Technology Assessment Protocol – Ecology (TAPE)

Process Overview

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For more information contact:

Water Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

Phone: 360-407-6600

Washington State Department of Ecology - www.ecy.wa.gov

o Headquarters, Olympia	360-407-6000
o Northwest Regional Office, Bellevue	425-649-7000
o Southwest Regional Office, Olympia	360-407-6300
o Central Regional Office, Yakima	509-575-2490
o Eastern Regional Office, Spokane	509-329-3400

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Technology Assessment Protocol – Ecology (TAPE)

Process Overview

by
Douglas C. Howie, P.E.

Water Quality Program
Washington State Department of Ecology
Olympia, Washington

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Introduction

This document provides an overview of the Technology Assessment Protocol-Ecology (TAPE) process for vendors, designers, and manufacturers (referred to as 'proponents') who wish to have their stormwater treatment technologies certified by the Washington State TAPE program. This guide walks proponents through the TAPE certification process, providing an overview of the program and the specific steps required for certification. Specific guidance for designing, executing, and reporting on performance monitoring is detailed in three companion Ecology documents:

- *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE)* (Publication 11-10-061) *(aka,* TAPE Technical Guidance Manual*)*

- *Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE)* (Publication 02-10-037)

- *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Publication 04-03-030).

Ecology updated the TAPE Technical Guidance Manual in August 2011[1]. Ecology may consider field data collected prior to August 2011 to satisfy the performance goals of TAPE. Previously collected field data must meet either the 2008 or the 2011 TAPE guidelines and include a third party reviewed or Ecology approved Quality Assurance Project Plan.

TAPE now requires all new applicants to pay a fee at three stages in the certification process. Please refer to the

Fee Structure for Program Participation for a description of these fees.

Overview of TAPE

The TAPE program provides a peer-reviewed regulatory certification process for emerging stormwater treatment technologies. The TAPE program is administered by the Washington Department of Ecology (Ecology), with assistance from staff at the Washington Stormwater Center (www.wastormwatercenter.org/), which provides stormwater management assistance including guidance on certification of emerging treatment technologies.

The stormwater management manuals for western and eastern Washington include design criteria and performance goals for stormwater treatment facilities in the state of Washington

[1] Proponents accepted into the TAPE program prior to July 2011 may choose to follow either the new protocol (June 2011) or the old protocol (January 2008). Proponents submitting a technology to the TAPE program for the first time can choose between the new protocol and the old protocol until December 31, 2012, after which your QAPP must follow the new protocol. Your QAPP must state which of the two protocols is being followed.

(stormwater management manuals). Volume V, Chapter 12 (western) and Chapter 5, Section 12 (eastern) of the manuals discuss Ecology's evaluation and approval process for emerging treatment technologies. The stormwater manuals do not provide criteria for the selection and sizing of emerging technologies because the technologies and the knowledge of them are rapidly evolving. Ecology and the Washington Stormwater Center established a Board of External Reviewers (BER)[2] to:

- Review emerging treatment technology design and performance data and recommend whether or not the technology should be certified.
- Provide overall advice and guidance as the TAPE program evolves and improves.

Performance must be demonstrated by proponents by testing their stormwater treatment technology under rainfall conditions typical of the Pacific Northwest. The testing protocol is specifically designed to evaluate flow-through best management practices (BMPs) with relatively short detention times, and may not be suitable for all stormwater treatment technologies. Based on BER technical reviews, Washington Stormwater Center staff members advise Ecology regarding which new stormwater treatment technologies meet performance goals and therefore, should be added to the list of approved technologies in the stormwater management manuals. Ecology makes the final decision to certify new stormwater treatment technologies.

Criteria for certification

Certification of emerging technologies depends on their performance relative to one or more of five performance goals (Table 1).

Table 1. TAPE Performance Goals

Performance Goal	Influent Range	Criteria [a]
Basic Treatment	20-100 mg/L TSS	Effluent goal ≤ 20 mg/L TSS
	100-200 mg/L TSS	≥ 80% TSS removal
	> 200 mg/L TSS	> 80% TSS removal
Dissolved Metals Treatment	Dissolved copper 0.005 - 0.02 mg/L	Must meet basic treatment goal and better than basic treatment currently defined as >30% dissolved copper removal
	Dissolved zinc 0.02 - 0.3 mg/L	Must meet basic treatment goal and better than basic treatment currently defined as > 60% dissolved zinc removal

[2] Formerly referred to as the Technical Review Committee (TRC).

Performance Goal	Influent Range	Criteria [a]
Phosphorus Treatment	Total phosphorus (TP) 0.1 to 0.5 mg/L	Must meet basic treatment goal and exhibit ≥ 50% TP removal
Oil Treatment	Total petroleum hydrocarbon (TPH) > 10 mg/L	1) No ongoing or recurring visible sheen in effluent 2) Daily average effluent TPH concentration < 10 mg/L 3) Maximum effluent TPH concentration of 15 mg/L for a discrete (grab) sample
Pretreatment [b]	50-100 mg/L TSS	≤ 50 mg/L TSS
	≥ 200 mg/L TSS	≥ 50% TSS removal

a. See TAPE Technical Guidance Manual for further details.

b. Pretreatment technologies generally apply to (1) project sites using infiltration treatment and (2) treatment systems where pretreatment is needed to ensure and extend performance of the downstream basic or dissolved metals treatment facilities.

mg/L - milligrams per liter
TP - total phosphorus
TPH - total petroleum hydrocarbons
TSS - total suspended solids

Use level designations

Ecology evaluates the existing data on a stormwater treatment technology to assign use level designations that determine how many installations may occur in Washington and what the monitoring requirements are for obtaining additional data on treatment performance. Depending on the relevance, amount, and quality of performance data provided with the application for certification, Ecology will place the technology into one of two use level designation categories: pilot use level designation (PULD) or conditional use level designation (CULD) (Table 2). PULDs are typically given when there are sufficient laboratory data available to indicate a treatment technology may meet the performance goals for TAPE that are described in the next subsection. CULDs are typically given when there are both laboratory and field data available for a treatment technology that would indicate an even greater likelihood of meeting these performance goals. The PULD and CULD allow the technology to be installed and operated in the state of Washington in order to gather the performance data required for final general use level designation (GULD) certification. Emerging technology use level designations are posted on Ecology's website at: www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html.

Table 2. TAPE Use Level Designations

Use level designation	Minimum data required for certification[a]	Time limit (months)[b]	Maximum number of installations in Washington State	Field testing required under designation
Pilot (PULD)	Laboratory	30	5[c]	A minimum of one site indicative of or located in the Pacific Northwest; *all* sites installed in Washington State must be monitored[d]
Conditional (CULD)	Field data required; laboratory data may supplement	30	10[c]	A minimum of one site indicative of or located in the Pacific Northwest
General (GULD)	Field data required; laboratory data may supplement	Unlimited	Unlimited[e]	None

a. Proponent must supply all available performance data with the initial application. PULD and CULD approvals will depend on the relevance, amount, and quality of data. Submittal of data does not ensure approval.
b. From the time the original use level designation is received from Ecology. Proponents with a PULD or CULD are typically allowed a maximum of 30 months to prepare a QAPP, receive QAPP approval, conduct stormwater monitoring according to the QAPP, and prepare a TER requesting CULD or GULD certification for their stormwater treatment technology. Proponents requiring extensions on the 30-month use level designation, or the submittal of a QAPP or TER, must submit a request to Ecology at least 2 weeks before the due date. Ecology will grant extensions only if the proponent shows that progress is being made toward completing required TAPE components.
c. No installation limit for retrofit projects.
d. Local governments covered by a municipal stormwater National Pollutant Discharge Elimination System (NPDES) permit must submit a Notice of Intent form to Ecology when a PULD technology is proposed for installation in their jurisdiction.
e. Subject to conditions imposed by Ecology (i.e., maximum flow rates, limitations on drainage basin size, locations for use, and others as appropriate) listed in the GULD document posted on Ecology's website. Local jurisdictions may impose other conditions.

What does certification mean?

The TAPE certification process was designed to ensure that the approved treatment technologies meet applicable design criteria and performance goals for new development and redevelopment. TAPE certification means that the new technology has successfully met the TAPE performance goals, when properly installed, operated, and maintained. However, TAPE certification does not

mean the technology is appropriate for any and all stormwater treatment applications. Local governments should use TAPE certification as one of many factors when selecting or allowing specific stormwater control and water quality treatment solutions to be used in their jurisdiction. Selection of a treatment technology must be based on a cost-benefit analysis and not simply on the fact that a technology is TAPE-certified. Although TAPE is a Washington State protocol, several other states, counties, and cities use TAPE certification to determine whether a technology can be installed within their jurisdiction.

The TAPE performance goals do not address capital costs, costs for operation & maintenance (O&M), or costs for material disposal; however, proponents are encouraged to provide this supplemental information in their Technical Evaluation Report (TER). In addition, the TAPE certification process represents specific influent concentration ranges and does not typically include an assessment of long-term performance. Local governments should take these and other factors into account when evaluating the potential use of a TAPE-certified treatment technology.

Ecology makes all final decisions whether to certify new stormwater treatment technologies after considering recommendations from the BER and Washington Stormwater Center staff. General-use-level designations (GULD) do not expire or need to be renewed. In rare circumstances, Ecology may rescind a GULD if egregious errors or gross technical mistakes are later discovered in the performance data upon which the GULD was based.

Steps to certification

Step 1. Complete the *Emerging Stormwater Treatment Technologies: Initial Application for Certification (Initial Application).* The *Initial Application* includes information about your technology and the performance data you have collected to help us evaluate whether your technology shows promise of meeting the TAPE performance goals. When we receive a completed *Initial Application,* we will assign your technology a case number and contact you if any additional information is required. The Washington Stormwater Center may ask up to three members of the BER to review and provide comments on the application. If after reviewing this information Ecology finds that your technology shows promise of meeting TAPE goals, Ecology will grant your technology either a pilot or a conditional use level designation (PULD or CULD). Our goal is to grant a use level designation within one to two months from receipt of your complete *Initial Application*. Once the proponent finds a suitable monitoring site and notifies Ecology, the deadlines for QAPP and TER submittal are set.

Initial Application

Submit two (2) hardcopies, and one text-searchable electronic (.pdf) copy

Your *Initial Application* must include as much of the following information as possible. If using data from testing following other protocols, describe how data are similar to or differ from TAPE guidelines (e.g., storm depth, sample type). If insufficient information is provided, your *Initial Application* will be returned without review, pending receipt of adequate information:

- Description of physical, chemical, and/or biological treatment functions.
- Design drawings/photographs.
- Description of construction materials.
- Equipment dimensions.
- Design flow rate (gallons per minute [gpm], cubic feet per second [cfs], inches per hour [in/hr]).
- Explanation of site installation requirements (e.g., necessary soil characteristics, hydraulic grade requirements, depth to groundwater limitations, utility requirements).
- Description of any pretreatment requirements or recommendations.
- Description of any components of the treatment system that may contain copper, zinc, or phosphorus or any other constituent of concern that might contribute to increased pollutant concentrations in the effluent.
- Description of any components (i.e., concrete) that may result in pH fluctuations in the effluent.
- Detailed description of the sizing methodology.
- Expected treatment capabilities.
- Maintenance procedures.
- Description of bypass process.
- Comparison of size of laboratory unit to typical field units (if laboratory testing data are submitted).
- Raw water quality data.
- Summary of water quality data and removal calculations.
- Statistical analysis.
- Flow rate(s) used for laboratory testing.
- Influent and effluent flow data.
- Storm event information.
- Any other information or data that will help determine if your treatment technology can meet or does meet TAPE's performance goals.

Step 2. Design a performance evaluation study and write a QAPP. The study must generate performance data of sufficient quality and quantity to evaluate with adequate statistical power how the technology performs in the field. Detailed guidance for designing your study, including how to write the QAPP is provided in the *TAPE Technical Guidance Manual* and in Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Publication No. 04-03-030, Guidelines for Preparing QAPPs). Finding a field site with suitable stormwater flows and influent ranges specified in the *TAPE Technical Guidance Manual* and Table 1 of this document is often challenging; consequently, proponents are encouraged to identify sites early in the process of designing the study. Selecting multiple field sites is often advantageous to the proponent; the QAPP must address field conditions at each field site where data collection will occur. Local governments covered by a municipal stormwater National Pollutant Discharge Elimination System (NPDES) permit must submit a Notice of Intent form to Ecology for every PULD technology that is proposed for installation in their jurisdiction.

QAPP
Submit 2 hardcopies and 1 text-searchable electronic (.pdf) copy

The completed QAPP will be reviewed by at least three experts chosen from the BER. The BER members will address the following question:

> *If the monitoring program described in the proponent's QAPP is substantively followed and completed, will the resulting data and statistical analyses allow Ecology to rigorously evaluate the technology's performance against the stated TAPE performance goals?*

Washington Stormwater Center staff will consolidate comments from the three BER members and forward the consensus recommendation to Ecology. If there is substantial disagreement among the external reviewers, we may request that additional BER members review the QAPP. The final decision to approve the QAPP rests with Ecology.

The proponent must submit a QAPP that meets Ecology's QAPP guidance and *TAPE Technical Guidance Manual* requirements within six months of finding a suitable monitoring site and notifying Ecology. Within three months[3] of receipt of the final QAPP, Ecology will complete the review and make a decision whether field testing can commence.

Step 3. Install, operate, and monitor the technology at one or more field sites indicative of or within the Pacific Northwest. Prior to the start of field-testing, the QAPP must be approved by Ecology. The approved QAPP must be used to guide project management during this phase of the certification process. While Ecology and the Washington Stormwater Center staff are available to discuss issues arising during the field study, the proponent's project team is responsible for monitoring the site(s) according to the QAPP.

Step 4. Send us the results. Upon completion of the field sampling, use the data analysis and statistical techniques described in your approved QAPP to summarize the results and write the TER. Instructions for completing the TER are found in the *TAPE Technical Guidance Manual.* Note that an independent professional third party must review key elements of the TER for all submittals that contain field monitoring data collected by a vendor or manufacturer of a stormwater treatment technology before it is sent to us for review.

[3] If circumstances prevent completion of Ecology's review within the stated review period, Ecology will notify the proponent of the reason for the delay and provide an estimated review schedule.

TER

Submit two (2) hardcopies, and one text-searchable electronic (.pdf) copy

We will review each TER for completeness and then ask at least three members of the BER to conduct a thorough examination of your results, interpretations, and findings. For consistency whenever possible, your TER will be sent to the same reviewers who evaluated your QAPP. Results of the external reviews will be compiled and a summary recommendation will be made to Ecology. Ecology intends to complete the review of your TER and make a final certification decision within three months[3] of receiving the TER. If the TER is approved by Ecology, the technology will be granted a GULD. At a minimum the GULD will identify the type of approved treatment (basic, dissolved metals, phosphorus, oil), the design flow rate, and the required maintenance interval. Ecology is responsible for the final certification decision.

Submitting information to Ecology

Initial Applications, QAPPs, and TERs, along with the appropriate fees should be sent to the Washington State Department of Ecology, using the contact information provided below. Fee information is provided at the end of this document.

Send the following: • Applications • QAPPS • TERS • Fees	**Please make checks payable to**: ***Department of Ecology***
Send to: TAPE Program Washington State Department of Ecology Cashiering P.O. Box 47611 Olympia, WA 98504-7611	
Questions? (360) 407-7052 ldar461@ecy.wa.gov	

Confidentiality

Proponents may request that certain records or other information be considered confidential. Such requests will be considered by Ecology consistent with Washington State law (RCW 43.21A.160). In order for such records or information to be considered confidential, the proponent must certify that the records or information is unique to the design and construction of the technology, or release to the public or to a competitor would adversely affect the competitive position of the proponent. The proponent must request that such records or information be made available only for the confidential use of Ecology. All monitoring data including, but not limited to, laboratory results and field measurements, QA/QC data, data qualifiers, and monitoring site information cannot be considered confidential.

To make a request for confidentiality, the proponent must clearly mark only those pages that contain confidential material with the word "confidential" and submit these pages as a separate file to Ecology. Placeholder pages must be placed in the document that state "confidential material has been provided as a separate document to Ecology." The proponent must also provide a letter of explanation as to why these pages are confidential. Ecology will review the request and send notice to the proponent either granting or denying the confidentiality request. Proponents may request return of material if Ecology denies the request for confidentiality. At a minimum, requests for confidentiality require a 1 month review.

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Technology Assessment Protocol – Ecology (TAPE)

Fee Structure for Program Participation

Fee category	Amount	Due
Initial Application	$ 2,000	Upon submittal of *Initial Application*
Quality Assurance Project Plan (QAPP) review	$ 4,000	Upon submittal of final QAPP [a]
Technical Evaluation Report (TER) review	$ 6,000	Upon submittal of final TER [b]
a. Fee must be paid before Ecology updates the TAPE website to reflect the change in the technology's status. Collection of fee does not guarantee approval of QAPP. b. Fee must be paid before Ecology updates the TAPE website to reflect the technology's new General Use Level Designation (GULD). Collection of fee does not guarantee approval of TER or guarantee GULD status.		
Please make checks payable to: Department of Ecology and send to: TAPE Program Washington State Department of Ecology, Cashiering, P.O. Box 47611, Olympia, WA 98504-7611		

TAPE is administered by the Washington State Department of Ecology with assistance from staff at the Washington Stormwater Center. The Washington Stormwater Center is a partnership between the City of Puyallup, the University of Washington Tacoma, and the Washington State University Puyallup Research and Extension Center.

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Appendix 1. Acronyms

BER	Board of External Reviewers
BMP	Best management practices
CULD	Conditional Use Level Designation
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and maintenance
PULD	Pilot Use Level Designation
QAPP	Quality Assurance Project Plan
TAPE	Technology Assessment Protocol-Ecology
TER	Technical Evaluation Report
TP	Total phosphorus
TPH	Total petroleum hydrocarbons
TRC	Technical Review Committee
TSS	Total suspended solids

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Appendix 2. References

Ecology 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies,* No. 04-03-030. Washington State Department of Ecology, Olympia, WA. (www.ecy.wa.gov/biblio/0403030.html)

Ecology, 2004. *Stormwater Management Manual for Eastern Washington*, No. 04-10-076. Washington State Department of Ecology, Olympia, WA. (www.ecy.wa.gov/programs/wq/stormwater/easternmanual/manual.html)

Ecology 2005. *Stormwater Management Manual for Western Washington*, No. 05-10-029, 05-10-030, 05-10-031, 05-10-032, 05-10-033. Washington State Department of Ecology, Olympia, WA. (www.ecy.wa.gov/programs/wq/stormwater/manual.html)

Ecology 2008. *Guidance for Evaluating Emerging Stormwater Treatment Technologies. Technology Assessment Protocol – Ecology (TAPE),* No. 02-10-037. Washington State Department of Ecology, Olympia, WA. (www.ecy.wa.gov/biblio/0210037.html)