



LEAF

D A T A S Y S T E M S

POWERED BY MJ FREEWAY

Leaf Data Systems

State of Washington

Job Aid: Traceability Explained

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Contents

| | |
|---|----|
| List of Figures | 4 |
| Defining Batches | 5 |
| Licensee Workflows and Traceability | 6 |
| Production Facility Workflows | 8 |
| PROPAGATION MATERIAL BATCH..... | 8 |
| PLANT BATCH..... | 8 |
| HARVEST BATCH..... | 9 |
| PRODUCTION FACILITY BATCH RELATIONSHIPS | 10 |
| Processing Facility Workflows | 11 |
| INTERMEDIATE/END PRODUCT BATCHES..... | 11 |
| CONVERSION EXAMPLES..... | 12 |
| Maintaining Traceability through Inventory Transfers | 14 |
| Traceability and Lab Results | 15 |

List of Figures

Figure 1: FOUR TYPES OF BATCHES (pg 5)

Figure 2: LICENSEE WORKFLOW OVERVIEW (pg 6)

Figure 3: HIGH-LEVEL TRACEABILITY OVERVIEW (RECALL EXAMPLE) (pg 7)

Figure 4: PROPAGATION MATERIAL BATCH (pg 8)

Figure 5: PLANT BATCH (pg 8)

Figure 6: HARVEST BATCH WITH FLOWER AND OTHER MATERIAL (pg 9)

Figure 7: HARVEST BATCH WITH FLOWER LOTS AND OTHER MATERIAL LOT (pg 9)

Figure 8: PRODUCTION FACILITY WORKFLOW OVERVIEW (pg 10)

Figure 9: INTERMEDIATE/END PRODUCT BATCH EXAMPLES (pg 11)

Figure 10: CREATION OF USABLE MARIJUANA THROUGH CONVERSION (pg 12)

Figure 11: CREATION OF CONCENTRATE FOR INHALATION THROUGH CONVERSION (pg 13)

Figure 12: INVENTORY TRANSFER OF FLOWER LOTS FROM PRODUCER TO PROCESSOR (pg 14)

Figure 13: INVENTORY TRANSFER OF CONCENTRATE FOR INHALATION FROM PROCESSOR TO RETAILER (pg 14)

Figure 14: RELATIONSHIP OF LAB SAMPLES TO "PARENT" INVENTORY LOT (pg 15)

Defining Batches

The purpose of using batches to group together plant and inventory records is two-fold. Batches assist with creating the traceability that the system is designed to offer. As well, batches allow producers to manage plants in any phase in groups, which enables mass actions to be applied to numerous records simultaneously.

Batch types include propagation material, plant, harvest, and intermediate/end product.

Propagation Material batches are used to create inventory lots of seeds, clones, and plant tissue so that these plants can be tracked as inventory throughout their propagation phase. As plants shift from their propagation to growing phase, they are moved to plants at which point the plant records are associated with a 'plant' type batch.

Plant batches are a group of plants from the same strain. Attributes of all the plants within a batch can be modified at the batch level, which will apply changes across all of the plant records.

Harvest batches represent a group of harvested material that is all the same strain. These types of batches are used to denote both 'wet' and 'dry' weight of 'flower' and 'other material' produced during the harvest. Resultant dry weight from a harvest batch is separated into 'inventory lots'.

Intermediate/end product batches are batches that generally consist of multiple harvest batches being combined, for example, combining two different strains to make a blended concentrate product. They can also be comprised of a single harvest batch that has been converted into an intermediate or end product.

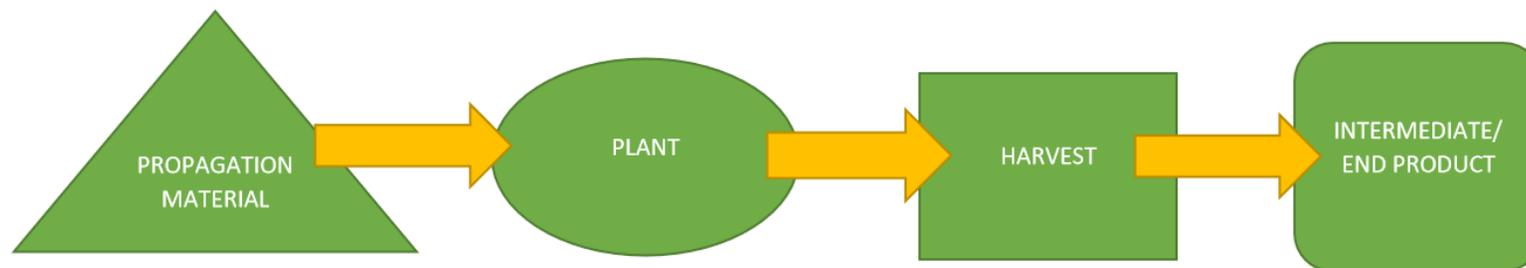


Figure 3: FOUR TYPES OF BATCHES

Licensee Workflows and Traceability

Understanding the nature of how batches are used to describe the life cycle of cannabis from propagation material to plants, from plants to harvest materials, and from harvest materials to intermediate/end products is key to comprehension of Leaf Data Systems seed-to-sale traceability.

The diagram on the right shows the most basic model of cannabis life cycle tracking based on the batches used to depict all of the related material. This diagram represents a high-level, simplified view the workflows that licensees follow in order to produce the inventory that is sent to Retailers for sale to consumers.

As licensees perform their daily workflows, all actions logged maintain a relationship to the batch that houses the propagation material, plants, harvest materials, or intermediate/end products that a licensee is producing, processing, or selling. These actions include but are not limited to: creation of propagation material inventory, cultivation of living marijuana plants, harvesting flower and other material, extraction and infusion processes, inventory transfers, destructions, wholesale transactions, and retail sales.

The batch associations to one another can be thought of as "parent-child" relationships. For example, when propagation material inventory (associated with a propagation material batch) is "moved to plants", the plant batch that is created is the "child" batch of the propagation material batch(es) that are resultant from this workflow function. The propagation material batch is the "parent" batch of the plant batch that is created.

The diagram on the following page adds an overlay to the licensee diagram that shows the concept of how traceability works from a State User perspective. The scenario depicted shows a simple model of how batch details, when traced backward from the downstream end product created (in the lower-right corner of the diagram), allow a State User to retrieve all associated details for each step of the processes that yielded the end product. In this example, which is designed to show a basic product recall process, the inventory global ID that is being investigated allows a user to retrieve all details of the life cycle of that inventory lot.

The blue pentagons on the left side of the diagram represent the records associated with each batch, which when combined, tell the seed-to-sale story of the related batch.



Figure 4: LICENSEE WORKFLOW OVERVIEW

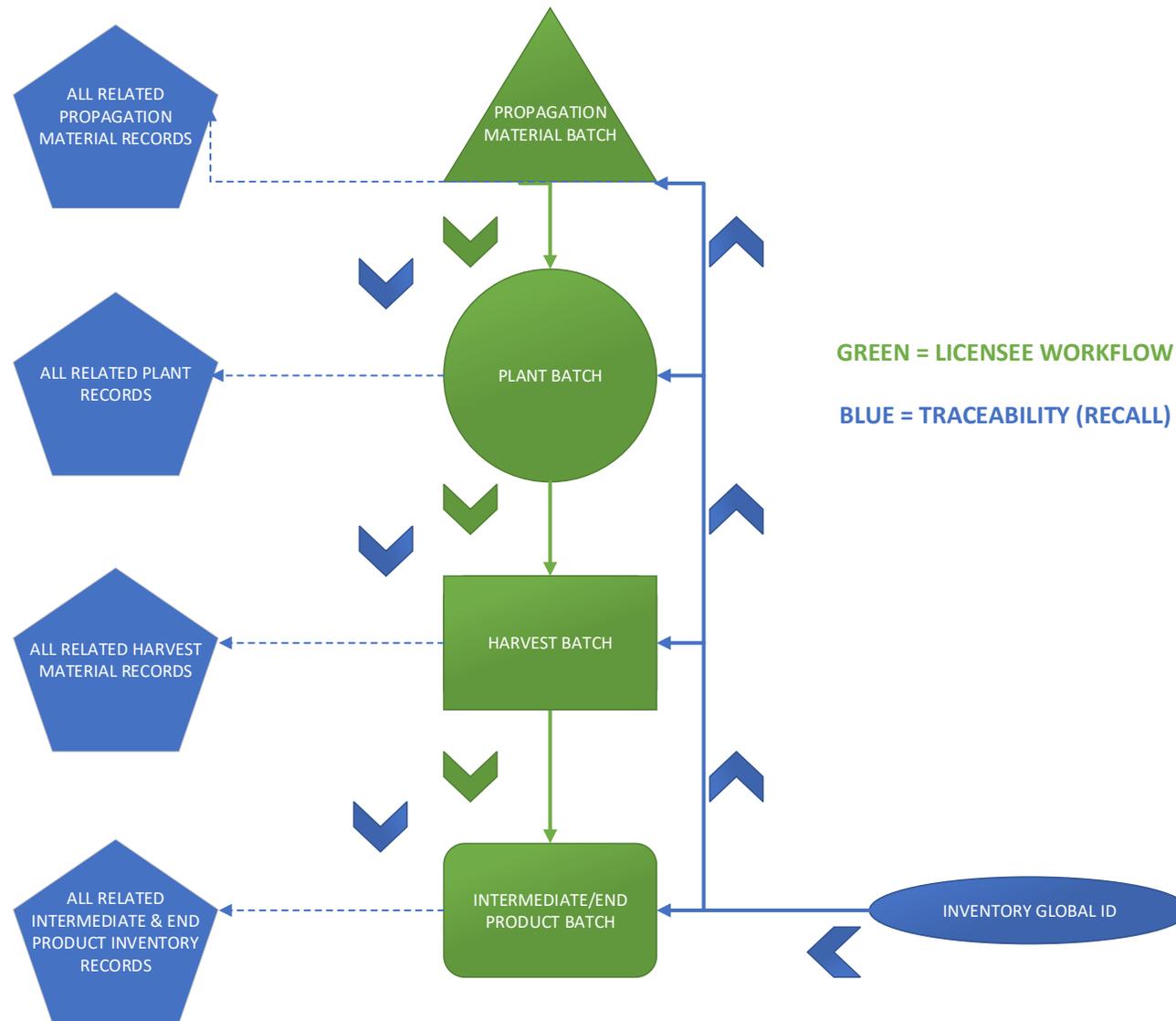


Figure 3: HIGH-LEVEL TRACEABILITY OVERVIEW (RECALL EXAMPLE)

Production Facility Workflows

PROPAGATION MATERIAL BATCH

At a Production Facility, traceability begins with creation of a propagation material batch. When a propagation material batch is created, the system creates an inventory lot of propagation material. As well, as propagation material is managed within a facility, destruction records related to a batch are associated to the propagation material batch record.

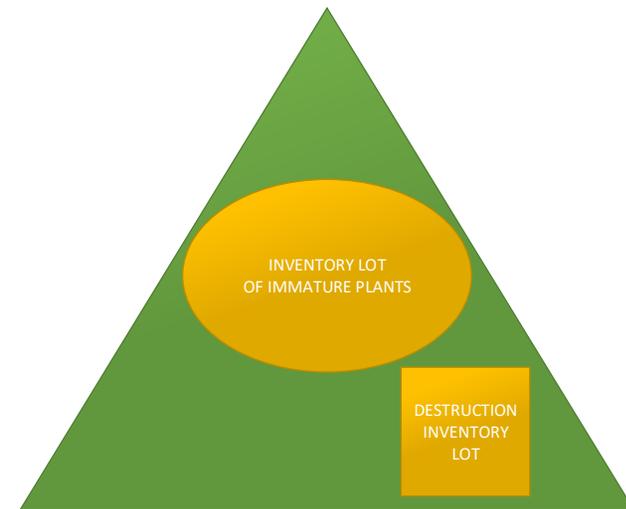


Figure 4: PROPAGATION MATERIAL BATCH

PLANT BATCH

Once propagation material reaches the point where it must be transferred to plant records (per WA regulations) the Producers find the propagation material (immature plant) inventory in the database and perform the "move to plants" function. When this occurs, a new plant batch is created which holds all of the plant records associated with the batch. As plants are destroyed, the waste inventory lots maintain their relationship with the plant batch. The new plant batch is the "child" of the "parent" propagation material batch(es) that the plants came from.

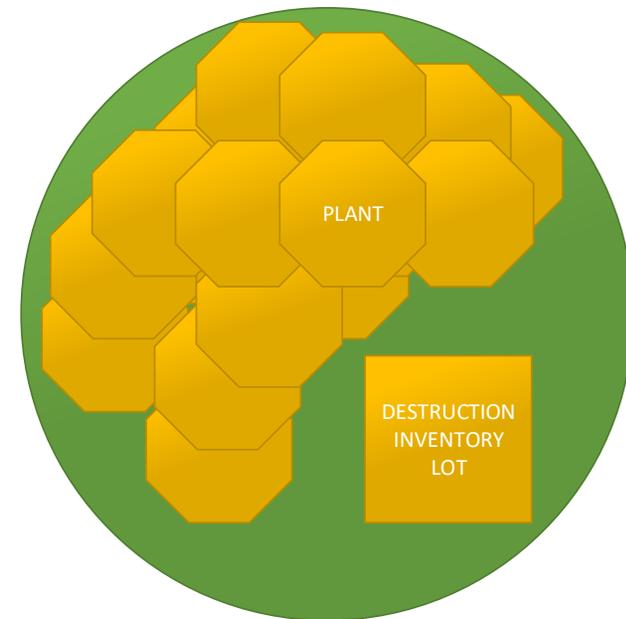


Figure 5: PLANT BATCH

HARVEST BATCH

As plants are harvested, a new harvest batch is created for the harvested materials. Harvest materials are referred to as either "flower" or "other material" and represent the total yield from a group of plants that are harvested. All waste associated with a harvest is tied to the harvest batch that it produced from as the destruction function is utilized. When Producers convert "flower" and "other material" to "flower lots" and "other material lots", all related material maintains an association with the same harvest batch. The harvest batch is the "child" of the "parent" plant batch(es) that the plants were harvested from.

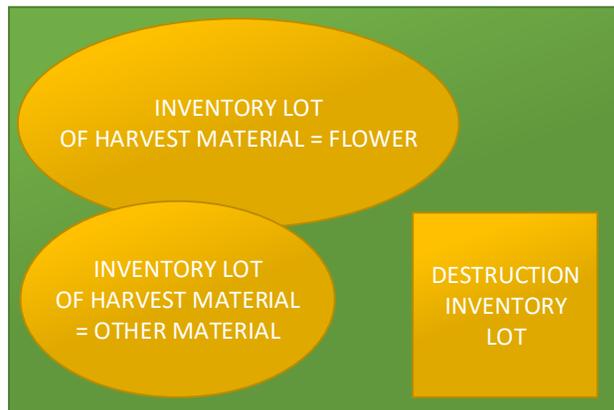
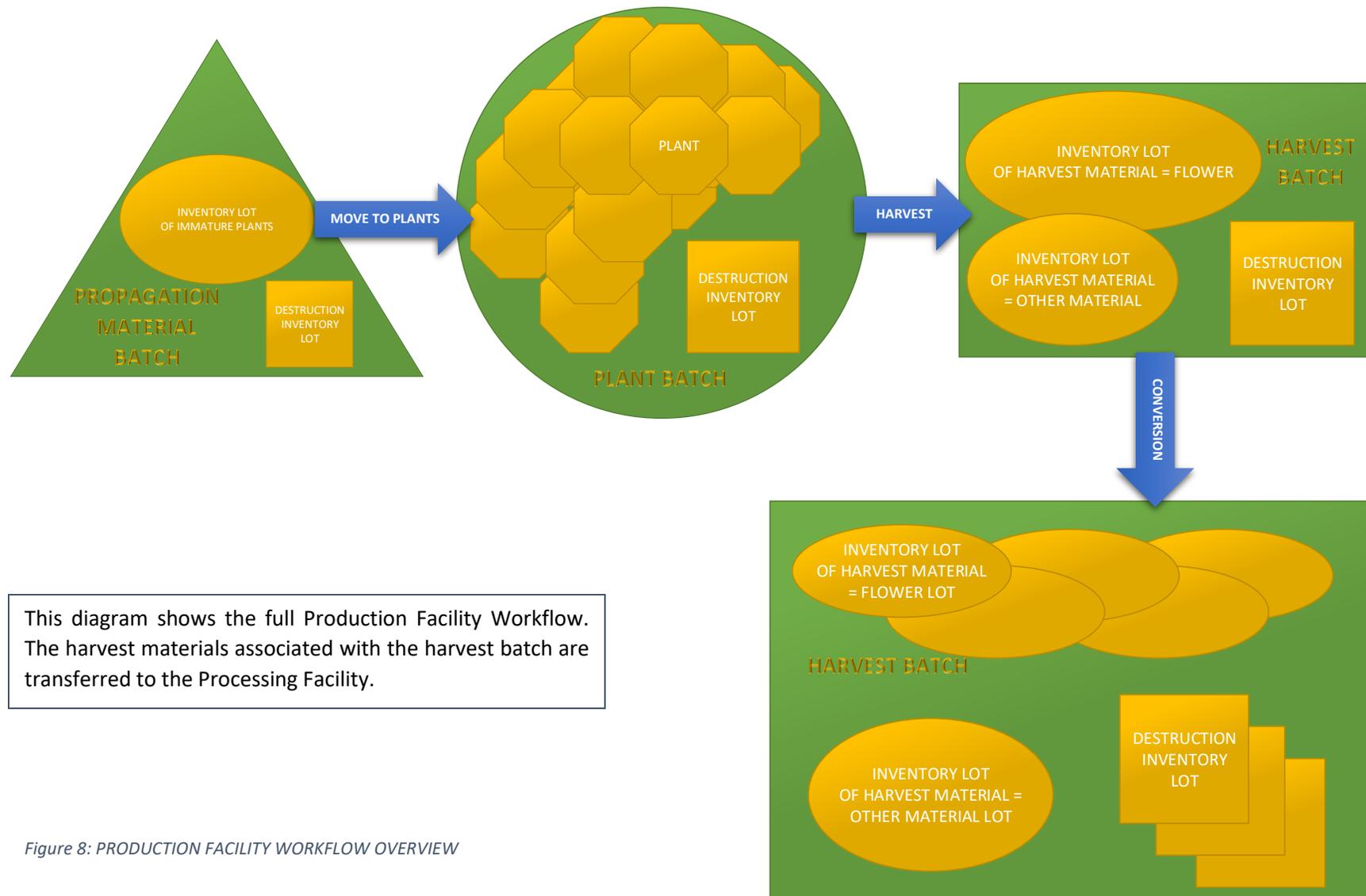


Figure 6: HARVEST BATCH WITH FLOWER AND OTHER MATERIAL



Figure 7: HARVEST BATCH WITH FLOWER LOTS AND OTHER MATERIAL LOT

PRODUCTION FACILITY BATCH RELATIONSHIPS



This diagram shows the full Production Facility Workflow. The harvest materials associated with the harvest batch are transferred to the Processing Facility.

Figure 8: PRODUCTION FACILITY WORKFLOW OVERVIEW

Processing Facility Workflows

INTERMEDIATE/END PRODUCT BATCHES

Processing Facilities receive harvest materials (associated with a harvest batch) from Production Facilities. The Processing Facilities perform conversion functions in the system to turn the harvest materials into intermediate products, and then end products. This introduces our fourth type of batch, the intermediate/end product batch. An intermediate/end product batch is created when a Processor produces either an intermediate or end product. For example, if multiple harvest batches are combined (as "inputs" for a conversion function) to produce a single intermediate product (the "output" of the conversion), a brand new intermediate/end product batch will be created. If the "output" inventory lot from this example is split into multiple inventory lots (but no new material is added), all of the lots will remain associated with the intermediate/end product batch created from the conversion. The intermediate/end product batch is the "child" batch of the "parent" harvest batch(es) used to create it.

For example, if multiple harvest batches are combined (as "inputs" for a conversion function) to produce a single intermediate product (the "output" of the conversion), a brand new intermediate/end product batch will be created. If the "output" inventory lot from this example is split into multiple inventory lots (but no new material is added), all of the lots will remain associated with the intermediate/end product batch created from the conversion. The intermediate/end product batch is the "child" batch of the "parent" harvest batch(es) used to create it.

If a new conversion is performed that incorporates inventory related to multiple intermediate/end product batches (used as "inputs" for the conversion), the resultant "output" will have a new intermediate/end product batch ID assigned to it. The intermediate/end product batch associated with the "output" from this type of conversion would be the "child" batch of the "parent" intermediate/end product batch(es) used to create it.

Destruction records created for inventory lots are associated with the batch that the inventory lot resides within.

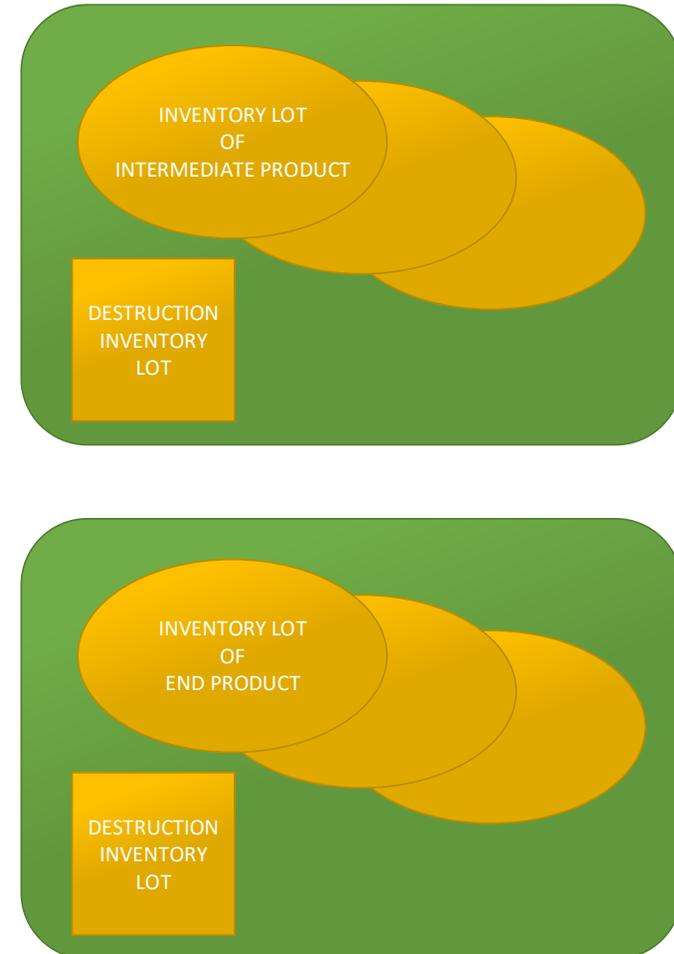
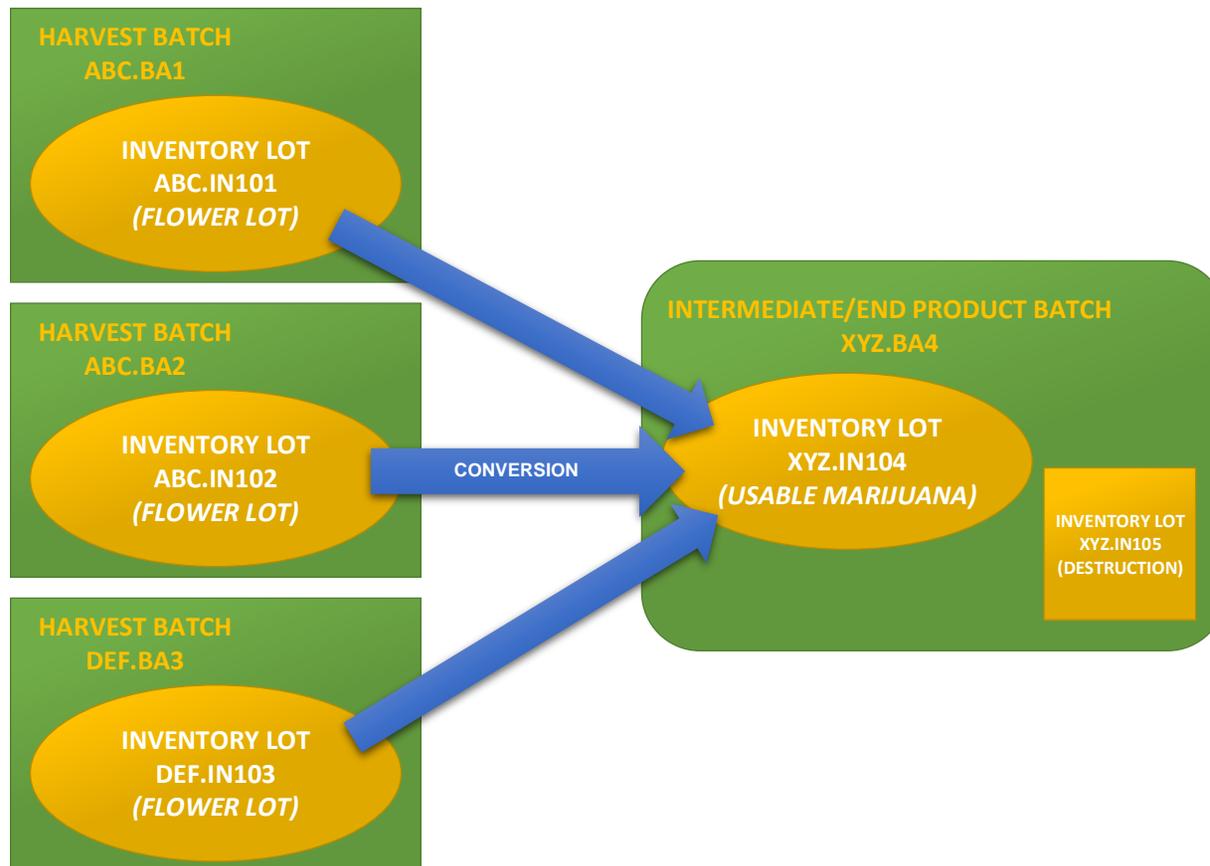


Figure 9: INTERMEDIATE/END PRODUCT BATCH EXAMPLES

CONVERSION EXAMPLES

At the Processing Facility, there are numerous combinations of inventory "inputs" and "outputs" that may exist when performing conversions. Following are some examples of common conversion workflows. For all examples, simplified IDs are assigned to each batch and inventory lot. The three letters before the "." in the ID represents the facility that the record originated from. The two letters following the "." represents the type of ID, either "BA" for batch, or "IN" for inventory. The number following this type code represents the unique ID of the record.

Creation of Usable Marijuana



Harvest batches of flower lots (received from a Production Facility) are combined through the conversion function. The resultant inventory lot produced is the end product "usable marijuana" which represents pre-packaged flower that can be sold to Retailer Facilities.

Figure 10: CREATION OF USABLE MARIJUANA THROUGH CONVERSION

Creation of Concentrate for Inhalation

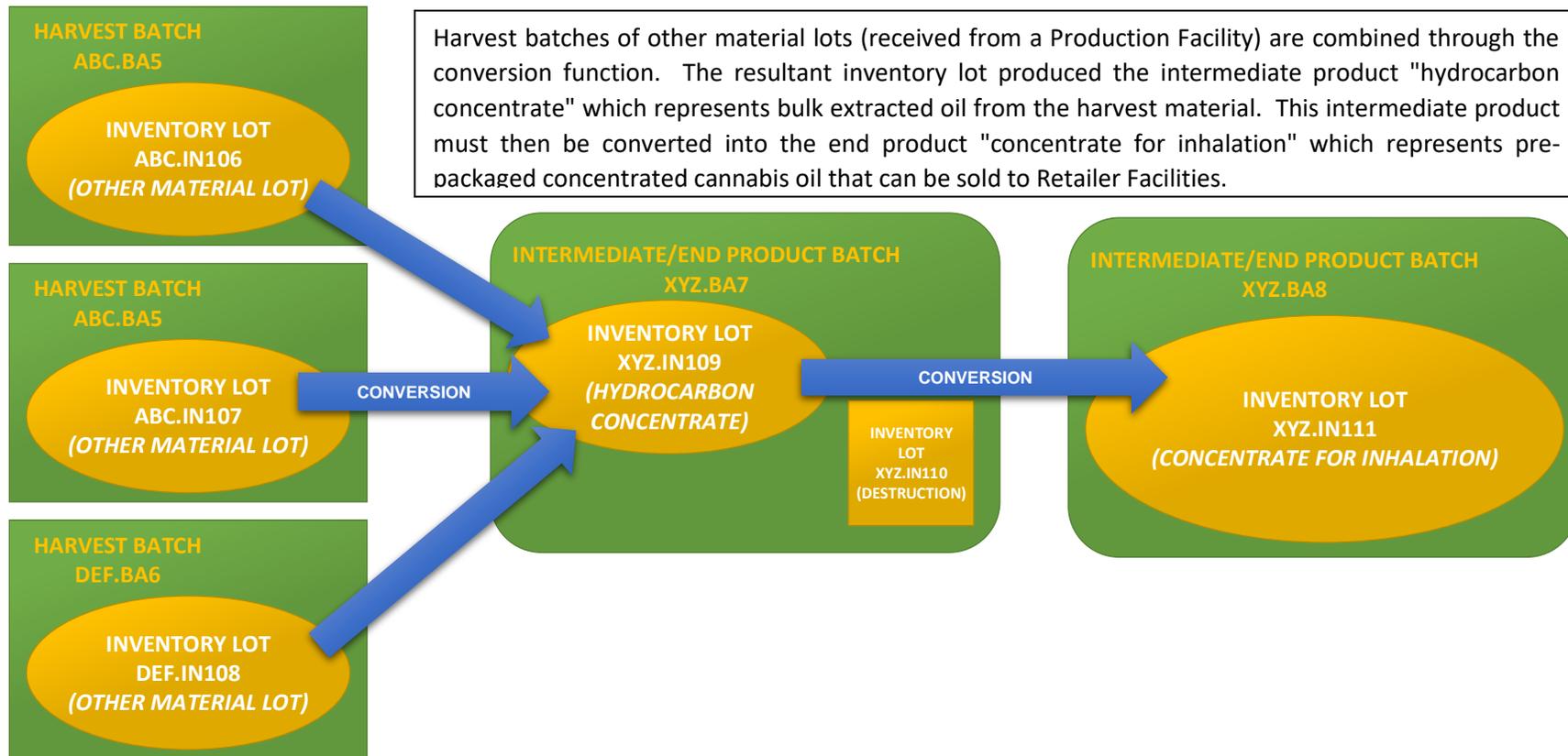


Figure 11: CREATION OF CONCENTRATE FOR INHALATION THROUGH CONVERSION

Maintaining Traceability through Inventory Transfers

When inventory lots are transferred from one facility to another, the global IDs of the batches change so that the records are relative to the facility that owns them. However, the batch characteristics remain the same between the sending facility and the receiving facility. The batch at the receiving facility becomes a "child" batch of the "parent" batch that was related to inventory sent from the sending facility. The diagrams below depict two examples of the 1:1 relationship between inventory that is sent from one facility to another. While the global IDs will change, the inventory and batch attributes will remain the same.

Transfer of Harvest Materials from a Producer to a Processor

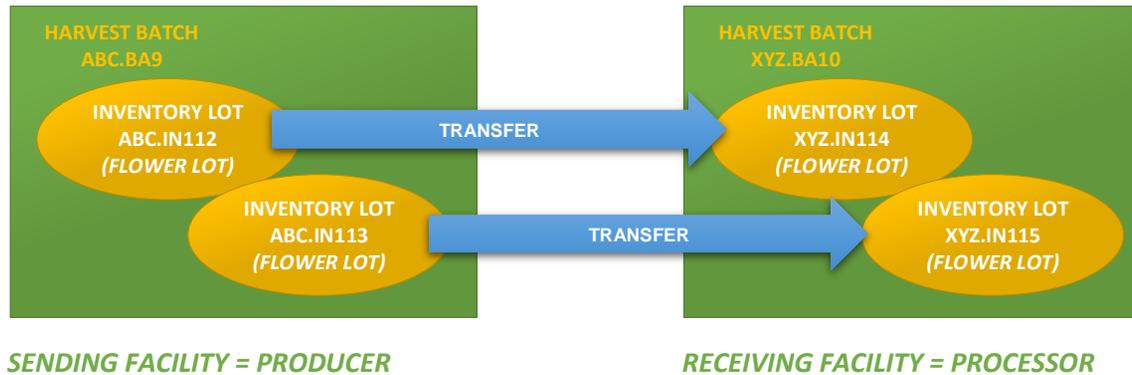


Figure 12: INVENTORY TRANSFER OF FLOWER LOTS FROM PRODUCER TO PROCESSOR

Transfer of Harvest Materials from a Processor to a Retailer

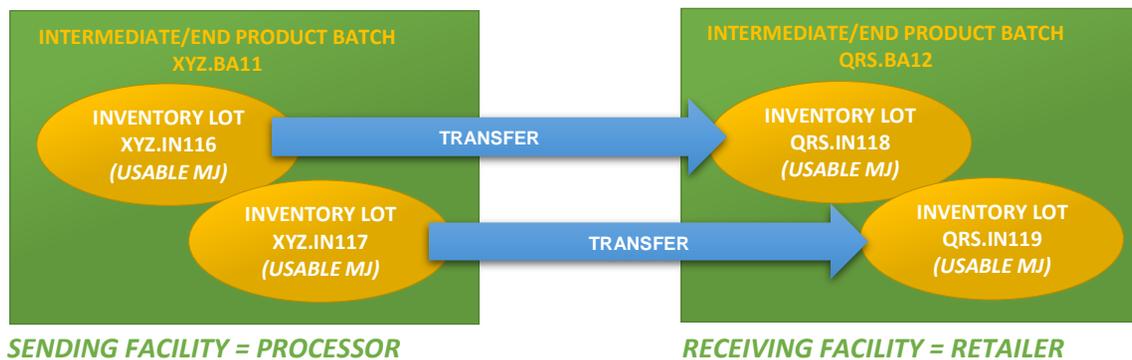


Figure 13: INVENTORY TRANSFER OF CONCENTRATE FOR INHALATION FROM PROCESSOR TO RETAILER

Traceability and Lab Results

When Producers and Processors send samples of inventory lots to obtain mandatory QA testing from a Testing Laboratory Facility, the sample created from an inventory lot maintains a "child" relationship to the "parent" inventory lot it was derived from. The QA results obtained will apply to the "parent" inventory lot. The samples will be assigned inventory lot IDs relative to the Testing Laboratory Facility that received them, which follow the same traceability rules explained in the previous section ("Maintaining Traceability Through Inventory Transfers").

Lab Results Related to Inventory Lots

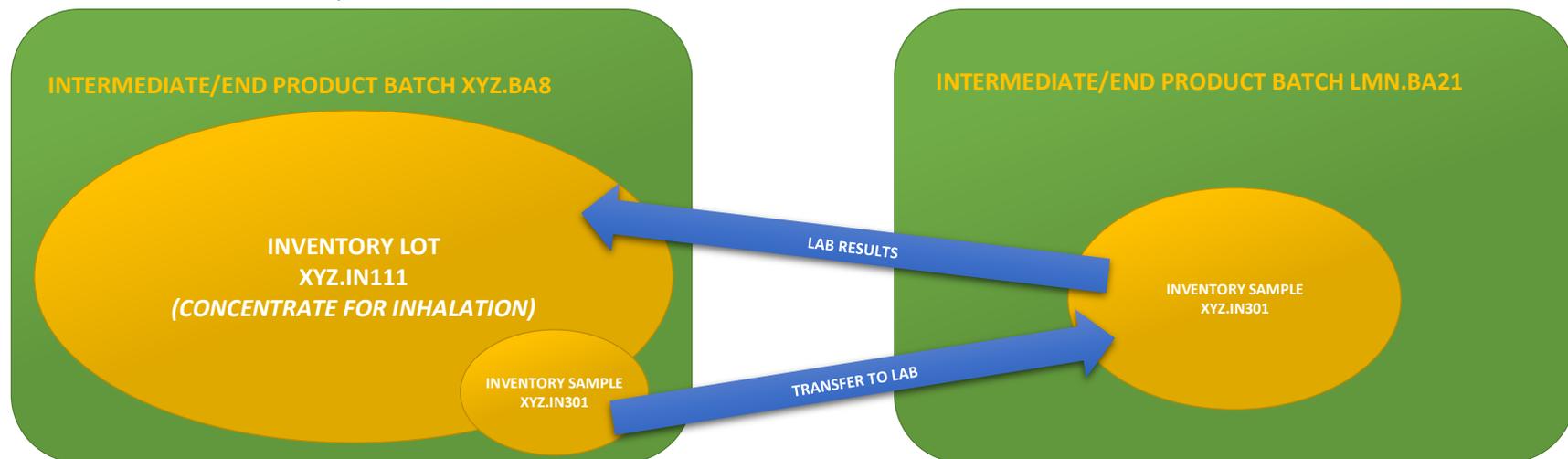


Figure 14: RELATIONSHIP OF LAB SAMPLES TO "PARENT" INVENTORY LOT