Requires discharge to sewer or holding tank	Waste soils and lint do not require special handling	Considered as waste oil in MA, to be disposed of as hazardous waste; empty containers may contain residual solvent and may be dangerous	Waste solvent disposed of as industrial waste	Difficult to distill water prior to waste mgmt	Separate solvent from water before disposal; not required to be treated as hazardous waste	If used as a drop in replacement, residual perc may be present for up to 6 months

[3] The term "aggressive" refers to the ability of the solvent/system to thoroughly remove soils from any garment. This also encompasses the potential for causing wear on garment fibers.

APPENDIX B 4.0 ENVIRONMENTAL AND HUMAN HEALTH COMPARISON OF ALTERNATIVES

A primary concern for dry cleaners is worker and customer exposure to volatile organic emissions. In addition, the historical experience of soil and groundwater contamination related to dry cleaning operations, and the financial liability associated with remediation of these events, further underscores the importance of selecting safer alternatives. Table 6 provides a summary of environmental and human health data associated with the alternatives.

It is important to note that the environmental and human health data associated with the wet cleaning system is based on the detergent and additive package that is largely responsible for the cleaning performance (as opposed to the solvent, which for this technology is water). Similar detergents and performance booster formulations are added to other solvent systems, including perc, but typically at lower concentrations. In wet cleaning, the detergent/additive package typically constitutes 3% to 5% by volume of the overall solution in which clothes are placed. In contrast, the detergent/additives that are used in other systems make up no more than 1% by volume of the overall solution in which clothes are placed.

The following are highlights of the environmental and human health considerations of alternative solvents in comparison to those of perc:

- The environmental and human health data analyzed for the wet cleaning system demonstrates that it poses the least potential risk to human health and the environment of the alternatives assessed.
- The CO_2 system generally exhibits better environmental and human health characteristics than perc systems. CO_2 systems have unique concerns associated with high pressure equipment and the potential for leaks and associated exposure to high concentrations of CO_2.
- Modeled information for butylal (the acetal) indicates similar aquatic toxicity characteristics as those for perc. Butylal is a volatile organic compound, indicating a potential for occupational exposure. Because the acetal solvent Solvon K4 is a new product, very little test data is currently available. The majority of human health effect data referenced here is based on product data provided by the manufacturer. The gaps in data may lead to a different comparative conclusion relative to perc after more is learned about the environmental and human health implications of acetals.
- Propylene glycol ethers are not expected to be harmful to the environment with regard to persistence, bioaccumulation or aquatic toxicity. Health effects of concern pertain to irritation and potential effects on the liver, kidneys or CNS. In addition, studies suggest that metabolism of one minor element of the overall composition might be linked with reproductive toxicity concerns.
- High flash point hydrocarbons present a high concern for aquatic toxicity, should there be a release into the aqueous environment. There are also concerns around bioaccumulation and effects on the central nervous system.
- D5 exhibits persistence, bioaccumulation potential, and aquatic toxicity characteristics that are of concern. In particular, modeling data indicates that D5 is highly persistent in sediments and air, and has high aquatic toxicity. Studies indicate that D5 may represent a reproductive hazard, and one recent animal study shows evidence of carcinogenicity.

- While nPB, a volatile organic compound, is less persistent in most media than is perc, it is highly persistent in air and, because of its volatility, represents a potentially significant occupational exposure risk. nPB is also highly toxic to aquatic species. nPB has been determined to be a reproductive and developmental toxicant and exhibits central nervous system effects. Finally, recent studies by the National Toxicology Program indicate clear evidence of carcinogenicity in certain animals.

TABLE 6A: DRY CLEANING ALTERNATIVES – ECOLOGICAL AND ENVIRONMENTAL INFORMATION

Assessment Criteria	Perc	Wet Cleaning[4]	Carbon Dioxide	High Flash Hydrocarbons	Acetal	Propylene Glycol Ethers	Siloxane	n-Propyl Bromide
Representative CAS #(s)	127-18-4	106232-83-1, 26027-37-2, 69227-21-0, 112-34-5, 29923-31-7, & 61791-32-0[5]	124-38-9	68551-17-7, 64742-48-9	2568-90-3	29911-28-2, 132739-31-2	541-02-6	106-94-5
Persistence (water, soil, sediment and/or air)[6]	M (water), H (soil, sed, air)	L (water, soil, air), M (sed)	NA	L (water, soil, air), M (sed)	L (water, soil, air), M (sed)	L (water, soil, air), M (sed)	L (water), M (soil), H (sed, air)	L (water, soil), M (sed), H (air)
Bioaccumulation[7]	Low	Low	NA	Mod	Low	Low	Mod	Low
Aquatic toxicity (mg/L)[8]	Mod (5)	Low to Mod[9]	Low (35)	High (0.023)	Mod (2.9)[10]	Low (84)	High (0.021)	High (0.051)
Volatile Organic Compound	Yes, Exempt[11]	No[12]	No	Yes	Yes	Yes	Yes, Exempt[13]	Yes

[4] Important note: The primary solvent in wet cleaning is water. For the purposes of this table, the EH&S information provided applies to undiluted detergents and other additives common in wet cleaning processes, which are also common in other cleaning systems. These additives are present in amounts of 3% to 5% in wet cleaning, and are used in lesser amounts in other systems (typically around 1%).

[5] These represent the primary (i.e., present in additive formulations at or greater than 1% by volume) undiluted detergents and additives included in this assessment.

[6] Persistence criteria in each of the environmental compartments: Air [L<=2 days, H>2 days]; Sediment, Soil & Water [L<60 days, M>=60 days, H>180 days]. Low (L) is considered to be 'Not Persistent.'

[7] Bioaccumulation criteria: Low (Not Bioaccumulative) <1,000, Mod (Bioaccumulative) >= 1,000.

[8] Fish ChV (mg/l) Toxicity criteria: Low (Not Toxic) > 10mg/l or no effects at saturation, Mod (Toxic) <10 mg/l, High (Toxic) <0.1 mg/l.

[9] This system is characterized as Low aquatic toxicity, with the exception of one constituent of the detergent package Lanadol Aktiv; it contains 1-5% of Oleic acid Monoethanolamid, ethoxylated (CAS# 26027-37-2), which is predicted to be moderately toxic but readily biodegradable.

[10] This value (based on the PBT Profiler model) differs from the Kreussler MSDS which states Solvon K4 is insoluble in water, and would therefore not reach a concentration in water sufficient to cause aquatic toxicity.

[11] Exempt from USEPA and MassDEP VOC regulations by rule, due to determination of negligible photochemical reactivity.

[12] This assessment is for the overall system composition. One component of the cleaning package Lanadol Avant contains 1-5% of 2-(2-butoxyethoxy) ethanol (CAS# 112-34-5), which is a VOC based on its boiling point of 439°F.

[13] Exempt from USEPA and MassDEP VOC regulations due to determination of negligible photochemical reactivity; U.S. EPA, 1994, direct final rulemaking: D5 specifically exempt from regulation as a Volatile Organic Compound (VOC).

TABLE 6B: DRY CLEANING ALTERNATIVES – HEALTH EFFECTS

Assessment Criteria	Perc	Wet Cleaning[14]	Carbon Dioxide	High Flash Hydrocarbons	Acetal[15]	Propylene Glycol Ethers	Siloxane	n-Propyl Bromide
Carcinogenicity	Probable Human Carcinogen (IARC 2A)	Not classified by IARC	Not classified by IARC	Not classified by IARC	Not classified by IARC	Not classified by IARC	Some evidence	Clear evidence in animal studies by NTP
Reproductive or developmental toxicity	Yes	Negligible[16]	No data available	No data available	No data available	No[17]	Studies indicate concern	Yes
LD_{50}	Oral, rat, 2,629 mg/kg	NA[18]	NA	Oral, rat, >5,000 mg/kg	Oral, rat, 6,873 mg/kg	Oral, rat, >3700 mg/kg	Oral, rat, >4,800 mg/kg	Oral, rat, >2,000 mg/kg
Dermal/ocular/ respiratory irritant	All	Dermal, ocular	Dermal, ocular	All	Possibly dermal, ocular	All	Dermal, ocular	All
Central nervous system effects	Yes	Negligible[19]	No[20]	Yes	No data available	Yes	Some evidence	Yes
Other target organs	Liver, kidneys, immune and hematologic system	Negligible[21]	Heart, lungs	Lungs, kidneys	None known	Liver, kidneys	Liver, immune system	Liver, kidney, digestive & blood systems
Recommended exposure limit	25 ppm[22]	NE	5000 ppm[23]	100 ppm[24]	NE	NE	10 ppm[25]	10 ppm[26]

NA = not applicable; NE = not established

[14] Important note: The primary solvent in wet cleaning is water. For the purposes of this table, the EH&S information provided applies to undiluted detergents and other additives common in wet cleaning processes, which are also common in other cleaning systems. These additives are present in amounts of 3% to 5% in wet cleaning, and are used in lesser amounts in other systems (typically around 1%).

[15] Except where noted, information on acetals is provided by the manufacturer, and has not been independently assessed.

[16] Lanadol Avant contains 1-5% of 2-(2-butoxyethoxy) ethanol (CAS# 112-34-5), which can cause fertility impairment or teratogenesis (HAZMAP 2011). Concentration in washer is approximately 0.1%, which is below accepted de minimis.

[17] Possible reproductive effects from minor β-isomer of propylene glycol ethers, which comprises ~1% of the substance and metabolizes to alkoxyacid. New studies confirmed the minor β-isomer developmental toxicity and showed, for the first time, testicular toxicity. (INSERM 2006).

[18] The oral, rat LD_{50} value for one constituent of Lanadol Avant, Alcohols C13-C15 branched and linear, ethoxylated (CAS #106232-83-1) [present at up to 35% of the individual detergent formulation], is >2,000 mg/kg. This value pertains to the individual chemical and may not be relevant with regard to the mixture.

[19] See note 19 - 2-(2-butoxyethoxy) ethanol (CAS# 112-34-5) includes the central nervous system as a target organ.

[20] At high concentrations (>6% in air), CO_2 causes CNS effects, at sufficient concentrations causes asphyxiation.

[21] See note 19 - 2-(2-butoxyethoxy) ethanol (CAS# 112-34-5) includes kidneys, liver, the heart and blood as target organs.

[22] ACGIH TWA-TLV (ACGIH 2006)

[23] OSHA PEL (NIOSH 2004)

[24] ACGIH TWA-TLV for Stoddard Solvent; No values established for specific hydrocarbons in these products. (ACGIH 2006)

[25] Manufacturer's recommended limit (DCC 2011)

[26] ACGIH TWA-TLV (ACGIH 2006)

APPENDIX B 5.0 REGULATORY AND SAFETY COMPARISON OF ALTERNATIVES

Many of the alternatives to perc have safety considerations, in particular, flammability. These characteristics often require a regulatory framework to ensure safe operation. These requirements may be a significant factor for small dry cleaning businesses. The Massachusetts Board of Fire Prevention Regulations (527 CMR 3) adopts NFPA 32 (National Fire Protection Association code for dry cleaning plants) by reference. In addition, dry cleaners using combustible solvents should check with their local fire department to determine applicability of Massachusetts process safety management regulations 527 CMR 33 (MADFS).

TABLE 7: DRY CLEANING ALTERNATIVES – REGULATORY AND SAFETY INFORMATION

Regulatory Considerations	Perc	Wet Cleaning	Carbon Dioxide	High Flash Point Hydrocarbons	Acetal	Propylene Glycol Ethers	Siloxane	nPropyl Bromide
Regulatory Information								
Regulated as hazardous air pollutant (HAP) under the Clean Air Act	Yes - HAP	No	No	No	No	No	No	No
Regulated as VOC under the Clean Air Act (CAA) NAAQS	No, exempt under CAA	No	No	Yes	Yes	Yes	No, exempt under CAA	Yes
Solid waste regulated as hazardous (US RCRA or MassDEP)	Yes - Listed hazardous waste	No	No	Waste oil must be managed as a hazardous waste in MA	No	No	No	No
Flammability classification (solvent class) (NFPA 32)	None	None	None	Combustible liquid (Class IIIA solvent)	Combustible liquid (Class IIIA solvent)	Combustible liquid (Class IIIA or IIIB solvent)	Combustible liquid (Class IIIA solvent)	NA[29]
Chemical reportable under US EPA Toxics Release Inventory	Yes	No	No	No	No	No	No	No
Chemical reportable under Massachusetts Toxics Use Reduction Act	Yes, higher hazard substance	No	No	No	No	No	No	Yes

Regulatory Considerations	Perc	Wet Cleaning	Carbon Dioxide	High Flash Point Hydrocarbons	Acetal	Propylene Glycol Ethers	Siloxane	nPropyl Bromide
Regulatory Information (continued)								
System regulated under Massachusetts Environmental Results Program	Yes	No	No	No	No	No	No	No
Other regulatory considerations	Leak detection and repair required	Wastewater may require permit for discharge to sewer. MA facilities on septic must discharge to holding tank or obtain groundwater discharge permit.	High pressure storage may require compliance with codes	Compliance with local fire safety codes required	Compliance with local fire safety codes required	Compliance with local fire safety codes required	Compliance with local fire safety codes may be required	None
Physical Safety Information								
Flash point (°F)	NA[27]	NA	NA	160 - 212	142	NA or 72[29]	171	NA
Other safety concerns	Combustion byproducts include HCl and phosgene	None	Safety hazard associated with high pressure equipment	None	None		None	Combustion byproducts include HBr

NA = not applicable

[27] Note: there are inherent difficulties with determining flash point of halogenated hydrocarbon liquids. Some test methods show no flash point for nPB; others show a flash point of 72°F (ECBI 2002). In MA nPB is considered non-flammable; in the European Union it is classified as R11 (highly flammable) (EU 2009).

The following highlights are indicated from the safety and regulatory data presented in Table 7:

- Wet cleaning wastewater discharges to sewer/publicly owned treatment works may require a municipal discharge permit agreement; cleaners must contact their municipal operator to determine what restrictions may apply. Common restrictions include limits on the amount of oils and grease or suspended solids, as well as pH limitations on wastewater discharges. Wet cleaning wastewater may not be discharged to septic systems without first obtaining a groundwater discharge permit in Massachusetts – a costly and time-intensive process. Utilizing an industrial wastewater holding tank that complies with the applicable regulations, prior to transporting wastewater to a publicly owned treatment works, is also an option for cleaners on septic systems. No other regulatory or safety considerations apply to wet cleaning systems.
- Cleaners should be aware of the hazard and regulatory requirements of spotting chemicals, regardless of which alternative system they are using.
- Compliance with local fire safety codes is likely required with siloxane, propylene glycol ether systems, and acetals, which are volatile and combustible. No other regulatory compliance requirements have been identified. Because the acetal solvent is a new technology for dry cleaning it is unclear whether regulatory restrictions may be developed as more information becomes available.
- The high pressure CO_2 vessels may be subject to local building code restrictions for high pressure equipment. Physical safety concerns are associated with risk of explosion and the ability of high concentrations of released CO_2 to asphyxiate workers in the event of a leak.
- Compliance with local fire safety codes is required for all operations using hydrocarbons. In addition, the solid waste associated with a hydrocarbon system is considered waste oil which, in Massachusetts, must be managed as hazardous. HC systems have inherent safety concerns associated with the combustibility of the primary solvent.
- nPB is now reportable to MassDEP under TURA as a listed toxic chemical. Because it is a VOC, there are air regulations that apply to nPB systems.

APPENDIX B 6.0 RESOURCES ON ALTERNATIVES

The information above was gathered from a variety of sources including academic research and vendor data. There are many other sources of information available that could help you in reaching a decision about when to switch to an alternative and which one is best for you and your facility.

For questions about regulatory compliance, TURA and ERP form filing see:

- The Department of Environmental Protection (MassDEP), through its Bureau of Waste Prevention, is responsible for implementing TURA. MassDEP certifies TUR Planners, receives and reviews toxics use reports submitted by companies subject to TURA requirements, provides guidance to both, takes enforcement actions against non-reporters, manages collected data and makes it available to the public, and evaluates the state's overall progress as it works toward the goals of TURA. http://www.mass.gov/eea/agencies/massdep/toxics/tur/

For a confidential site visit to discuss regulatory compliance or potential alternatives see:

- The Office of Technical Assistance and Technology (OTA) is a non-regulatory agency within the Executive Office of Energy and Environmental Affairs that provides free, confidential, on-site technical and compliance consultations to manufacturers, businesses and institutions. OTA also facilitates the development of innovative TUR technologies and sponsors workshops and conferences that focus on toxics use reduction activities for specific industry sectors. http://www.mass.gov/eea/grants-and-tech-assistance/guidance-technical-assistance/agencies-and-divisions/ota/

For a full report on alternatives completed in 2012 and information about converting to professional wet cleaning see:

- The Toxics Use Reduction Institute (TURI), on the Lowell campus of the University of Massachusetts, provides TUR education and training for professionals and the general public, conducts a technology transfer program and sponsors research into the development of cleaner, safer production materials and technologies. The Institute consults with an eleven-member Science Advisory Board on issues such as the addition or deletion of chemicals from the TURA chemical list and the designation of chemicals as higher or lower hazard. www.turi.org and www.turi.org/drycleaning

Additional technical and training assistance can be available through:

- Your detergent or equipment vendor – keeping in mind you should shop around to weigh various opinions and costs
- Trade associations in the New England area:
  - Northeast Fabricare Association
    Contact: Peter Blake (PETEBLKE@aol.com); (800) 442-6848
  - Korean Dry Cleaners Association
    Contact: Harry Cho (HBCHO@aol.com); (978) 535-6936 or Myeong Lowe (mhlowe@hanmail.net); (617) 767-5693
  - MA Wet Cleaning Workgroup, contact Joy Onasch at TURI (joy@turi.org); (978) 934-4343

Financial assistance to convert to one of the alternatives may also be available through:

- Your local bank, given a good credit rating
- The Small Business Administration, Boston Regional Office: http://www.sba.gov/about-offices-content/2/3162 or (617) 565-5590
- Accion USA, if access to traditional capital is not possible: http://www.accionusa.org/home/small-business-loans.aspx
- TURI, for full conversion from either perc or nPB to dedicated wet cleaning. Visit www.turi.org/drycleaning for an application, up to $15,000 may be available as a grant.

APPENDIX C: COMPARATIVE ANALYSIS

This Appendix contains a comparative analysis worksheet to assist you in considering alternatives to perchloroethylene. Various aspects such as cost, performance, capital and operating costs must be weighed to make a fully-informed decision. We have drawn on various sources to produce a worksheet that provides information needed for a full comparative analysis. The Comparative Analysis worksheet includes a column on the left for you to include the data from your current facility and one on the far right for you to record your comments and information specific to your needs and concerns for each data row. There are also summary rows at the bottom to record your conclusions about advantages or disadvantages, and remaining questions you may wish to pursue before making a decision. We have included symbols denoting "equal," "approximately equal to," "more than or less than," "greater than" and "less than," as quick summaries of what the information suggests. These are not strict mathematical quantities but represent the best estimate of how the burden or value of the alternative compares to that of perchloroethylene use.

Following the Comparative Analysis Worksheet we have also provided a summary of the information drawn from eight case studies of cleaners in Massachusetts using various alternatives to perc. We suggest that as you go through the Comparative Analysis Worksheet that you also consult the Case Study Summary, as it provides a slightly different way of weighing the various aspects, and is drawn from near-by real world examples. However, you should make careful note of the size of each of the case study facilities as they may vary greatly from your facility, and the numbers presented should be scaled accordingly as you make your comparisons. The Case Study Summary also includes columns for recording specific information about your shop, so that you can capture details that may be more or less important in your case, and tailor the exercise of comparing alternatives to your individual concerns and goals.

Finally, we have included a recent data set compiled by the Drycleaning & Laundry Institute from a panel discussion at the Clean ’13 event held in New Orleans in June of 2013. The data is direct from the industry representatives on hand for each of the solvents compared. Note, however, that professional wet cleaning is not included in this data set. The data does include points about cycle length, wash time, costs, etc. This may be another helpful resource in comparing alternatives you are considering.

COMPARATIVE ANALYSIS WORKSHEET OF ECONOMICS, PERFORMANCE, ENVIRONMENTAL AND HEALTH CHARACTERISTICS OF ALTERNATIVE DRY CLEANING SOLVENTS

(July 31, 2013)

Based on case studies and research conducted by the Toxics Use Reduction Institute, to be updated in response to comments and as new information becomes available.

Note: All costs are approximate and have not been verified with vendors

FACTOR THAT MAY VARY WITH TYPE OF EQUIPMENT	Your perc data	Perc (Capital Costs for new machines are provided; fill in your operating costs for your existing perc machine)	Wet Cleaning	High Flash Point Hydrocarbon (e.g., DF2000)	Acetal (Solvon K4)	Propylene Glycol Ethers (Solvair, Rynex)	Siloxane (Green Earth)	nPB (DrySolv)	Your comparison
>, >> or >>> means greater than -- the more arrows the greater the difference <, <<, or <<< means less than -- the more arrows the greater the difference				= means equal to ≥ means greater than or equal to ≤ means less than or equal to			± means plus or minus ≈ means approximately equal to		
COST CONSIDERATIONS									
Capital Costs									
Washing / Drying / Finishing Equipment *(cost range depends on size and extra features; based on 2005 data)*		**$40,000 to $65,000**	**10% < perc** *$36,000 to $61,000*	**± 10% perc** *$38,000 to $75,000*	**25% - 50% > perc** *$50,000 to $100,000*	**≥ perc** *$56,000 to $90,000*	**20 -25% < perc** *$30,500 to $55,000*	**≈ perc** *$40,000 to $60,000*	
(If No Public Sewer) Holding Tank or Wastewater Treatment System with Groundwater Discharge Permit		**No cost**	**» perc, if no public sewer** *illegal to discharge cleaning wastewater to septic system*	**= perc** *no wastewater discharge*	**= perc** *no wastewater discharge*	**= perc** *no wastewater discharge*	**= perc** *no wastewater discharge*	**= perc** *no wastewater discharge*	
Fire Code Compliance (if Class II or III solvent)		**No cost: not a flammable liquid**	**= perc** *not combustible*	**>> perc** *Class III solvent**	**>> perc** *Class III solvent**	**>> perc** *Class III solvent**	**>> perc** *Class III solvent**	**= perc** *not combustible*	
				**Retrofit building to meet NFPA 32 code for Type III solvents (flame barriers, automatic sprinklers unless <330 gallons on site, and have specified fire protections in equipment). Local codes may apply as well.*					

FACTOR THAT MAY VARY WITH TYPE OF EQUIPMENT	Your perc data	Perc (Capital Costs for new machines are provided; fill in your operating costs for your existing perc machine)	Wet Cleaning	High Flash Point Hydrocarbon (e.g., DF2000)	Acetal (Solvon K4)	Propylene Glycol Ethers (Solvair, Rynex)	Siloxane (Green Earth)	nPB (DrySolv)	Your comparison
>, >> or >>> means greater than -- the more arrows the greater the difference <, <<, or <<< means less than -- the more arrows the greater the difference			= means equal to ≥ means greater than or equal to ≤ means less than or equal to			± means plus or minus ≈ means approximately equal to			
Operating Costs									
Equipment Maintenance Costs									
Gaskets and Seals Replacement		Requirement to test weekly and fix identified leak within 24 hours	**<< perc** *Water does not break down gaskets and seals*	**< perc**	**< perc**	**< perc**	**< perc**	**> perc** *Causes need for frequent replacement of gaskets and seals; however there is not requirement for testing and replacement*	
Labor Costs									
Initial Staff Training			*Requires training on computer controlled equipment and tensioning machines*	*Training necessary for all new equipment*	*Training necessary for all new equipment*	*Training necessary for all new equipment*	*Training necessary for all new equipment*	*Training necessary for all new equipment*	
Finishing and Pressing			**< perc** *tensioning equipment needed (minimizes need to press clothes)*	**= perc**	**≤ perc** *manufacturer says less wrinkling during cleaning cycle*	**≤ perc** *manufacturer says less wrinkling during cleaning cycle*	**= perc**	**= perc**	
Pre Spotting			**< perc**	**= perc**	**< perc**	**≈ perc**	**> perc**	**< perc**	
Regulatory Compliance: Air Pollution		Weekly leak detection & repair, equipment monitoring, recordkeeping per ERP Workbook because perc is a hazardous air pollutant. ALL co-residential and ALL co-located perc machines must cease operation on or by December 21, 2020.	**< perc** *no air pollutants*	**none: unless use >2000 pounds per year** *if > 2000 lb, Air VOC emissions permit required, would involve recordkeeping and controls*	**none: unless use >2000 pounds per year** *if > 2000 lb, Air VOC emissions permit required, would involve recordkeeping and controls*	**none: unless use >2000 pounds per year** *if > 2000 lb, Air VOC emissions permit required, would involve recordkeeping and controls*	**none: unless use >2000 pounds per year** *if > 2000 lb, Air VOC emissions permit required, would involve recordkeeping and controls*	**none: unless use >2000 pounds per year** *if > 2000 lb, Air VOC emissions permit required, would involve recordkeeping and controls*	

FACTOR THAT MAY VARY WITH TYPE OF EQUIPMENT	Your perc data	Perc (Capital Costs for new machines are provided; fill in your operating costs for your existing perc machine)	Wet Cleaning	High Flash Point Hydrocarbon (e.g., DF2000)	Acetal (Solvon K4)	Propylene Glycol Ethers (Solvair, Rynex)	Siloxane (Green Earth)	nPB (DrySolv)	Your comparison
>, >> or >>> means greater than -- the more arrows the greater the difference <, <<, or <<< means less than -- the more arrows the greater the difference			= means equal to ≥ means greater than or equal to ≤ means less than or equal to			± means plus or minus ≈ means approximately equal to			
Regulatory Compliance: Hazardous Waste		Maintaining proper labeling, storage conditions, record keeping, shipping and disposal per ERP Workbook	**<< perc** *no hazardous or industrial waste*	**= perc** *maintaining proper labeling, storage conditions, recordkeeping, shipping and disposal*	**< perc** *no hazardous waste*	**< perc** *no hazardous waste*	**< perc** *no hazardous waste*	**< perc** *no hazardous waste*	
Materials and Resource Costs									
Water Use (Cleaning and Condensing / Chilling) and Sewer Discharge (if applicable)		Water used for condenser/chiller	**≈ perc** *no chilling/condensing, but water used for cleaning*	**= perc**	**= perc**	**= perc**	**= perc**	**= perc**	
			Alternatives compared to refrigerated condenser/chillers						
Cleaning Chemicals -- Detergent			**> perc**	**= perc**	**= perc**	**= perc**	**= perc**	**= perc**	
Solvent			*no cost*	**= perc**	**> perc**	**> perc**	**> perc**	**>> perc**	
Energy (electricity for machine operation including solvent recovery)			**<< perc** *no distillation / solvent recovery*	**<< perc if no distillation** **= perc if distillation**	**<< perc** **< other solvents** *For distillation about 1/2 of other solvents*	**= perc**	**> perc if distillation** **< perc if no distillation** *high temperature required for distillation*	**= perc**	
Natural Gas / Oil (heating, pressing, steam, cooling)			**< perc** *less pressing*	**= perc**	**= perc**	**= perc**	**= perc**	**= perc**	

FACTOR THAT MAY VARY WITH TYPE OF EQUIPMENT	Your perc data	Perc (Capital Costs for new machines are provided; fill in your operating costs for your existing perc machine)	Wet Cleaning	High Flash Point Hydrocarbon (e.g., DF2000)	Acetal (Solvon K4)	Propylene Glycol Ethers (Solvair, Rynex)	Siloxane (Green Earth)	nPB (DrySolv)	Your comparison
>, >> or >>> means greater than -- the more arrows the greater the difference <, <<, or <<< means less than -- the more arrows the greater the difference			= means equal to ≥ means greater than or equal to ≤ means less than or equal to			± means plus or minus ≈ means approximately equal to			
Fees									
Technology Licensing		no cost	= perc	= perc	= perc	= perc	$2500/year for the first, $1250/year for additional machines	= perc	
Regulatory Compliance Fees		$250 annual ERP Compliance Fee + TURA fees for large users	<< perc	<< perc	<< perc	<< perc	<< perc	<< perc *TURA fee for very large users*	
Unquantifiable Costs									
Customer Acceptance / Good Will			>> perc *No loss of customers*	> perc *advertised as "green"*	> perc *advertised as "green"*	> perc *advertised as "green"*	> perc *advertised as "green"*	= perc	
Potential Liability from Spill or Accidental Release		Risk: highly toxic solvent that persists in air, and sediments, and groundwater	<<< perc	< perc	<< perc	<< perc	< perc	= perc	
Risk of Fire		Minimal risk, not a flammable liquid	= perc *not a flammable liquid*	>> perc *Class III combustible solvent*	>> perc *Class III combustible solvent*	>> perc *Class III combustible solvent*	>> perc *Class III combustible solvent*	= perc *not a combustible liquid*	
Worker Health and Safety (See also Human Health Risk section below)		Risk: volatile toxic solvent; IARC carcinogen, and other adverse respiratory, neurological, and skin effects	<<< perc *no toxic solvents in washing – pre-spotting chemicals should be checked*	< perc *pre-spotting chemicals should be checked*	< perc *pre-spotting chemicals should be checked*	< perc *pre-spotting chemicals should be checked*	< perc *pre-spotting chemicals should be checked*	= perc *Volatile toxic solvent; National Toxicology Program has identified it as a likely carcinogen, with other adverse respiratory, neurological, and skin effects. pre-spotting chemicals should be checked*	

FACTOR THAT MAY VARY WITH TYPE OF EQUIPMENT	Your perc data	Perc (Capital Costs for new machines are provided; fill in your operating costs for your existing perc machine)	Wet Cleaning	High Flash Point Hydrocarbon (e.g., DF2000)	Acetal (Solvon K4)	Propylene Glycol Ethers (Solvair, Rynex)	Siloxane (Green Earth)	nPB (DrySolv)	Your comparison
>, >> or >>> means greater than -- the more arrows the greater the difference <, <<, or <<< means less than -- the more arrows the greater the difference			= means equal to ≥ means greater than or equal to ≤ means less than or equal to			± means plus or minus ≈ means approximately equal to			
TECHNICAL CONSIDERATIONS									
Cycle Time			<< perc *20 - 40 minutes: washing and drying in separate machines so cycles can overlap*	>> perc *60-75 minutes*	>> perc *60-65 minutes*	> perc *> 45 minutes*	>> perc *53-58 minutes*	= perc *45 minutes*	
Materials does not handle well		Leather, suede, beads, delicates	Leather, suede and fur	Vinyl appliqués	Appliqués or decorations glued to fabric	None identified	None identified	Leather, suedes, beads, delicates	
Aggressive-ness of solvent (roughness on clothes)		aggressive	< perc	< perc	< perc	unclassified	< perc	= perc	
ENVIRONMENTAL & HEALTH CONSIDERATIONS									
Environmental Risks		Persistence in soil, sediment, and air is an issue, as well as some aquatic toxicity. Hazardous Air Pollutant	<<< perc *no toxic solvents in washing – pre-spotters should be checked*	< perc *serious issues with aquatic toxicity, moderate issues in other areas. Volatile Organic Carbon that contributes to smog*	<< perc *based on current information, appears to be low to moderate issues. Volatile Organic Carbon that contributes to smog*	<< perc *based on current information, appears to be low to moderate issues. Volatile Organic Carbon that contributes to smog*	< perc *high issues with sediment and air as well as aquatic toxicity*	= perc *persistence in air, high aquatic toxicity,and a Volatile Organic Compound that contributes to smog*	

FACTOR THAT MAY VARY WITH TYPE OF EQUIPMENT	Your perc data	Perc (Capital Costs for new machines are provided; fill in your operating costs for your existing perc machine)	Wet Cleaning	High Flash Point Hydrocarbon (e.g., DF2000)	Acetal (Solvon K4)	Propylene Glycol Ethers (Solvair, Rynex)	Siloxane (Green Earth)	nPB (DrySolv)	Your comparison
>, >> or >>> means greater than -- the more arrows the greater the difference <, <<, or <<< means less than -- the more arrows the greater the difference					= means equal to ≥ means greater than or equal to ≤ means less than or equal to			± means plus or minus ≈ means approximately equal to	
Human Health Risks		**IARC has identified this as a probable carcinogen and skin, eye and respiratory irritant; it is toxic to the liver,kidney, nervous, immune and hematological systems. Recommended occupational exposure limit 25 ppm**	**<<< perc** *skin and eye irritant from detergent concentrate*	**< perc** *Skin, eye, respiratory irritant, and toxic to lungs, kidneys and nervous system. Recommended occupational exposure limit: 5000 ppm*	**unknown** *possible skin and eye irritant; no occupational exposure limit established*	**< < perc** *skin, eye, and respiratory irritant, toxic to the nervous system, liver and kidneys; no occupational exposure limit established*	**< perc** *Skin and eye irritant, toxic to liver and immune system, some evidence of carcinogenicity and toxicity to the reproductive/ developmental and nervous systems. Recommended occupational exposure limit: 10 ppm*	**= perc** *Potent neurotoxin; National Toxicology Program has identified it as reasonably anticipated to be a human carcinogen; eye, skin, and respiratory irritant, toxic to liver and kidney and to the digestive, blood and nervous systems. Recommended occupational exposure limit: 10 ppm*	
WOULD YOU CONSIDER THIS OPTION?									
Advantages									
Disadvantages									

FACTOR THAT MAY VARY WITH TYPE OF EQUIPMENT	Your perc data	Perc (Capital Costs for new machines are provided; fill in your operating costs for your existing perc machine)	Wet Cleaning	High Flash Point Hydrocarbon (e.g., DF2000)	Acetal (Solvon K4)	Propylene Glycol Ethers (Solvair, Rynex)	Siloxane (Green Earth)	nPB (DrySolv)	Your comparison
>, >> or >>> means greater than -- the more arrows the greater the difference <, <<, or <<< means less than -- the more arrows the greater the difference = means equal to ≥ means greater than or equal to ≤ means less than or equal to ± means plus or minus ≈ means approximately equal to									
Questions to ask Vendor, TURI, OTA, Trade Organization, Other Dry Cleaners, etc.									

CASE STUDY SUMMARY FOR DIFFERENT TYPES OF DRY CLEANING FACILITIES

July 31, 2013 (page 1 of 2)

(to be updated as additional information becomes available)

Cost Element		Perc	Perc	Wet Cleaning	Hydrocarbon	Acetal	PGE	Siloxane	nPB	How does your shop compare?
		Your Shop	Case Study Facilities							
Shop Sizing:	Pieces/day (DC)		60	100	TBD	650	~300	100	100	
	Pieces/day (Laundry)		50	500		600	350	100	30	
	lbs/day (DC)		-	-		-	260	-	-	
	lbs/day (Laundry)		-	-		-	-	-	-	
	FTEs		7	2.5		15+	4.5	4+	2.5	
	Square footage		1300	1,500		3600	4000	2800	1700	
Capital Costs:	Dry Cleaning		$44,000	$46,900		$90,000	$90,000	$49,620	$40,000	
	Other Investments		$0	$0		$ 0	as needed	$115,285	$0	
Time Investments:	Load size (pounds)		30	30		50	60-70	40	40	
	Cycle time (mins/load)		40	12-25 washer; 8-15 dryer		65	120	60	35	
	ERP/DEP paperwork (average hours/year)		2	0		2 (for waste pick-ups)	10	5 hrs/week	0	
	Spotting time (average hours/day)			0.3		6	4	0.5	1.5	
	Finishing time (average hours/day)			5		6 pressers at 8 hrs/day	6	4	5	
	Training on new methods (hours/employee)		0	6 initial hours for tensioning equip; 3 initial hours for washer		4 hrs for spotter	0	?	1-2 days	
	OTHER					Also paid $3600 for start-up solvent		distiller in use		
Performance (items or $/month)	Send-outs		0	0		0	13	0	0	
	Redos		0	0		0	27	1	3	
	Claims		$65	0		0	2	0	0	

CASE STUDY SUMMARY FOR DIFFERENT TYPES OF DRY CLEANING FACILITIES

July 31, 2013 (page 2 of 2)

Cost Element		Perc	Perc	Wet Cleaning	Hydrocarbon	Acetal	PGE	Siloxane	nPB	How does your shop compare?
		Your Shop	Case Study Facilities							
Operation Costs ($/month)	Machine Maintenance		$0	$32		$0	$1,200	$206	$42	
	Filters		$34	0		$0	$100	$26	$0	
	Solvent		$130	0		$36	$200	$520	$225	
	Detergent		$74	$180		$326	$0	$24	$10	
	Spotting agents		$18	$3		$200	$500	$8	$60	
	Waste disposal		$125	0		$92	$54	$49	$21	
	Regulatory/ permitting		$11	0		$0	$54	$8	$0	
	Licensing fees		$0	0		$0	$0	$183	$0	
Resource Use (Unit/month)	Electricity (kwH)		3027	1606		8284	625	2610	1962	
	Electricity ($)		$513	$234		$1,707	$120	$521	$367	
	Natural Gas (therms)		98	0		1435	0	377	480	
	Natural Gas ($)		$90	0		$1410	0	$378	$615	
	Oil (gallons)		0	424		0	675	0	0	
	Oil ($)		0	$1,086		$0	$2,360	$0	$ 0	
	Water (100cuft)		24	26		60	-	34	24	
	Water ($)		$66	$142		$275	$230	$160	$ 107	
	Sewer (100 cuft)		24	26		60	-	34	24	
	Sewer ($)		$77	$186		$836	$310	$254	$136	
Monthly total Operating Cost (w/out labor)			$1,203	$1,863		$4,882	$5,128	$2,237	$1,583	
Monthly per piece total operating cost (w/out labor)			(110/day or ~2640/month) $0.46	(600/day or ~14,400/month) $0.13		(1250/day or ~ 30,000/month) $0.16	(650/day or ~ 15,600/month) $0.33	(200/day or ~ 4800/month) $0.47	(130/day or ~ 3120/month) $0.50	

DRYCLEANING & LAUNDRY INSTITUTE CLEAN SHOW '13 PANEL DISCUSSION DATA COMPILATION
COMPARING THE SOLVENTS
Source: http://www.natclo.com/1308/solvents.htm

Solvent/ Manufacturer	Perc Dow	Hydrocarbon R.R. Street & Co	Solvon K4 Kreussler	Rynex Adco	GenX Caled	GreenEarth GreenEarth Cleaning
Cycle length (minutes)	45	2 baths: 55-65 1 bath: 50-60	2 baths: 70 1 bath: 62	74	55-60	60
Wash time (minutes)	15-20	18-20	15-20	75	4-8	17
Drying time (minutes)	30-35	28	48 with cool down	60	25-30	35
Specific machine required?	Class IV	Class IIIA	Class IIIA with vacuum still	K Series Class IIIA	Class IIIA	Class IIIA
Fees/Licenses	No	No	No	No	No	$2,500/year
Proprietary products required?	No	No products	Yes, Kreussler	Booster sizing	No	Many approved available, top brands
Average cost per gallon	$25	$13.95	$30.70	$36	$29.41	$21-$34
Average solvent mileage (pounds cleaned per gallon)	750 to 1,000	1,500 to 1,800 4,000 in K series	4,500 Minimum of .5% of load	3,000+	800 to 1,100	1,500
Recommended waste disposal	Licensed waste hauler	Appropriate waste hauler	Licensed waste hauler	Regular waste hauler	Non-hazardous municipal waste	Licensed waste hauler
Number of machines in U.S.	36,000 U.S.	10,000+	200 U.S. 400 global	10 U.S. 13 global	800 U.S. 1,000 global	More than 900 U.S. 1,700 global
Any major issues?	Proper handling and disposal; restrictions on location; special reporting & permitting	None	None	Residual solvent temperature after drying	None	None
Rumors or misconceptions?	1. Banned 2. Unavailable 3. Stabilizer disappears when distilled	1. Doesn't clean	1. Odor of solvent will be a problem	None	1. Doesn't need detergent	1. Doesn't clean 2. Banned in Canada
Top 3 benefits	1. Safety 2. Proven performance 3. Economical	1. Cost effective 2. Virtually odorless 3. Ease of transition and ongoing operations	1. Exceptional cleaning performance 2. Unmatched solvent mileage 3. Environmental & occupational safety for clients, staff, landlords, and drycleaners	1. Better soil removal 2. Fewer reruns 3. Great solvent mileage	1. Better performance for oil & water stain removal 2. Cheaper spotting labor and chemical cost 3. Faster cleaning with no harsh smell	1. Favorable regulatory profile 2. Garment makers' recommendations 3. Landlord specified locations

APPENDIX D: POLLUTION PREVENTION, HEALTH & SAFETY BEST MANAGEMENT PRACTICES

General Record-keeping checklist:

- ☐ Keep Perc Consumption Log
- ☐ Keep Receipts for Perc Purchases
- ☐ Keep Logs on Equipment Maintenance, Leak Detection, Equipment Monitoring, and Equipment Repair*
- ☐ Keep Copies of Hazardous Waste Manifests
- ☐ Keep Wastewater Analysis Records
- ☐ Keep Wastewater Disposal Information and Records
- ☐ Keep Wastewater Treatment Information and Records
- ☐ Keep State or Local Agency Communication Records
- ☐ Keep a Copy of the Signed Compliance Certification, Compliance Workbook and Other Forms or Correspondence
- ☐ Keep Equipment Design Specifications and Operating Manuals
- ☐ Keep Copy of Hazardous Waste Generator Notification Form
- ☐ Keep Copies of Land Disposal Restriction (LDR) Notification with Your Manifests

*May be on the same log sheet

Good Management Practices: Emergency Preparedness Checklist

- [ ] Develop procedures for emergencies.
- [ ] Train personnel in emergency procedures.
- [ ] Designate someone in charge, in the event of an emergency.
- [ ] Ensure that your emergency procedures require employees to notify the local fire department, police department and/or DEP in the event of an emergency. You have to notify DEP within two hours after a sudden, continuous or intermittent release to the environment. Perchloroethylene is the most likely chemical dry cleaners will use that is subject to these standards. In general only releases greater than ten (10) pounds should be reported. (The original report should be followed up by a written report to DEP within sixty (60) days.) However, you must also report any emergency or release, which threatens human health or the environment (see below).
- [ ] Post-emergency information next to telephones.
- [ ] Take action to familiarize police, fire department, hospitals and other local emergency agencies with your place of business.
- [ ] Document all emergency procedures, plans, evacuation emergency training and preparedness activities.
- [ ] Keep emergency equipment on hand and make sure all employees are aware of where it is and how to use it.
- [ ] After an emergency occurs, review what happened with employees and correct any problems.
- [ ] Ensure that your emergency procedures identify when you must contact the DEP, Board of Health or National Response Center and how this contact should be made.

If a release (spill or leak) or threat of release, fire, or explosion of hazardous waste that may threaten human health or the environment occurs call:

DEP at 1-888-304-1133
State Police at 508-820-2121
National Response Center at 1-800-424-8802

APPENDIX E: SPOT REMOVERS

The following information is supplied from the Safer Spotting Chemicals Best Practices for Textile Cleaning -- May 2007; EPA & Department of Toxic Substances Control.

Many cleaners have converted away from PERC dry cleaning to safer alternative processes. A number of them, however, continue to use TCE and PERC spotting agents. Use of these spotting agents will make the waste streams generated by the non-PERC garment cleaning processes hazardous.

How do I know if my spotting agent contains TCE or PERC?
Ask your spotting chemical supplier for a Material Safety Data Sheet (MSDS) for the spotting agent. If the spotting agent contains TCE or PERC, it should list the chemical under the second section of the MSDS sometimes labeled "Composition / Information on Ingredients" or "Components." The Chemical Abstract Service (CAS) number should also be listed. This is important because suppliers may call TCE and PERC by different names, but the CAS number stays the same. The CAS number for TCE is 79-01-6 and for PERC 127-18-4.

Have safer alternative spotting agents been tested?
The Institute for Research and Technical Assistance (IRTA) is a technical nonprofit organization. During a project sponsored by California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) and U.S. EPA Region IX, IRTA tested low-VOC safer alternatives with a number of textile cleaning facilities using a range of different textile cleaning processes. IRTA and the test facilities found that the alternative POG spotting agents worked effectively.

Are the safer alternative POG spotting agents available?
There are some alternative spotting agents on the market. Many of these contain other ingredients that are toxic or are Volatile Organic Compounds (VOCs) that contribute to smog. The best alternatives from an overall health and environmental standpoint are water-based and soy based products.

APPENDIX F: MASSDEP INSPECTOR CHECKLIST

Environmental Results Program- DRY CLEANERS SECTOR

Inspection Checklist --- August 2014

Instructions:

The inspection checklist includes Dry Cleaners Certification workbook references and citations to 310 CMR 7.26(10)-(16) that will help to determine compliance. Workbook references and regulatory citations are inside square brackets (e.g., [A-1] and [310 CMR 7.26(14) (d)]). The Inspection Checklist also provides "cues" (text in *ITALICS*) to assist inspectors in understanding when to seek verbal responses from the facility owner or manager, make visual observations, or a combination of the two. The "cues" are mainly provided for AQ requirements.

The evaluation of E.R.P. for dry cleaners following inspections helps to determine whether or not the workbook-plus-self-certification process has improved the compliance rate, improved environmental behaviors in this sector, and will identify owners who falsely certified compliance, documenting any enforcement actions.

Inspectors may investigate beyond the workbook requirements, as necessary, if indications of significant environmental threat or damage exist.

Some of these questions will require use of inspectors' best judgment. Please try to obtain the most accurate assessment possible. Circle or fill-in your response to each question or requirement.

DO NOT LEAVE ANY QUESTIONS BLANK UNLESS YOU HAVE BEEN DIRECTED TO SKIP A QUESTION. If absolutely necessary, indicate "Could not determine" next to a question and include the reason why. A completed inspection checklist must be returned to Boston for each facility inspected. They will be used to make statistical extrapolations about the effectiveness of E.R.P. on this industry sector.

BWP needs to assess the state of compliance and environmental behavior in each sector. Any questions or comments, please contact Paul Reilly at 617 556-1097.

1	Does this facility perform perchloroethylene-based dry cleaning on site? If YES, SKIP to Question 2	**Y**	**N**
	IF NO, ANSWER 1a-c below and STOP		
1a	Is this facility closed?	**Y**	**N**
1b	Is this facility a storefront only?	**Y**	**N**
1c	Does this facility use only non perchloroethylene based dry cleaning machines?	**Y**	**N**

2	Are there any other occupants in the building that houses this dry cleaner? *(A strip mall or mall counts as the same "building")* IF NO, SKIP to Question 3	**Y**	**N**
	IF YES, PROCEED TO QUESTION 2a		

2a	Are there any residential units in the building?	**Y**	**N**
2b	Are there any licensed day care centers in the building?	**Y**	**N**
2c	Are there any schools in the building?	**Y**	**N**
2d	Are there any health care facilities in the building?	**Y**	**N**
2e	Are there any children's pre-schools in the building?	**Y**	**N**
2f	Are there any youth or senior centers in the building?	**Y**	**N**
2g	Are there any prisons in the building?	**Y**	**N**
2h	Is the unit leased?	**Y**	**N**
2i	Is the unit owner occupied?	**Y**	**N**

AIR QUALITY

3	Are previous month's perchloroethylene purchases recorded on the first day of each month? [C -16] *(Check log or records enter Y as long as they have the records even if no log**)***	**Y**	**N**
4	Is the total perchloroethylene purchased in past year calculated on the first day of each month? [C -16] *[310 CMR 7.26(15)(d)2.]* *(Check log)*	**Y**	**N**
5	Are dry cleaning system specification and operating manuals kept onsite? [C -14] [310 CMR 7.26(13)(k) *(Ask to see manuals)*	**Y**	**N**
6	Are all emission control device specification and operating manuals kept onsite? [C-14] [310 CMR 7.26(13)(k)] *(Ask to see manuals; describe any "extra" systems and operating procedures)*	**Y**	**N**
7	Is leak detection performed weekly, following the workbook protocol and using proper leak detection equipment? [C-12] *[310 CMR 7.26(13)hi)ij); (15)(d)3.]* *(Ask to see leak detector and demonstration of leak detection procedures for each machine (while operating).)*	**Y**	**N**
8	Is a log of weekly leak checks kept onsite? *(Ask to see log)*	**Y**	**N**
9	Is the operation of the refrigerated condenser monitored weekly, using **ONE** of the following options (10 or 11)?	**Y**	**N**
10	Is the temperature at the end of cycle measured on the outlet side of the refrigerated condenser and recorded weekly? [C-9, C10] [310 CMR 7.26(14)(a)1.; (15)(d)5.]	**Y**	**N**
11	Are the refrigeration system high and low pressure gauges monitored during the drying cycle, to verify that they are within the ranges specified in the manufacturer's operating instructions?	**Y**	**N**

12	Is a log of weekly emission control monitoring kept onsite? *(Ask to see log)*	**Y**	**N**
13	Are all problems repaired within 24 hours or, if not possible, are parts ordered within 2 days and installed within 5 days of receipt?[C-11, C-13] *[310 CMR 7.26(13)(j)]*	**Y**	**N**
14	Is a log of all problems, repairs, and parts ordered kept onsite?[C-14] *[310 CMR 7.26(15)(d)3.,4.]* *(Ask to see log)*	**Y**	**N**
15	Are dry cleaning systems operated according to manufacturers recommendations? [310 CMR 7.26(13)(b)] (*Ask to be walked through facility and shown operating procedures and compare to manual. Have facility give a couple of examples.)*	**Y**	**N**
16	Is virgin perchloroethylene stored in closed, non-leaking tanks or containers? [C-33] *[310 CMR 7.26(13)(g)]* *(Examine tanks/containers)*	**Y**	**N**
17	Are all machine doors closed immediately after transferring articles and kept closed at all times except during maintenance? *[310 CMR 7.26(13)(a)]* *(Observe operations and ask verbally)*	**Y**	**N**
18	Is perchloroethylene odor absent in the facility (while the machine is operating)?	**Y**	**N**
19	Are seals and gaskets periodically replaced before they become brittle? *(Verbal) (P 2 -- Not a regulatory requirement)*	**Y**	**N**
20	Are spent filter cartridges drained in housings/sealed containers for 24 hours prior to disposal? [310 CMR 7.26(13)(f)] *(Observe operations and ask verbally)*	**Y**	**N**
21	Does the facility have any Transfer Machines? IF YES, CEASE operation. Transfer Machines are prohibited.	**Y**	**N**
22	List the installation date of each dry-to-dry machine		

23	Does this facility have any dry-to-dry machines installed before 12/9/91? IF NO, SKIP to Question 24	**Y**	**N**
23a	Do all dry-to-dry machines installed before 12/9/91 have a carbon adsorber that was installed prior to 9/22/93 or a refrigerated condenser? [C-7] [*310 CMR 7 .26 (12)(a)1.]* (*Look for refrigerated condenser. If no condenser, look for carbon adsorber and ask to see installation records, receipts, look at model numbers, or get a specific verbal date for each machine)*	**Y**	**N**
24	Do all dry-to-dry machines installed after 12/9/91 have a refrigerated condenser? [310 CMR 7.26(12)(a)2] *(Ask look for refrigerated condenser)*	**Y**	**N**
25	Were any dry-to-dry machines installed after 12/21/05? IF NO, SKIP to Question 26	**Y**	**N**
25a	Do the dry-to-dry machines installed after 12/21/05 have a secondary carbon adsorber, as well as a refrigerated condenser?	**Y**	**N**
26	Is the cleaning cycle stopped only after the refrigerated condenser temperature reaches less than 45 F? [310 CMR 7.26(13)(c)4.;(14)(a)1.; (15)(d)5.] *(Ask procedures and look for any automatic feature to prevent door from being opened until temperature drops below 45 F; check log)*	**Y**	**N**
27	If the Facility has a boiler of at least 1 MMBTU/HR capacity, is it operated in compliance with the standards in [310 CMR 7.02, 7.04, 7.05, or 7.26(30) – (37)]?	**Y**	**N**

HAZARDOUS WASTE REQUIREMENTS

28	Does the facility have a Hazardous Waste generator ID? [C-25]	**Y**	**N**

29	Circle the facility's hazardous waste status: VSQG SQG LQG [C-26] [310 CMR 30.353(5)] [310 CMR 30.061(1)] **IF THE FACILITY IS A VSQG, SKIP to Question 31**	**Y**	**N**
30a	Does the facility have an employee notification system? [SQG: 30.351(9)(c)1. LQG: 30.340(1)(d)2 & 30.524(2)(a)] CHECK THIS	**Y**	**N**
30b	Does the facility have a device to summon emergency response agencies? [SQG: 30.351(9)(c)2.] LQG: 30.524(2)(b)]	**Y**	**N**
30c	Does the facility have a portable fire extinguisher and spill control equipment? [SQG: 30.351(9)(c)3 LQG: 30.524(2)(c)]	**Y**	**N**
30d	Does the facility have adequate fire suppression equipment? [SQG: 30.351(9)(c) LQG: 30.524(2)(d)]	**Y**	**N**
30e	Does the facility have a program to test emergency equipment? [SQG: 30.351(9)(d) LQG: 30.524(3)]	**Y**	**N**
30f	Does the facility have an adequate aisle space and clearly marked exits? [SQG: 30.351(9)(c)5 LQG: 30.524(5) & 30.524(2)(e)]	**Y**	**N**
30g	Does the facility have a program to familiarize and obtain agreements from local ER agencies? [SQG: 30.351(9)(j) LQG: 30.521(5)]	**Y**	**N**
30h	Does the facility have a designated emergency coordinator? [SQG: 30.351(9)(b) LQG: 30.521(7)]	**Y**	**N**
30i	Has the facility posted names and telephone numbers of emergency coordinators, locations of fire alarms and extinguishers, fire department telephone numbers, and evacuation routes? [SQG: 30.351(9)(c)6. LQG: 30.524(2)(f)]	**Y**	**N**
30j	Does the facility have a log of weekly storage area inspections? [SQG: 30.351(8)(a) 30.340(1)(a)1.d. 30.686 30.340(1)(a)1.d.]LQG	**Y**	**N**
31	Does the facility have emergency notification procedures and training? [C-37, 38]	**Y**	**N**
32	Is the facility in compliance with quantity and time limits for HW storage? [C-28, C-29] [VSQG-310 CMR 353(3)(4)] [SQG-310 CMR 30.351(6)(7)] [LQG-310 CMR 30.340(2)]	**Y**	**N**
33	Are containers labeled properly? [C-34, C-39] VSQG[30.353(6)(g) 30.682] SQG [30.351(8)(a)] LQG: [30.340(1)(b)]	**Y**	**N**

34	Are containers in good condition and kept closed? [C-33] VSQG[30.353(6)(g) 30.683 30.340(1)(a)1.a. (LQG) 30.351(8)(a)]SQG VSQG[30.353(6)(g) 30.685(1) 30.340(1)(a)1.c. (LQG) 30.351(8)(a)]SQG	**Y**	**N**
35	Is there a separate, designated hazardous waste storage area, marked with line or tape? [C-31] VSQG[30.353(6)(h) 30.340(1)(k) (LQG) 30.351(8)(b)]SQG	**Y**	**N**
36	Are wastes appropriately segregated? [C-33] VSQG[30.353(6)(g) 30.688(2) 30.340(1)(a)1.e. (LQG) 30.351(8)(a)]SQG	**Y**	**N**
37	Are hazardous waste containers stored on a crack-free surface that will contain leaks or spills? [C-35] VSQG[30.353(6)(h) 30.340(1)(f) (LQG) 30.351(8)(b)]SQG	**Y**	**N**
38	Is there adequate spill containment for **outdoor** storage area (110% of largest container or 10% of total storage, whichever is greater)? [C-35] VSQG[30.353(6)(h) 30.340(1)(g) (LQG) 30.351(8)(b)] SQG	**N/A** **Y**	**N**
39	Is entrance by unauthorized people restricted? [C-31] VSQG[30.353(6)(h) 30.340(1)(i) (LQG) 30.351(8)(b)] SQG	**Y**	**N**
40	Does the storage area have appropriate signage? [C-31] VSQG[30.353(6)(h) 30.340(1)(j) (LQG) 30.351(8)(b)] SQG	**Y**	**N**
41	Are pallets used if containers are stacked? VSQG[30.353(6)(g) 30.685(2) 30.340(1)(a)1.c. (LQG) 30.351(8)(a)] SQG	**N/A** **Y**	**N**
42	Is the storage area inspected weekly for leaks and is there adequate aisle space to allow inspections? vsqg 30.686 30.340(1)(a)1.d. (LQG) 30.351(8)(a)SQG] (weekly inspections) vsqg 30.685(4) 30.340(1)(a)1.c. (LQG) 30.351(8)(a)]SQG (aisle space)	**Y**	**N**
43	Has there been a perchloroethylene leak or spill of more than 10 pounds? If NO, SKIP to Question 44	**Y**	**N**
43a	If more than ten pounds of perchloroethylene was spilled or leaked, was DEP notified? [C-36] 310 CMR 40.0311(1)(2) VSQG[30.353(4)] SQG[30.351(9)(h)2.] LQG[30.340(1)(d)2. 30.524(6)(d)&(e)2.]	**Y**	**N**

44	Is this facility a VSQG? IF NO, SKIP to Question 45	**Y**	**N**
44a	Does the facility-self transport hazardous waste?	**Y**	**N**
45	Does the facility use manifests and licensed transporters? [C-30] VSQG[30.353(12) 30.311(1) (LQG) 30.351(10)(e)] SQG	**Y**	**N**
46	Are logs, shipping records, manifests kept for at least three years? [C-30] VSQG[30.353(6)(e) 30.331(1) 30.351(10)(f)]SQG 30.340(1)]LQG	**Y**	**N**
47	Are wastes shipped to a licensed TSDF or permitted HW recycler? [C-30] VSQG[30.353(8)] [30.305(1) or (2) 30.340(1) (LQG) 30.351(10)(d)]SQG	**Y**	**N**
	INDUSTRIAL WASTEWATER REQUIREMENTS		
48	Does this facility discharge industrial wastewater to a Publicly Owned Treatment Works? IF NO, SKIP to Question 49	**Y**	**N**
48a	Are discharges to sewer free of perchloroethylene (other than separator water), and contain no flammable materials, no corrosives, no solids, and no wastewater hotter than 104 F? [C-19c] [310 CMR 72.04(3)(a)(b)]	**Y**	**N**
48b	Does the facility have a local sewer permit or other permission to discharge?	**Y**	**N**
48b1	Is the facility in compliance with its local sewer permit?[C-7] [310 CMR 72.04(2)]	**Y**	**N**
49	Does this facility discharge to Surface Waters? IF NO, SKIP to Question 50	**Y**	**N**
49a	Is the facility in compliance with NPDES? [C-20a] [310 CMR 72.04(1)]	**Y**	**N**
50	Does this facility use a wet cleaning and/or laundering process at the facility?	**Y**	**N**

51	Does this facility discharge industrial (nonsanitary) wastewater to a septic system? [C-21a]	**Y**	**N**
52	Does this facility discharge industrial (nonsanitary) wastewater to ground? IF NO, SKIP to Question 53	**Y**	**N**
52a	Does the facility (or its lessor) have a Groundwater Discharge Permit? [C-22]	**Y**	**N**
52b	Is the facility in compliance with its state groundwater discharge permit?	**Y**	**N**
53	How does the facility dispose of its separator water? [C-17, C-23] [310 CMR 72.04(1)]		
53a	Discharge to sewer?	**Y**	**N**
53b	Store in a container / tank and ship as hazardous waste?	**Y**	**N**
53c	Use an evaporator ?	**Y**	**N**
53ci	Is separator water treated (carbon adsorber) before evaporation? (This question is for informational purposes only).	**Y**	**N**
53cii	Are filter changes recorded in a log book? (This question is for informational purposes only).	**Y**	**N**
54	Does the facility store industrial wastewater in containers? [C-24] IF NO, SKIP to Question 55	**Y**	**N**
	IF YES, PROCEED to Question 54a		
54a	Are records of wastewater analysis kept? [310 CMR 72.04(5)(c)]	**Y**	**N**
54b	Are disposal manifests, bills of lading kept onsite for three years? [310 CMR 72.04(5)(c)]	**Y**	**N**
54c	Are containers in good condition? [310 CMR 72.04(5)(b)]	**Y**	**N**
54d	Are containers stored on crack-free surface? [310 CMR 72.04(5)(b)]	**Y**	**N**
54e	Are containers in good condition labeled "industrial wastewater" or "non hazardous waste")? [310 CMR 72.04(5)(b)]	**Y**	**N**

54f	Are any containers stored outdoors? IF NO, SKIP to Question 55	**Y**	**N**
54f1	′IF YES, PROCEED to Question 51f1 Is there spill containment for outdoor containers? [310 CMR 72.04(5)(b)]	**Y**	**N**
55	Does the facility store industrial wastewater in tanks? [C-24] **IF NO, THE INSPECTION IS COMPLETE**	**Y**	**N**
	IF YES, PROCEED to Question 55a		
55a	Are tanks labeled “Non hazardous” and securely stored on a crack-free, impervious surface?	**Y**	**N**
55b	Does containment system equal 110% of capacity of total volume of all above ground tanks?	**Y**	**N**
55c	Is there year round access for emptying?	**Y**	**N**
55d	Is there odor control if needed?	**Y**	**N**
55e	Is the tank lined with and made of compatible materials?	**Y**	**N**
55f	Is the tank remotely or automatically filled? IF NO, SKIP to Question 55g	**Y**	**N**
	IF YES, PROCEED to Question 55f1		
55f1	Is there a bell and light alarm that sounds at 75% capacity?	**Y**	**N**
55g	Is the tank manually filled? **IF NO, THE INSPECTION IS COMPLETE**	**Y**	**N**
55g1	Do the manually filled tanks have visual or sight glass level measurement?	**Y**	**N**

INSPECTION IS COMPLETE