Understanding Testing Lab Results and QA Testing Workflows

Quality assurance (QA) testing for cannabis is of paramount importance in verifying that end products are safe for consumption. All requirements and thresholds for lab results have been programmed to align with the rules set forth in Washington Administrative Code (WAC) 314-55 per the guidance of the Washington State Liquor and Cannabis Board (WSLCB).

Licensees are required to send samples of different harvest materials and intermediate products to third party QA Testing Labs that have been accredited by the WSLCB. To send samples to a lab, a Licensee should create an inventory transfer directly to a Testing Lab for the parent inventory lot being tested. The licensee should designate the quantity being sent, and denote that it is a sample. The 'sample type' should be 'lab sample'. *(For more information on how to create an inventory transfer, please reference the job aid titled "Inventory Transfers v1.37.5".)*

This document will discuss:

- Required QA Tests for Non-Medically Compliant
- Required QA Tests for Medically Compliant Product
- Medically Compliant Status
- QA Test Results
    - Test Thresholds
    - Eligibility for Retest
    - Eligibility for Extraction
- Requesting Retest of Eligible Product
- QA Test Result Inheritance
- Non-Mandatory Lab Testing

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Required QA Tests for Non-Medically Compliant Product

Following are the different types of screening and analysis for non-medically compliant (recreational) product that relate to cannabis.

Moisture Screening	Moisture screening consists of two separate tests: moisture content and water activity rate. Moisture content measures the percentage of water concentration for a sample of marijuana. Water activity is a thermodynamic measurement of the "free" water in a substance and is reported as a rate with results ranging from 0.000 to 1.000.
Potency Analysis	Potency analysis provides the amount of concentration of the active ingredients (cannabinoids) in a marijuana sample, reported as a percentage.
Foreign Matter Inspection	Foreign matter inspection involves observation of stems (3mm or more in diameter), seeds, or other foreign matter present within a sample. This is logged as a "pass" or "fail" based on the percentage of foreign matter present.
Microbiological Screening	Microbiological Screening tests for unwanted microorganisms that can be responsible for product spoilage and potential disease and the results are presented as a measure of colony-forming units per gram (cfu/g).
Mycotoxin Screening	Mycotoxin screening measures the amount of aflatoxins and ochratoxins present within a sample and the results are presented as a measure of parts per billion (ppb).
Residual Solvent Testing	Residual solvent testing is applied to the output of solvent-based extraction processes and the results for the specific solvents that the product is screened for are presented in parts per million (ppm).

Testing required for individual products is driven by the "Inventory Type" of the inventory sample sent to a QA Lab for testing, so not all products require the full list of tests above.

Inventory Type Category	Inventory Type Sub-category	Product Description	Test(s) Required
Harvest Material	Flower Lots	Lots of marijuana flowers or other material that will not be extracted	1. Moisture Content 2. Potency Analysis 3. Foreign Matter Inspection 4. Microbiological Screening 5. Mycotoxin Screening

Intermediate Product	Marijuana Mix	The result of combining multiple lots of marijuana flower or other material into a single product	1. Moisture Content* 2. Potency Analysis 3. Foreign Matter Inspection* 4. Microbiological Screening 5. Mycotoxin Screening
Intermediate Product	Hydrocarbon Concentrate	Concentrated cannabis extract derived through solvent-based extraction process(es) involving hydrocarbons (including but not limited to: n-butane, isobutane, propane, heptane)	1. Potency Analysis 2. Mycotoxin Screening* 3. Residual Solvent Testing
Intermediate Product	CO_2 Concentrate	Concentrated cannabis extract derived through solvent-based extraction process(es) involving carbon dioxide (such as CO_2-extracted hash oil)	1. Potency Analysis 2. Mycotoxin Screening* 3. Residual Solvent Testing
Intermediate Product	Ethanol Concentrate	Concentrated cannabis extract derived through solvent-based extraction process(es) involving ethanol	1. Potency Analysis 2. Mycotoxin Screening* 3. Residual Solvent Testing
Intermediate Product	Food Grade Solvent Concentrate	Concentrated cannabis extract derived through solvent-based extraction process(es) involving food grade solvents	1. Potency Analysis 2. Microbiological Screening* 3. Mycotoxin Screening* 4. Residual Solvent Testing
Intermediate Product	Non-Solvent Based Concentrate	Concentrated cannabis extract derived through non-solvent extraction process(es) such as kief, hash, rosin, or bubble hash	1. Potency Analysis 2. Microbiological Screening* 3. Mycotoxin Screening*

Tests with an asterisk (*) for intermediate products are only required if the QA tests were not performed when the product was in the form of Flower Lots. If testing was applied to the Flower Lot, these test results will be inherited by the Intermediate Products created from the Flower Lot.

Required QA Tests for Medically Compliant Product

For cannabis products that are seeking 'medically compliant' status, there are additional QA tests that must be performed.

Pesticide Testing	Pesticide testing measures how much of a list of specific pesticides exist in the product and reports these amounts in parts per million (ppm).
Heavy Metal Screening	Heavy metal screening determines how much of a list of specific heavy metals exist in the product and reports these amounts in parts per million (ppm).

Medically Compliant Status

Licensees (Producers, Processors, Producer/Processors, and Tribes) can designate different types of harvest material and intermediate products as *seeking* a 'medically compliant' status. This can be accomplished in three different ways, as follows:

UPON FINISHING A BATCH

When a production facility is performing the "Finish Batch" function where harvest material is turned into inventory lots, a Licensee can seek 'medically compliant' status for individual lots being created by selecting the 'medically compliant' checkbox for each line item seeking the special designation.

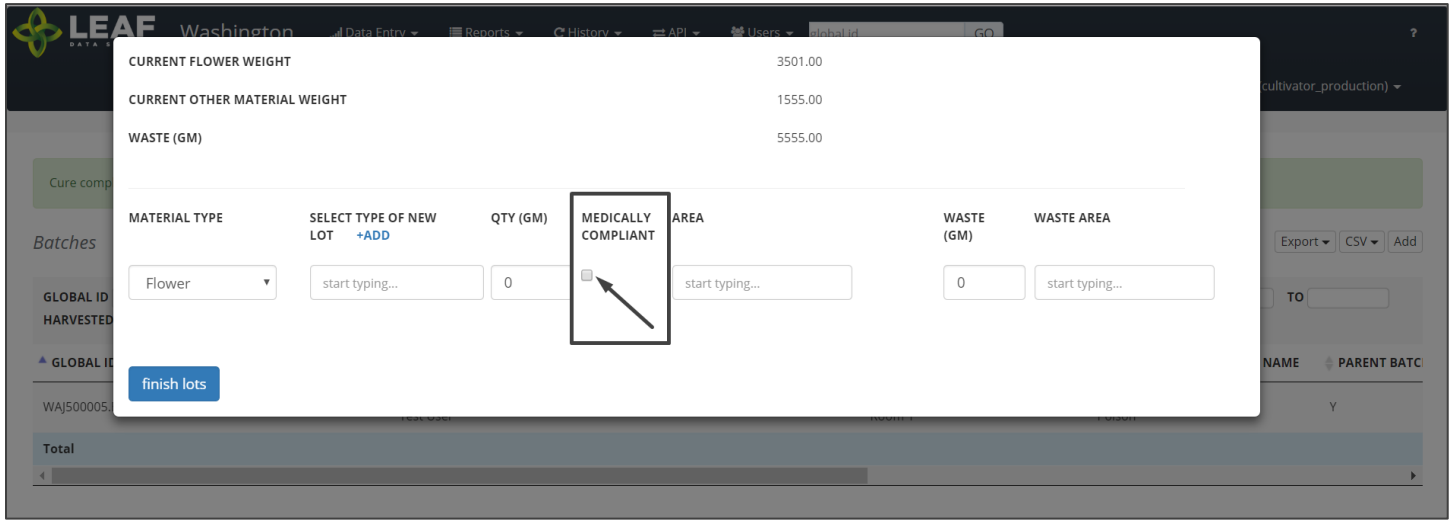

Figure 1: Finish Batch screen (Data Entry→Batches, then click the 'finish batch' icon)

UPON PERFORMING A CONVERSION

When a production or processing facility performs a conversion, they have the ability to select whether or not the output is seeking 'medically compliant' status by using the 'medically compliant' checkbox. *NOTE ABOUT TEST RESULT INHERITANCE*: When applicable, for conversions that utilize input inventory lots that have already attained 'medically compliant' status and this status is eligible to be inherited by the output inventory lot, the 'medically compliant' checkbox MUST be checked in order for test inheritance to occur. (Inheritance is elaborated in the section of this document titled 'QA Test Result Inheritance'.)

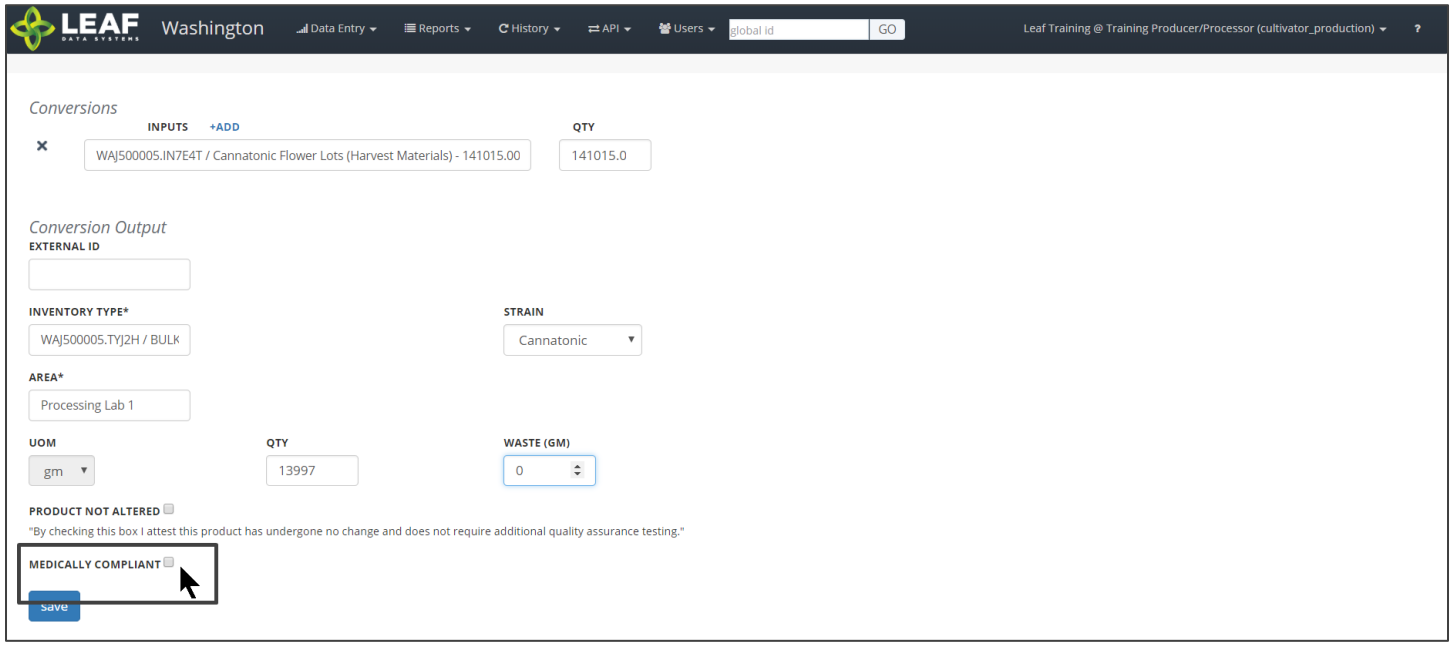

Figure 2: Conversions page (Data Entry →Conversions)

UPON EDITING AN INVENTORY LOT

At any time an inventory lot needs to be designated as seeking 'medically compliant' status outside of the processes in which this can otherwise occur (finish batch and conversion), the lot can be modified and the 'medically compliant' checkbox selected.

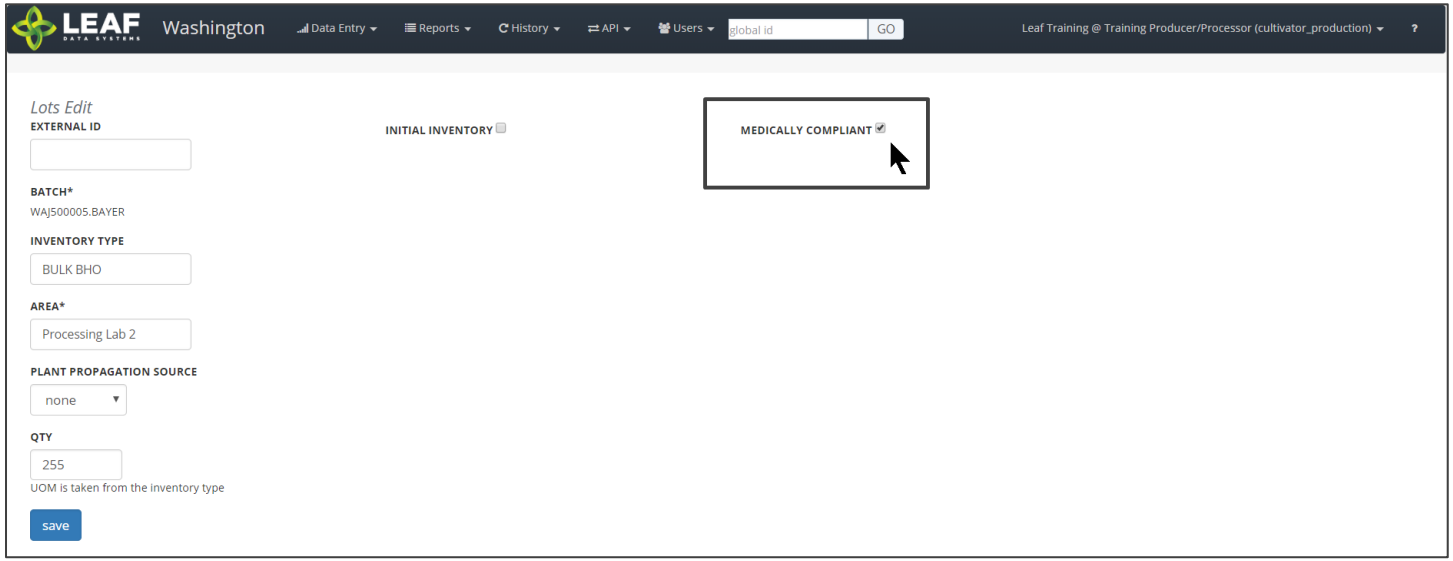

Figure 3: Lots Edit screen (Data Entry→Lots, then 'modify' the lot)

Once a Licensee has designated that an inventory lot is seeking 'medically compliant' status, this notifies the Testing Laboratory in receipt of the samples that the appropriate medical testing should be performed by assigning the inventory lot a 'medically compliant' status of 'pending.' Once the required QA tests have been performed (and passing values attained) to achieve the 'medically compliant' designation for the product, the 'medically compliant' status will change to 'yes' from 'pending'.

The screenshot on the following page shows the 'Lots Listing' where you can search for any inventory lot using the filters at the top, then scroll to the right to view the 'medically compliant' status.

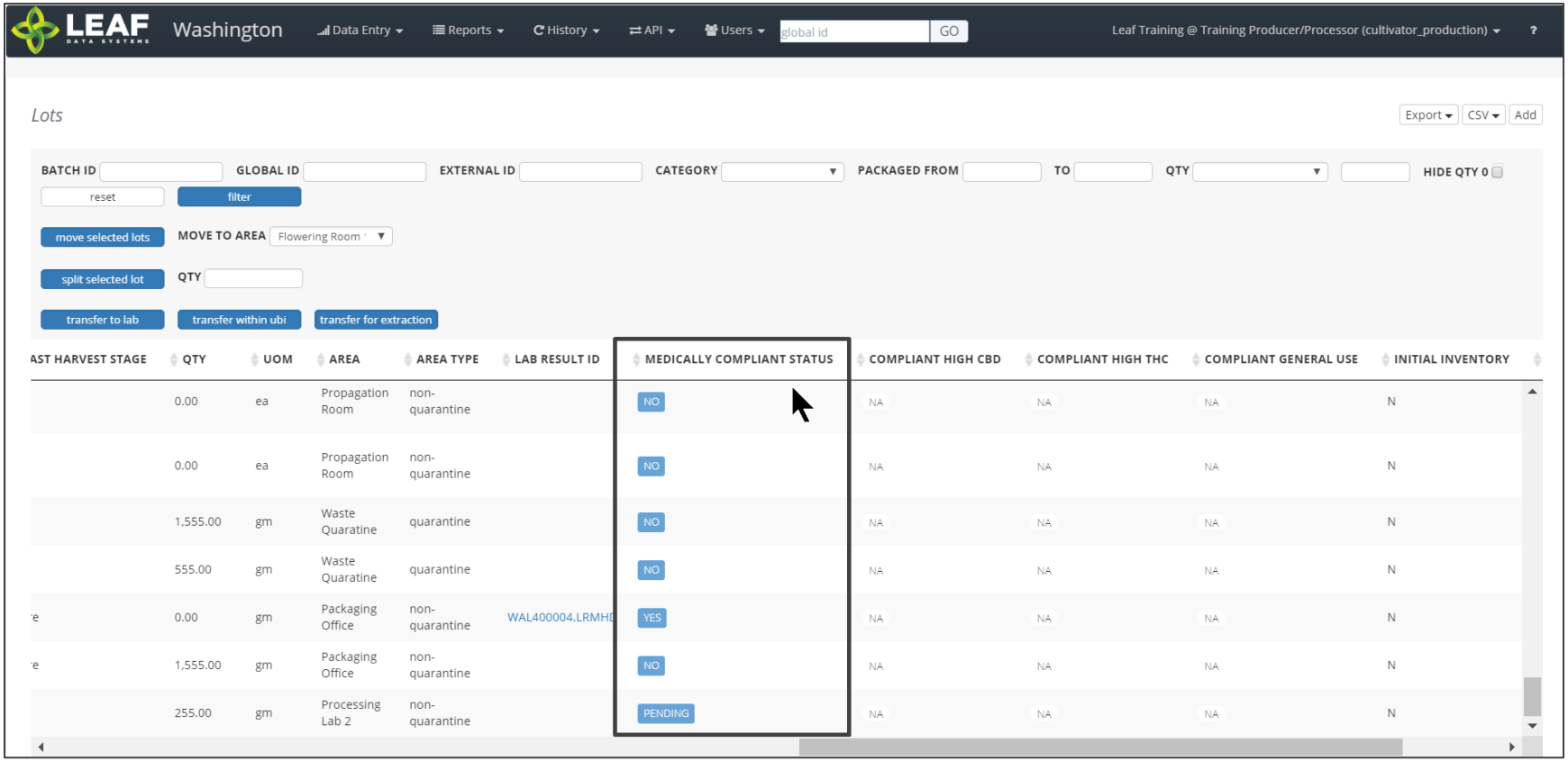

Figure 4: Lots listing (Data Entry-->Lots, then filter to inventory lot and scroll to the right to see 'medically compliant' status)

QA Test Results

Each type of testing that can be performed to cannabis has certain thresholds or parameters that cause it to either 'pass' or 'fail' testing. For the required tests (for both non-medical product and medical product) the following tables show the minimum and maximum 'passing' values for each of the tests along with the minimum 'failing' value.

When these required tests are 'failed', there are a few different scenarios that may be allowed depending on the specific values of the test results. In some situations a Licensee can retest the product (either in its same state or in a different future state once conversions have been performed). The column in the following tables titled 'Max. Retest Allowed' describes the situations when a retest would be permissible following a failed test result. The column titled 'Extraction Eligible?' details the test results that can be failed, but the product can still be used as material to be extracted. If the test result values of a product do not fall within the guidelines necessary for it to either be 'eligible for retest' AND/OR 'eligible for extraction', it must be destroyed.

MOISTURE SCREENING

MOISTURE TESTS	**MIN. PASSING**	**MAX. PASSING**	**MIN. FAILING**	**MAX. RETEST ALLOWED**	**EXTRACTION ELIGIBLE?**
Moisture Water Activity Rate	0.000	0.650	0.651	Always allowed	Yes
Moisture Content Percentage	0.000	15.000	15.001	Always allowed	Yes

FOREIGN MATTER INSPECTION

FOREIGN MATTER TESTS	**MIN. PASSING**	**MAX. PASSING**	**MIN. FAILING**	**MAX. RETEST ALLOWED**	**EXTRACTION ELIGIBLE?**
Stems, 3mm diameter or larger	0.00%	5.00%	5.01%	Always allowed	Yes
Seeds and other foreign matter	0.00%	2.00%	2.01%	Always allowed	Yes

NOTE: Foreign Matter Tests are either "PASS" or "FAIL". Threshold values listed are for reference, only.

MICROBIOLOGICAL SCREENING

MICROBIOLOGICAL TESTS	**MIN. PASSING**	**MAX. PASSING**	**MIN. FAILING**	**MAX. RETEST ALLOWED**	**EXTRACTION ELIGIBLE?**
Bile Tolerant	0.000	1000.000	1000.001	<=2000	Yes
Pathogenic E Coli	0.000	0.000	0.001	Never allowed	No
Salmonella	0.000	0.000	0.001	Never allowed	No

MYCOTOXIN TESTING FOR MEDICALLY COMPLIANT PRODUCT

MYCOTOXINS	**MIN. PASSING**	**MAX. PASSING**	**MIN. FAILING**	**MAX. RETEST ALLOWED**	**EXTRACTION ELIGIBLE?**
Aflatoxin	0.000	19.999	20.000	<=40	No
Ochratoxin	0.000	19.999	20.000	<=40	No

MYCOTOXIN TESTING FOR NON-MEDICAL PRODUCT

MYCOTOXINS	**MIN. PASSING**	**MAX. PASSING**	**MIN. FAILING**	**MAX. RETEST ALLOWED**	**EXTRACTION ELIGIBLE?**
Aflatoxin	0.000	20.000	20.001	<=40	No
Ochratoxin	0.000	20.000	20.001	<=40	No

RESIDUAL SOLVENT TESTING

SOLVENTS	**MIN. PASSING**	**MAX. PASSING**	**MIN. FAILING**	**MAX. RETEST ALLOWED**	**EXTRACTION ELIGIBLE?**
Acetone	0.000	5000.000	5000.001	Always allowed	Yes
Benzene	0.000	2.000	2.001	Always allowed	Yes
Butanes	0.000	5000.000	5000.001	Always allowed	Yes
Cyclohexane	0.000	3880.000	3880.001	Always allowed	Yes
Chloroform	0.000	2.000	2.001	Always allowed	Yes
Dichloromethane	0.000	600.000	600.001	Always allowed	Yes
Ethyl acetate	0.000	5000.000	5000.001	Always allowed	Yes
Heptanes	0.000	5000.000	5000.001	Always allowed	Yes
Hexanes	0.000	290.000	290.001	Always allowed	Yes
Isopropanol (2-propanol)	0.000	5000.000	5000.001	Always allowed	Yes
Methanol	0.000	3000.000	3000.001	Always allowed	Yes
Pentanes	0.000	5000.000	5000.001	Always allowed	Yes
Propane	0.000	5000.000	5000.001	Always allowed	Yes
Toluene	0.000	890.000	890.001	Always allowed	Yes
Xylene	0.000	2170.000	2170.001	Always allowed	Yes

HEAVY METAL TESTING

METALS	**MIN. PASSING**	**MAX. PASSING**	**MIN. FAILING**	**MAX. RETEST ALLOWED**	**EXTRACTION ELIGIBLE?**
Arsenic (Inorganic)	0.000	10.000	10.001	Never allowed	No
Cadmium	0.000	4.100	4.101	Never allowed	No
Lead	0.000	6.000	6.001	Never allowed	No
Mercury	0.000	2.000	2.001	Never allowed	No

PESTICIDE SCREENING

PESTICIDES	**MIN. PASSING**	**MAX. PASSING**	**MIN. FAILING**	**MAX. RETEST ALLOWED**	**EXTRACTION ELIGIBLE?**
Abamectin	0.000	0.499	0.500	Never allowed	No
Acephate	0.000	0.399	0.400	Never allowed	No
Acequinocyl	0.000	1.999	2.000	Never allowed	No
Acetamiprid	0.000	0.199	0.200	Never allowed	No
Aldicarb	0.000	0.399	0.400	Never allowed	No
Azoxystrobin	0.000	0.199	0.200	Never allowed	No
Bifenazate	0.000	0.199	0.200	Never allowed	No
Bifenthrin	0.000	0.199	0.200	Never allowed	No
Boscalid	0.000	0.399	0.400	Never allowed	No
Carbaryl	0.000	0.199	0.200	Never allowed	No
Carbofuran	0.000	0.199	0.200	Never allowed	No
Chlorantraniliprole	0.000	0.199	0.200	Never allowed	No
Chlorfenapyr	0.000	0.999	1.000	Never allowed	No
Chlorpyrifos	0.000	0.199	0.200	Never allowed	No
Clofentezine	0.000	0.199	0.200	Never allowed	No
Cyfluthrin	0.000	0.999	1.000	Never allowed	No
Cypermethrin	0.000	0.999	1.000	Never allowed	No
Daminozide	0.000	0.999	1.000	Never allowed	No
DDVP (Dichlorvos)	0.000	0.099	0.100	Never allowed	No
Diazinon	0.000	0.199	0.200	Never allowed	No
Dimethoate	0.000	0.199	0.200	Never allowed	No

Ethoprophos	0.000	0.199	0.200	Never allowed	No
Etofenprox	0.000	0.399	0.400	Never allowed	No
Etoxazole	0.000	0.199	0.200	Never allowed	No
Fenoxycarb	0.000	0.199	0.200	Never allowed	No
Fenpyroximate	0.000	0.399	0.400	Never allowed	No
Fipronil	0.000	0.399	0.400	Never allowed	No
Flonicamid	0.000	0.999	1.000	Never allowed	No
Fludioxonil	0.000	0.399	0.400	Never allowed	No
Hexythiazox	0.000	0.999	1.000	Never allowed	No
Imazalil	0.000	0.199	0.200	Never allowed	No
Imidacloprid	0.000	0.399	0.400	Never allowed	No
Kresoxim-methyl	0.000	0.399	0.400	Never allowed	No
Malathion	0.000	0.199	0.200	Never allowed	No
Metalaxyl	0.000	0.199	0.200	Never allowed	No
Methiocarb	0.000	0.199	0.200	Never allowed	No
Methomyl	0.000	0.399	0.400	Never allowed	No
Methyl parathion	0.000	0.199	0.200	Never allowed	No
MGK-264	0.000	0.199	0.200	Never allowed	No
Myclobutanil	0.000	0.199	0.200	Never allowed	No
Naled	0.000	0.499	0.500	Never allowed	No
Oxamyl	0.000	0.999	1.000	Never allowed	No
Paclobutrazol	0.000	0.399	0.400	Never allowed	No
Permethrinsa	0.000	0.199	0.200	Never allowed	No
Phosmet	0.000	0.199	0.200	Never allowed	No
Piperonyl butoxideb	0.000	1.999	2.000	Never allowed	No
Prallethrin	0.000	0.199	0.200	Never allowed	No
Propiconazole	0.000	0.399	0.400	Never allowed	No
Propoxur	0.000	0.199	0.200	Never allowed	No
Pyrethrinsbc	0.000	0.999	1.000	Never allowed	No
Pyridaben	0.000	0.199	0.200	Never allowed	No

Spinosad	0.000	0.199	0.200	Never allowed	No
Spiromesifen	0.000	0.199	0.200	Never allowed	No
Spirotetramat	0.000	0.199	0.200	Never allowed	No
Spiroxamine	0.000	0.399	0.400	Never allowed	No
Tebuconazole	0.000	0.399	0.400	Never allowed	No
Thiacloprid	0.000	0.199	0.200	Never allowed	No
Thiamethoxam	0.000	0.199	0.200	Never allowed	No
Trifloxystrobin	0.000	0.199	0.200	Never allowed	No

If an inventory lot has failing lab results applied to it, a Licensee can view its status for eligibility for extraction and retest on the Lab Results listing. From the Lab Results listing, filter to the global ID of the lab result and then scroll to the right to see if it is 'Eligible for Extraction' and/or 'Eligible for Retest'.

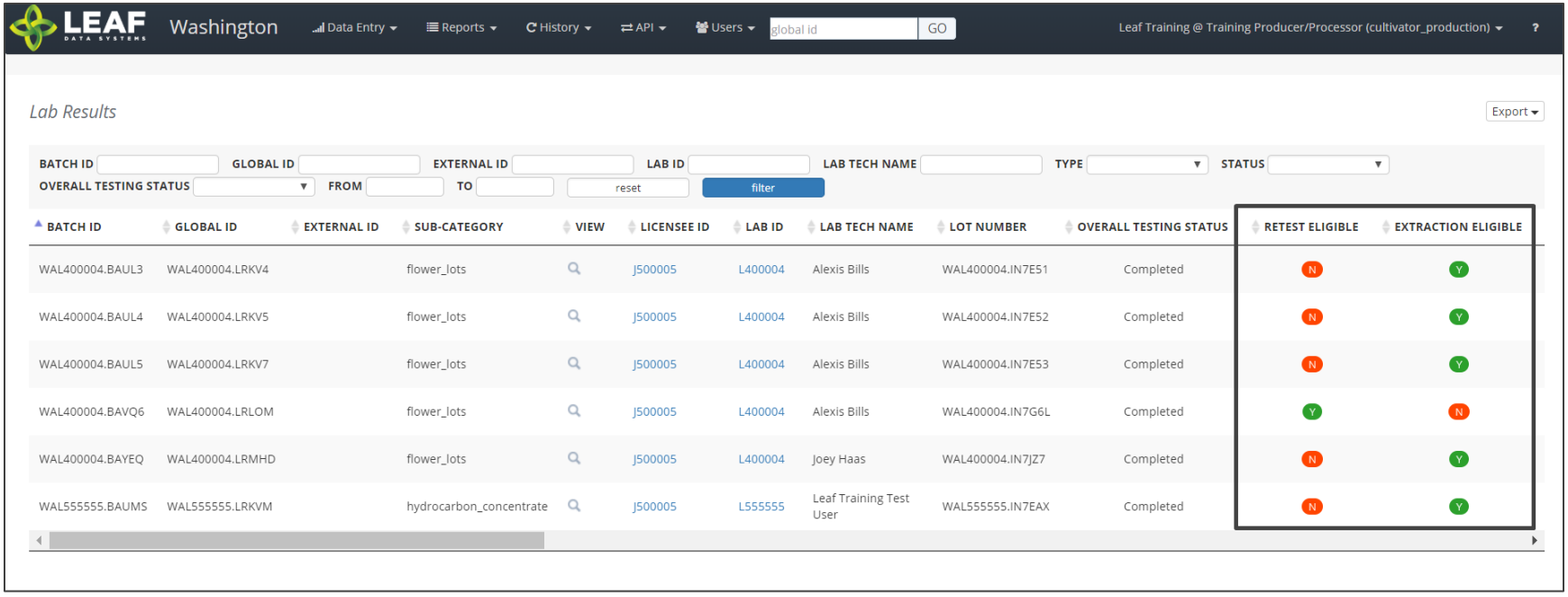

Figure 5: Lab Results listing (Data Entry-->Lab Results)

Requesting Retest of Eligible Product

If a Licensee has inventory that has failed QA testing, but is 'Eligible for Retest', a second lab sample from the same inventory lot must be sent to the lab. When the sample is sent, on the 'Inventory Transfers→Add' page, each sample designated for retesting should have the 'Retest' checkbox selected. Here is an example of what the inventory transfer should look like for lots being retested:

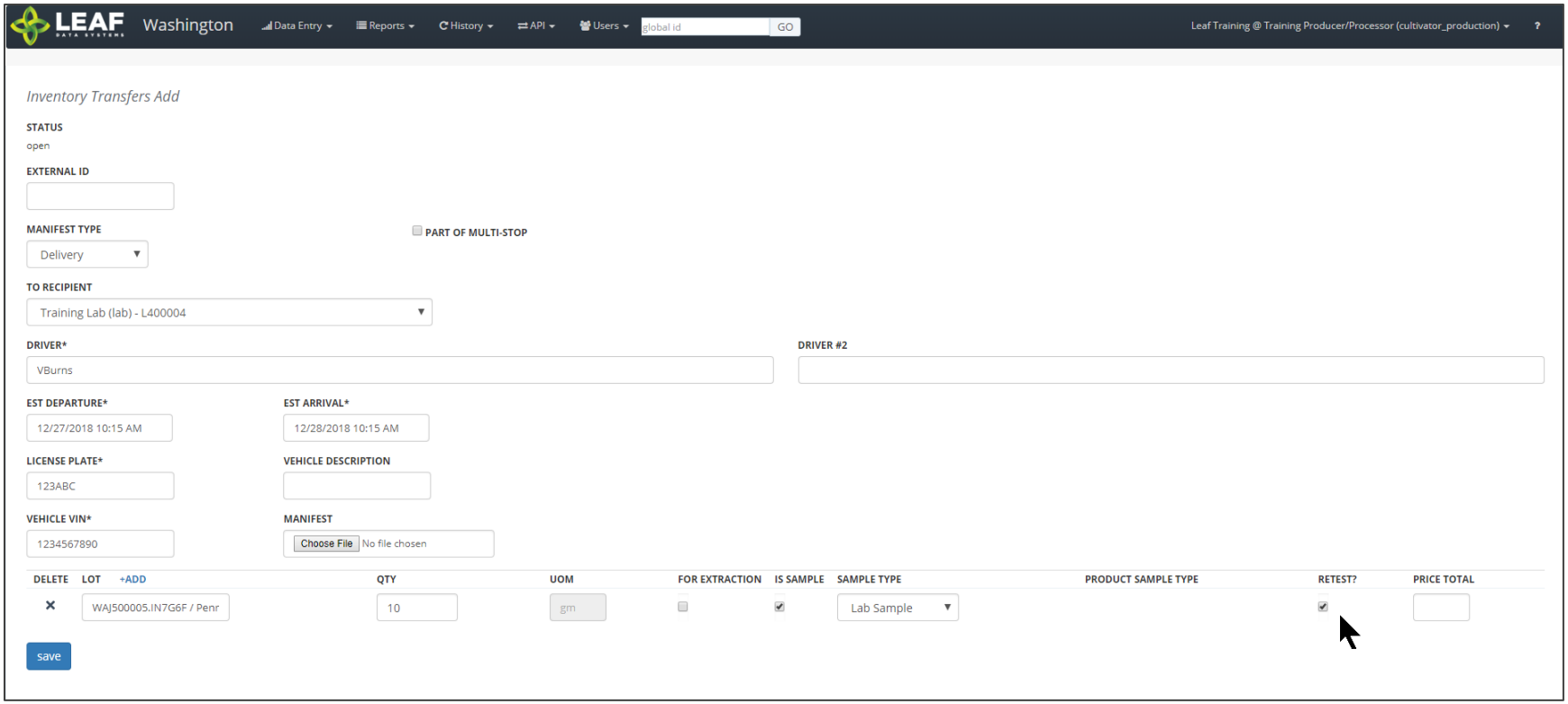

Figure 6: Inventory Transfers Add (Data Entry-->Inventory Transfers; then click the 'add' button)

REMEMBER:

- *Retesting cannot be applied to the same sample that failed the first test; a separate sample MUST be sent to the lab that is designated for 'retest'.*
- *If an inventory lot is not 'Eligible for Retest', the 'Retest?' checkbox on the inventory transfer will be blocked from selection.*

QA Test Result Inheritance

In certain situations, lab results can be inherited from a parent lot to a child lot created through a conversion. For details regarding which tests can be inherited, please refer back to the section titled "Required QA Tests for Non-Medically Compliant Product". The tests that have an asterisk (*) next to them in the far-right column are able to be inherited as inventory is converted into the inventory types listed. Here are a few rules regarding QA test result inheritance as it relates to inventory conversions:

- If a conversion input has a 'medically compliant' status = 'yes', the conversion output can inherit the 'medically compliant' status.
- If a conversion input has a 'medically compliant' status = 'pending', the conversion output can be designated as seeking 'medically compliant' status but will need to undergo medical testing for the 'medically compliant' status to change from 'pending' to 'yes'.
- For conversions, selected inputs may include: lots without lab results (that do not require them prior to extraction), lots with passing lab results where 'eligible for extraction' = 'yes', and lots with failed lab results where 'eligible for extraction' = 'yes'.
- For conversions, selected inputs may NOT include: lots where 'eligible for extraction' = 'no' and lots with pending lab results ('status' = 'in progress').
- If a conversion input has a failed lab result, but a certain section that applies for inheritance is 'passing', the 'passing' results (if they qualify for inheritance) can be inherited by the conversion output. This means that only the failed test would have to be repeated.
- For conversions with single inputs, if the input has passing test results, all tests eligible for inheritance can be inherited by the output.
- For conversions with multiple inputs, if all inputs have passing test results, all tests eligible for inheritance can be inherited by the output.

How Inheritance Works:

- If an inventory lot is eligible for QA test inheritance, this will not be discernable in the system until a lab sample of the child lot is sent for testing at which point the Testing Lab will be able to see the inherited test results.
- At the Testing Lab, upon receipt of a lab sample that has inherited results from a parent inventory lot, a new lab result will be generated for the sample received.
- The new lab result generated will show a testing status of 'already passed' for the sections of the QA tests that have been inherited. This status cannot be changed.
- Only the status is inherited, not the individual test values (which are grayed out for inherited tests).

Non-Mandatory Lab Testing

When production and processing facilities wish to send samples of plants or inventory to QA Testing Labs for non-mandatory lab testing, the process is very similar to sending Lab Samples. However, once the inventory lot is designated as a 'sample', the 'sample type' of 'non-mandatory lab sample' should be selected.

When a non-mandatory lab sample is sent to a QA Testing Lab, the Lab will be unable to enter the results into Leaf Data Systems and will be prompted to send the results straight to the Licensee who generated the request for them.

Non-mandatory lab samples are only tracked in Leaf Data Systems for the purposes of inventory management, but these test results do not have an effect on any workflows in the system, such as inventory transfers or conversions, like mandatory lab samples do.