

UCD CSN Technical Information #904A

Receiving and Inventorying of CSN Quartz Samples

*Chemical Speciation Network
Air Quality Research Center
University of California, Davis*

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DOCUMENT HISTORY

Revision	Release Date	Initials	Section/s Modified	Brief Description of Modifications
1.0	10/31/2022	LMK	All	Document created. Previously based on TI 402A. Updated images and wording. Added procedural steps for physical inventory, editing electronic trays, creating tray lists. Added information on processing lab blanks, performing integrity checks. Added procedural steps for batch completeness.

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1. PURPOSE AND APPLICABILITY

The purpose of this technical information document (TI) is to describe the process of receiving and inventorying of Quartz samples collected for the Chemical Speciation Network (CSN).

2. SUMMARY OF THE METHOD

A Laboratory Technician in AQRC will receive shipments of CSN samples and perform integrity checks. Information will be entered for each batch of samples into the CSN Data Management Site (CSN web app). Sample analysis tray lists will be generated and reviewed prior to analyses. Samples are stored in cold storage, unless undergoing analysis. Following analysis of each batch a completeness check is performed.

3. DEFINITIONS

Inventory: The list includes the number of samples received, type of filter (sample, lab blank, field blank etc.) as well as analysis order.

Chain of custody (COC) form: The form received with the samples including the itemized list, amount, sample type, ship date and name, as well as a field for receive date and name.

Analysis Request ID: WOOD PLC assigns a batch number to each shipment of filters, e.g., A0000001. Other names include Batch ID, and ContractorBatchNumber.

Filter Analysis ID: WOOD PLC assigns a barcode to each sample format F#####, e.g. F000002. Other names include Barcode ID, and ContractorFilterAnalysisId.

SampleId (Id): The number assigned to the electronic record in CSN database.

CSN Data Management Site: User interface web application for the CSN database (*csn.aqrc.ucdavis.edu*).

Laboratory Technician: Authorized personnel responsible for processing CSN samples; must receive prior approval from the Lab Manager. The lab tech shall have access to the Carbon lab where the carbon analyzers and refrigerators are located.

Wood: Short for WOOD PLC, is the Environmental Protection Agency (EPA) subcontractor for sampling handling including deployment of filters, sample processing, and electronic record delivery and shipping samples to University of California, Davis (UCD)

4. HEALTH AND SAFETY WARNINGS

Not applicable.

5. CAUTIONS

Not applicable.

Electronic documents are official. Paper copies are for reference only.

6. INTERFERENCES

Not applicable.

7. PERSONNEL QUALIFICATIONS, DUTIES, AND TRAINING

Only trained lab personnel designated by the Laboratory Manager may receive and inventory CSN samples.

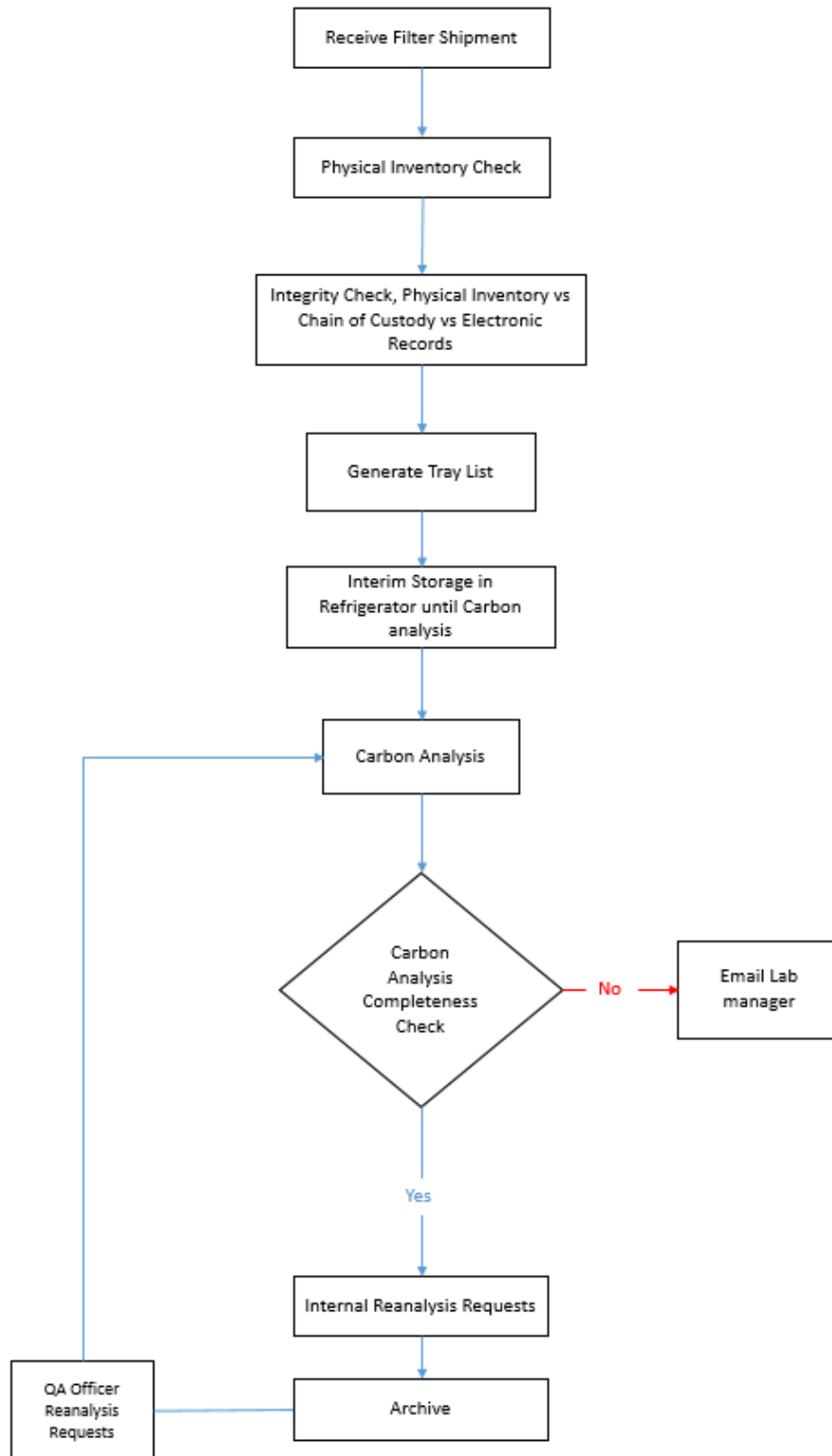
8. EQUIPMENT AND SUPPLIES

Not applicable.

9. PROCEDURAL STEPS

The flowchart of sample receiving and inventorying shown in Figure 1.

Figure 1. The flowchart of sample receiving to archiving.



Electronic documents are official. Paper copies are for reference only.

9.1. Inbound Sample Shipment

CSN samples are shipped in coolers from Wood to UC Davis with accompanied COC forms (Figure 2). Upon receipt, the laboratory technician will sign, and write down the date and time on the COC. The COC includes the following information for each sample, Filter Analysis ID (Barcode ID), intended use date, analysis requested, set number, and status flag.

Figure 2. Example of chain of custody form.

CSN Laboratory Chain of Custody Form

Ship Date and Name: 6/14/2022 Knoll
 Receive Date and Name:
 Analysis Request ID:
 Intended Sample Date: 4/2/2022
 Set #: 1Q

Barcode/Filter Analysis ID: A0000090 ← Batch Number

Barcode/Filter Analysis ID	Filter Type	Analysis Requested	Invalid?
 Filter Analysis ID F288525	Quartz	Carbon ← Analysis type	<input type="checkbox"/>
 Filter Analysis ID F288531 ← Barcode ID	Quartz	Carbon	Status Flag → <input type="checkbox"/>
 Filter Analysis ID F288537	Quartz	Carbon	<input type="checkbox"/>
 Filter Analysis ID F288543	Quartz	Carbon	<input type="checkbox"/>
 Filter Analysis ID F288549	Quartz	Carbon	<input type="checkbox"/>
 Filter Analysis ID F288555	Quartz	Carbon	<input type="checkbox"/>
 Filter Analysis ID F288561	Quartz	Carbon	<input type="checkbox"/>
 Filter Analysis ID F288802	Quartz	Carbon	<input checked="" type="checkbox"/>
 Filter Analysis ID F289690	Quartz	Carbon	<input type="checkbox"/>
 Filter Analysis ID F289696	Quartz	Carbon	<input type="checkbox"/>
 Filter Analysis ID F289702	Quartz	Carbon	<input type="checkbox"/>

9.2. Receiving the Samples

CSN samples are received using the CSN Data Management Site (CSN web app). Best practice is to perform all the physical and electronic inventory checks prior to receiving the shipment in the CSN web app.

1. Navigate to the CSN web app, <https://csn.aqrc.ucdavis.edu/> and login.
2. Click on the “Batches” tab from the submenu.
3. Click on the “View record details” Icon for the batch being received, opening the Batch Details screen, figure 3.

Figure 3. Batch Details screen.

Batch Details

Receive Box Generate XRF Queue Back to List

Received Box

ContractorBatchNumber A0000091
 BoxReceivedDate 7/13/2022 10:36:00 AM
 BoxTeflonCount 1223
 BoxQuartzCount 1226
 First IntendedUseDate 5/2/2022 12:00:00 AM
 Last IntendedUseDate 5/29/2022 12:00:00 AM
 BoxReceivedBy jrsantia

Received Filter Data

First SampleStartDate 5/2/2022 12:00:00 AM
 Last SampleStartDate 5/29/2022 12:00:00 AM

Filter type	Valid	Invalid	Total
All	3577	131 (3 %)	3708 (Blanks: 442)
Teflon	1194	29 (2 %)	1223 (Blanks: 145)
Nylon	1192	31 (2 %)	1223 (Blanks: 145)
Quartz	1156	70 (5 %)	1226 (Blanks: 146)
25mm Teflon	35	1 (2 %)	36 (Blanks: 6)

Sets (12) IntendedUseDates (10) Filters missing Barcodes (0)

Imports (6)

Type	Date	Added/Updated	Comments
Filter	7/13/2022	3692 / 0	FilterDataTransferFiles_A000... - Ingest of filter electronic records for Batch 91 (May 2022)
Filter	7/13/2022	15 / 0	LabBlanksDataTransfer_A00... - Ingest of Lab Blank filter electronic records for Batch 91 (May 2022)
NullCodes	7/13/2022	0 / 133	FilterDataNullFlags_A0000091 - Ingest of filter data null flags for Batch 91 (May 2022)
Flags	7/13/2022	1475 / 0	FilterDataValidFlags_A0000091 - Ingest of filter data valid flags for Batch 91 (May 2022)
Mass	7/13/2022	136 / 0	MassTransfer_A0000091 - Ingest of Mass records for those Teflon and 25mm Teflon filters receiving Gravimetric Analysis for Batch 91 (May 2022)
Filter	7/19/2022	0 / 12	FilterDataTransfer_Q120 and Q121 0526 and 0529 - revised file updating Filter Analysis IDs which were originally delivered ending in "b".

4. Click on Receive Box (Figure 4).

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Figure 4. Receive Box.

Receive Box for Batch A0000092

BoxReceivedDate	06/10/2022 10:00 AM	
BoxReceivedBy	jrsantia	
BoxTeflonCount	1225	
BoxQuartzCount	1223	
BoxFirstSampleDate	06/01/2022 12:00 AM	
BoxLastSampleDate	06/28/2022 12:00 AM	
Comments	Quartz physical total is only 1223, there is one quartz filter listed as missing barcode.	

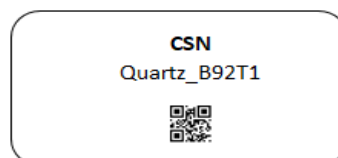
5. The BoxReceivedDate will auto-populate, the time listed will need to be manually adjusted to the time recorded on the physical COC.
6. The BoxReceivedBy will auto-populate with your username.
7. For Quartz filters fill in the BoxQuartzCount field (Teflon count can be updated separately).
8. The BoxFirstSampleDate and BoxLastSampleDate will need to be filled in, this information is on the physical COC.
9. Add any additional comments needed in the comments box and click save.

9.3. Inventorying

The purpose of inventorying is to verify if the physical filter count, COC count and electronic records agree. During the inventory process a subset of samples are verified with information on the hardcopy of the COC. In addition to these checks, the Barcode ID for each sample is verified by laboratory staff when loading samples into the carbon instruments. Following the completion of inventory, a summary including any discrepancies is emailed to the laboratory manager and QA officer.

Prior to the shipment arriving, barcode labels need to be generated for the Petri trays. The barcode labels are in the following format Quartz_B#T#, B# is the Batch number and T# is the tray number. The file for generating barcode labels is located here, "U:\IMPROVE_Lab\CSN Labels\Inventory\Quartz_CSN Tray labels.xlsx". Update the batch number listed in the file, refresh the barcodes and print.

Figure 5. CSN quartz tray label.



Samples are organized in Petri trays by sampling month, each sampling month is assigned a Batch number by Wood. Petri trays are prepared for shipping by placing them in sealed plastic bags and into cardboard boxes. Each box can hold two Petri trays and each Petri trays holds 50 Petri slides. Each Petri slide has a unique barcode sticker, which is also the Filter Analysis ID (e.g., F000002). Samples are placed in the Petri trays in the same order as the COC. The boxes of prepared filters are packed in coolers with ice packs and shipped overnight.

Coolers will arrive with either quartz or Teflon filters inside, occasionally a cooler will contain both filter types. The coolers containing quartz filters will have a label with Q followed by a set of numbers. The Q refers to quartz and the set of numbers refers to the numbered boxes in the cooler.

Notations are made on the hardcopy of the COC during the inventory process using black and red pens. The tray number is written in red at the top of each page in the following format, T# (e.g. T1). If a page contains samples for two trays, write both tray numbers in the following format T#/T# (e.g. T1/T2). Use a red pen, to mark the COC with a small dash (-) before the first sample of each tray to designate the start of the tray. The tray number is also written in red pen next to this mark. Use a black pen to mark the COC with a small dash (-) after the 25th sample of each tray. If less than 50 samples are received in a Petri tray or plastic bag, continue with the same procedure by checking the first and last filters in the tray or bag.

1. Start by finding the cooler marked Q 1-4, this cooler will contain quartz boxes 1-4. Open the cooler and note if there is anything unusual about the contents, melted icepacks, damp boxes, damaged plastic bags, etc. Remove the sealed plastic bag containing the COC, if the COC is not in this cooler check all the coolers until it is located.
2. Write the date, time and your name on the COC in the designated box. This information is used when the shipment is received in the CSN web app.
3. Use a red pen to mark the top right corner of the first page of the COC with a T1, this indicates tray 1. A small red dash is also placed to the right side of the first filter listed on the COC and T1 is written here as well. This helps indicate where the tray starts on the COC.
4. Find the box marked 1 and remove the two Petri trays from inside. The Petri trays will not contain tray numbers to start. The only identifiers on the Petri trays are written set numbers and sampling dates. Some trays will have the same set number and sampling date written on them making it difficult to know which tray is first.
5. Use the COC to check the Barcode ID of the filter in position 1 of the two trays. After locating the Barcode ID of the first filter listed on the COC place the filter back into position. Find the printed label with B#T1 on it and place it on the Petri tray. The label is placed on the tray with the filter barcodes facing away from you, this is to allow position 1 of the tray to be in the top left corner.

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6. After verifying the filter in position 1 is correct, verify the filter in position 25 is correct. The COC does not list position numbers for the samples, each sample on the COC is counted starting with position 1 until 25 is reached. Remove the filter in position 25 from the Petri tray and verify the Barcode ID matches the Barcode ID on the COC. Use a black pen and place a small dash on the right side of the COC between positions 25 and 26.
7. Next verify the Barcode ID for the filter in position 26.
8. Count from position 26 on the COC until position 50, verify the Barcode ID for position 50 on the COC matches the filter in position 50 of the tray.
9. Set this tray aside and repeat steps 3-8 for the next tray.
10. Once both trays in a box have been checked, place the two trays back inside the plastic bag and seal the bag.
11. Place the sealed bag of filters in the designated refrigerator.
12. Repeat steps 3-11 for all remaining filters.
13. Count the number of quartz filters physically received and write this information down on separate piece of paper.

Remember to keep the COC in order and to only open one box of filters at a time. If a discrepancy is found when verifying positions 1, 25, 26 or 50 start by recounting the COC. If the discrepancy is not resolved by recounting then each filter in the tray is verified with the COC. If filters are found out of order per the COC, detailed notes are made on a separate piece of paper and will be reported with the integrity check. Filters are left in the order received until the laboratory manager and QA officer have been notified of the discrepancy. The QA officer will communicate with the lab on how to proceed. Typically, filters are moved to the physical location matching the COC and filter comments are added to the CSN web app detailing the discrepancy.

For samples received without COC documentation, leave the sample in the tray and position it was found. Draw an asterisk (*) on the COC between the two records where the filter is located. On the bottom of the COC draw an asterisk and write the Barcode ID and the comment, "Sample missing from COC, refer to appendix for further sample information." Initial and date the comment. Open the UCD COC file, located at U:\IMPROVE_Lab\CSN\COC_Quartz and enter the requested information in the worksheet UCD COC. The UC Davis Laboratory Chain of Custody Form will then be generated, see Figure 3. Print the form and place behind all the COCs for the specific batch. Save a copy of the form in the COC Quartz folder with the Batch number as the name of the file. An email is sent to the QA officer with filter information and they will add the filter to the database. The filter cannot be added to an electronic tray until it has been added to the database.

Figure 6. UC Davis Chain of Custody Form.

UC Davis Laboratory Chain of Custody Form
 Form to be used for samples received from Wood without a Chain of Custody Form

Received Name _____	Date/ Time _____		
Analysis Request ID  A00000038	Intended Sample Date Set # 12/14/2019 1Q		
Barcode/ Filter Analysis ID  F187190	Filter Type Quartz	Analysis Requested Carbon	Invalid? Yes

9.4. Generate Quartz Filter Trays

Electronic trays must be generated via the CSN web app upon receiving a shipment of filters. The hardcopy of the COC will be utilized to generate trays.

1. Login to the CSN web app at <https://csn.aqrc.ucdavis> and select “Inventory”
2. The inventory tab will default to Teflon, click on Quartz (Figure 10) to see a list of “Filter Inventory Boxes”. The most recent box will be at the top of the list. Check the number of trays in the “Storage Trays” column, if less than 20, trays will be added to this box.

Figure 7. Quartz Inventory Boxes.

Year	Box Number	BoxLabel	StorageTrays	Created	ArchivedDate
2022	54	Quartz CSN Box 54	14	8/10/2022 12:01:35 PM	Details
2022	53	Quartz CSN Box 53	20	7/14/2022 10:33:45 AM	Details
2022	52	Quartz CSN Box 52	20	6/17/2022 9:47:58 AM	Details
2022	51	Quartz CSN Box 51	20	6/17/2022 9:11:00 AM	Details
2022	50	Quartz CSN Box 50	20	5/5/2022 2:34:56 PM	Details

3. Click on “Details” for the box to add a new tray.

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4. Click on “Add Tray” at the bottom of the screen and type in the Barcode ID for the first filter in the tray. If this is the first tray being generated for a batch, it will be the first filter listed on the COC, click select.
5. The first 50 filters will populate in the same order as the COC, verify the filter order matches the COC.
6. Type in the Tray Label in the following format, B#T# and click create
7. Repeat these steps until all filters on the COC have been assigned to a tray.

Once an inventory box contains 20 trays a new box needs to be generated. From the Quartz Filter Inventory box screen, click on the “Add Box” option near the top of the screen. The Box number and Box Label fields need to be filled in. The box numbers are in numerical order, if the previous box is 54 then the new box is 55. Type in the box label is in the following format, Quartz CSN Box ## and click create.

Electronic trays can be edited if there is a discrepancy. This is done from the Inventory tab in the CSN web app, pay careful attention when selecting the filter type. Lab blanks and filters without barcodes may be randomly inserted in the electronic trays, these will need to be removed from the electronic trays and added to the appropriate tray and position. If the filter order of an electronic tray does not match the COC then the following steps are taken to edit the tray.

1. Start by verifying the filter listed in position 1 of the electronic tray matches the COC.
2. Continue verifying the electronic tray positions with the COC until the discrepancy is found. For this example, the filter in position 10 will be removed.

Figure 8. Electronic tray details screen.

Filters

Position	FilterId	BarcodeId	Intended Use Date	Set	Batch	Type	Purpose	Null Code	Manufacturer #						
1	303012	F303167	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
2	303030	F303170	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
3	303147	F303173	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
4	303231	F303176	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
5	303285	F303178	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
6	303339	F303181	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
7	303357	F303184	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
8	303408	F303187	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
9	303426	F303190	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove
10	304068	F303193	6/16/2022	1a	A0000092	Quartz	SA					▲ Up	▼ Down	Insert Above	Remove

3. Click the remove button for the filter listed in position 10, here is how the tray will look:

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Figure 9. Electronic tray details screen with deleted row.

Filters

Position	FilterId	BarcodeId	Intended Use Date	Set	Batch	Type	Purpose	Null Code	Manufacturer #				
1	303012	F303167	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
2	303030	F303170	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
3	303147	F303173	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
4	303231	F303176	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
5	303285	F303178	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
6	303339	F303181	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
7	303357	F303184	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
8	303408	F303187	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
9	303426	F303190	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
10												Add filter	
11	304206	F304001	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
12	304257	F304004	6/16/2022	1a	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove

- The “Add Filter” button can be used to insert a different filter in position 10. Only use this option if a different filter needs to be added to this tray. Otherwise the up and down buttons are utilized to shift the inventory within the electronic tray. If the filters are shifted up in the tray this will leave a blank position at the end of the tray as seen below.

Figure 10. Electronic tray details screen with deleted row shifted to position 50.

43	302253	F299804	6/16/2022	5Q	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
44	302286	F299810	6/16/2022	5Q	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
45	302319	F299816	6/16/2022	5Q	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
46	302352	F299822	6/16/2022	5Q	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
47	302409	F299828	6/16/2022	5Q	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
48	302442	F299834	6/16/2022	5Q	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
49	302511	F299840	6/16/2022	5Q	A0000092	Quartz	SA			▲ Up	▼ Down	Insert Above	Remove
50												Add filter	

- Position 50 is blank in this tray and the Add filter button can be used to add the correct filter. Click “Add filter” to go to the add filter screen.

Figure 11. Add filter to tray.

[Back to Tray](#)

Add Filter to Tray

Filter barcode/Id:

[Back to Tray](#)

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6. Type in the Barcode ID and hit select, position 50 will now be filled in with the Barcode ID that was just typed in.
7. If lab blanks appear in the wrong electronic tray they need to be removed by using the remove button. The filter purpose for lab blanks is listed on the electronic trays as LB, this is used to identify and remove blanks from the wrong location in a tray.
8. After removing lab blanks add them to the final electronic tray for the batch. Lab blanks are added after all routine samples have been assigned a tray and position. Use the add filter button to add them.
9. If a filter without barcode is listed in a tray, use the remove filter button. Any filters without a barcode do not need to be added to a tray; these are filters the lab did not physically receive.

An electronic tray can be completely deleted and restarted if necessary. This is done from the Inventory tab in the CSN web app, pay careful attention when selecting the filter type. Entire trays usually only need to be deleted because more than 20 trays were added to an inventory box.

1. From the Inventory tab, click Quartz
2. Click details for the necessary box
3. Click details for the tray that needs to be deleted
4. Click the delete button to remove the entire tray

Figure 12. Tray details screen.

[Back to Box](#)

Tray details

TrayLabel	B92T12	ArchivedDate		<input type="button" value="Edit"/>	<input type="button" value="Delete"/>	<input type="button" value="List"/>
TrayNumber	1	ArchivedBy				
Created	8/10/2022 12:01:57 PM					
CreatedBy	tashcole					

Filters

Position	FilterId	BarcodeId	Intended Use Date	Set	Batch	Type	Purpose	Null Code	Manufacturer #
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Electronic documents are official. Paper copies are for reference only.

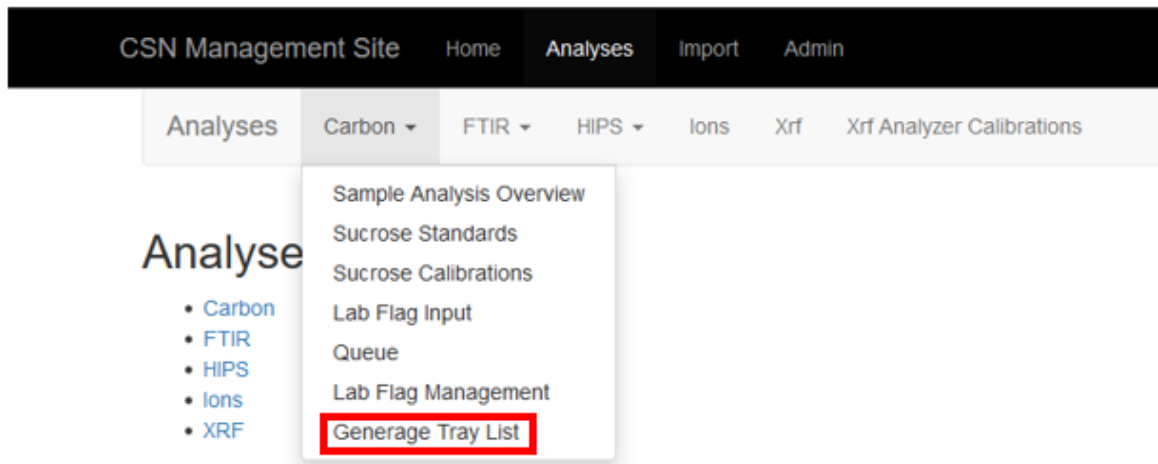
5. Once the tray has been deleted the web app will automatically redirect to the Box details page. The tray is ready to be regenerated if needed.

9.5. Generate Carbon Analysis Tray List

Carbon analysis utilizes a generated inventory list referred to as a Tray List for analyzing routine samples, the list matches the order of the COC. Tray Lists are generated per batch prior to beginning analysis of any given batch. Tray Lists are generated via the CSN web app following generating electronic trays.

1. Go to the CSN web app and login, <https://csn.aqrc.ucdavis.edu/>
2. Click on Analyses and select Carbon from the dropdown
3. Click on the down-arrow next to Carbon and select “Generate Tray List”

Figure 13. CSN Management Site Carbon submenu.



4. The analyzer names will auto-populate, leave them in this order unless instructed to change it:

Figure 14. Generate tray list.

GenerateTrayList

Analyzer	Analyzer	Analyzer	Analyzer	Analyzer	Analyzer
beta	alpha	gamma	delta	zeta	theta
Tray	Tray	Tray	Tray	Tray	Tray
Last Replicate Filter Number					
Last Filter Number					
	Update	Cancel			

Copy to Clipboard

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5. Starting with the first analyzer listed, from the dropdown options (if available) select the desired Batch number and Tray number. The Batch number and Tray number can be typed into the “Tray” field. Each Batch will begin with Tray 1. The Batch number for each tray will remain the same for all trays generated within a Batch. When generating the first group of tray lists (Trays 1-6) the “Last Replicate Filter Number” and “Last Filter Number” will remain blank.
6. After filling in the Batch and Tray numbers for each analyzer, click “Update” and then click “Copy to Clipboard”.
7. Go to the U drive and open the Carbon Lab Inventory folder, located here: U:\IMPROVE_Lab\Carbon Analysis Lab\Daily Operation files\Inventory.
8. Create a folder for the batch, name the folder as the Batch ##.
9. On the u-drive open the following file, "U:\IMPROVE_Lab\Carbon Analysis Lab\Daily Operation files\Inventory\Template_tray_lists.xlsx".
10. Paste the information into the worksheet “Paste from web app”. The individual instrument worksheets will auto-populate.
11. Save the file as B#T1-6 within the folder created in step 8.
12. Repeat steps 5-11 (with the exception of steps 7 and 8) until all trays within a batch are assigned. The last replicate filter number and last filter number fields will be filled in for the remaining trays.
13. Update the Generate Tray List to Trays 7-12, and input the last replicate filter number and the last filter number from the previous list (e.g., for Tray 7-12, the last replicate filter number is 290, and the last filter number is 300). Save and print all Tray Lists, print the individual instrument lists in each saved file.

9.6. Laboratory Blanks

Wood provides 5 lab blanks with every CSN batch, these filters are typically placed in the last quartz tray of the shipment. The blanks will be listed on a separate COC form and the Barcode IDs and manufacturer numbers are verified. Lab blanks are handled in the same manner as samples during the inventory process. However, for analysis purposes each lab blank is analyzed 4 times, with each of the 4 analyses per filter being conducted on a different carbon instrument.

A separate tray list is created for lab blanks. Open the template utilized for generating the lab blank tray list, "U:\IMPROVE_Lab\Carbon Analysis Lab\Daily Operation files\Inventory\Template_lab_blank_list.xlsx". Next open the final tray list created in step 13 of Section 9.5 Generating Carbon Analysis Tray Lists, locate the lab blanks listed in the final tray and cut them from this file, save and close. Paste the lab blanks into the designated columns in the lab blank template. Save the as Batch ## Lab blank list in the corresponding batch folder, U:\IMPROVE_Lab\Carbon Analysis Lab\Daily Operation files\Inventory.

9.7. Shipment Integrity Check

Report Integrity check information (Table 1) and discrepancies to the Laboratory Manager and QA officer via email. The “Filter Count” field is the number of samples

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received within a Batch. The “COC” field refers to the number of samples included in the COC forms. The “Electronic Records” field refers to the number of records in the database for the specific Batch. To view the number of electronic records, log into the CSN Data Management Site and go to Batches, select the corresponding batch number from the list and click the “view record details” icon. On the Batch Details page locate filter type and check the total listed for quartz, this is the number of electronic records per filter type for the batch.

The Batch Details page is also used to check for filters without barcodes. Scroll down to the “Filters missing barcodes” list and check for any listed quartz filters. This number will be subtracted from the total listed for quartz filters.

Information from the integrity checks are saved in an excel file locate here;
U:\IMPROVE_Lab\CSN\Inventory

1. Go to the U:\IMPROVE_Lab\CSN\Inventory folder and open the inventory receiving template, "U:\IMPROVE_Lab\CSN\Inventory\Inventory receiving template.xlsx"
2. Click save as and rename the template with as Batch ##.
3. The template has designated fields for Teflon and quartz filters, fill out the requested information for quartz filters, save and close the file.

After information has been input in the inventory file for both filter types an email is sent to the QA officer and Lab manager. The table for each filter type from the inventory file is included in the email, see Table 1.

Table 1. Quartz integrity check.

Quartz – CSN Batch ##			
	COC	Physical Count	Electronic Records
25 mm Filters	1200	1200	1200
47 mm Filters	NA	NA	NA
Lab Blanks	5	5	5
Total	1205	1205	1205

9.8. Carbon Analysis Inventory Verification

Sample information is verified in the Carbon lab when loading samples by scanning directly into the carbon analyzer software. The laboratory personnel will verify individual sample receipt by comparing the Barcode ID with the printed tray lists, the order of which matches the COC. Analyst initials are recorded on the printed tray lists next to each sample analyzed.

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9.9. Storage

CSN network samples are stored between 0 and 4 °C. Refrigerators are available for CSN sample storage, located in the lab. Archive samples for long-term storage after carbon analysis. Refer to *UCD CSN SOP #901: Long-Term Archiving of Filters*.

9.10. Cooler Return

The laboratory technician will prepare and ship the ice packs/coolers back to Wood, using the provided UPS return labels. If labels are not provided contact Wood for shipping account information.

9.11. Carbon Analysis Batch Completeness

Batch completeness is performed when Carbon analysis of a batch is completed. This includes verifying all filters have a valid analysis, duplicates are reconciled and pre-analysis flags have been applied where needed.

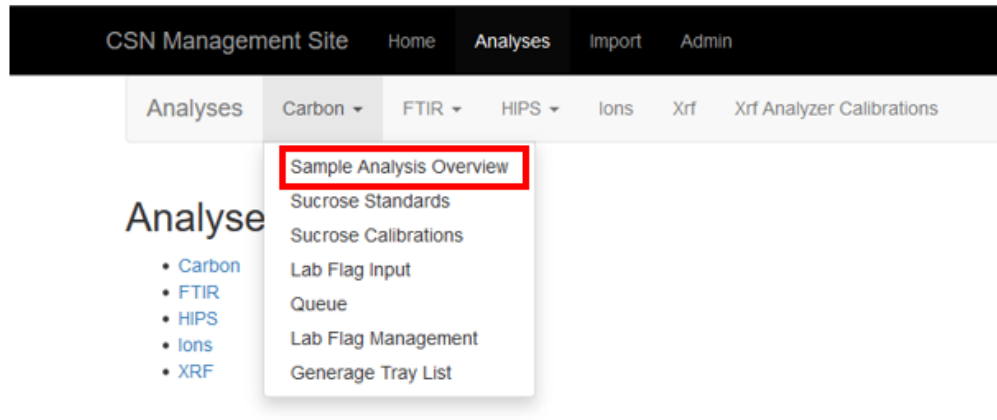
9.11.1 Verify Filters Analyzed

1. Go to the CSN status page; <https://shiny.aqrc.ucdavis.edu/csnStatus/>
2. From the menu on the left side select Analysis Completeness.
3. From the year dropdown select the year for the batch being completed.
4. From the month dropdown select the month for the batch being completed. The page will update automatically.
5. Scroll down to the “Filters Not Analyzed by TOR” section.
6. If there are “0 out 0 entries” listed this indicates all quartz filters from this batch were analyzed.
7. If there are any quartz filters listed here copy the Barcodes IDs and use the CSN web app to look up the filter information. If a filter has an assigned tray and tray position listed in the CSN web app, go physically locate the filter and visually inspect it for signs of analysis (signs of analysis for a quartz filter would include a missing punch). If the filter has not had a punch removed then the filter was most likely skipped during routine analysis and needs to be analyzed. If the filter does have a punch removed and no valid analysis listed in the web app, notify the spectroscopist. The spectroscopist will assist in investigating and resolving the issue.
8. If a filter does not have an assigned tray and tray position in the web app, check for any comments listed by the CSN sample handling lab to determine if the filter was shipped to our location. Comments from the CSN sample handling lab are visible in the web app and the CSN status page. The filter may not have been returned from the field to the sample handling lab for various reasons. The filter will still be listed on the “Filters Not Analyzed by TOR” list but should have a comment referencing the filter issue and if it was not shipped.

9.11.2 Check for duplicate analyses

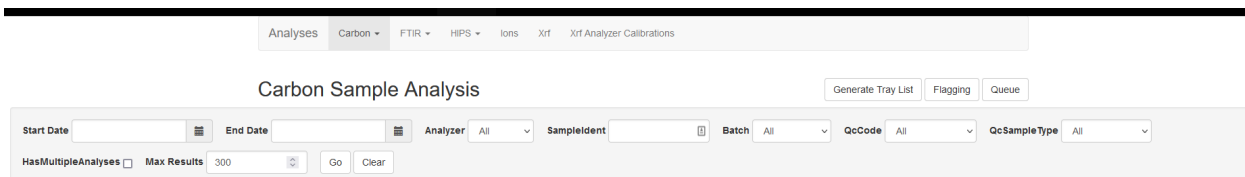
1. Go to the CSN web app, <https://csn.aqrc.ucdavis.edu/>
2. Click on Analyses, then Carbon and from the Carbon dropdown select, “Sample Analysis Overview”.

Figure 15. CSN Data Management Site Carbon submenu.



3. The Carbon Sample Analysis screen allows various filtering options, seen below:

Figure 16. Carbon sample analysis filtering.



4. From the Batch dropdown select the batch being completed and click go, this will only show results for the selected batch.
5. Check the “Has Multiple Analyses” box, this will filter the selected batch and show any results with more than 1 analysis per filter. This will return filters analyzed as planned replicates and any filters reanalyzed.
6. For each replicate filter under the “Has multiple analyses” list verify there is a replicate (QC code 6) and a valid analysis (QC code 1).
7. For each reanalyzed filter under the “Has multiple analyses” list verify there is a reanalyzed (QC code 2) and a valid analysis (QC code 1).
8. Any filter listed with multiple analyses and the same QC code, need to be investigated. For example, if a filter has two analysis results listed as QC code 6 and no analysis results listed as QC code 1, work with the spectroscopist to determine which result should be listed as QC code 1. All filters need to have 1 valid analysis result (QC code 1). Similarly, if a

filter has two results listed as valid (QC code 1) work with the spectroscopist to determine which result needs to be changed to a different QC code, filters can only have 1 valid result (QC code 1).

9. Lab blanks will also appear on the “Has Multiple Analyses” list. Each lab blank typically has 4 valid results (QC code 1), this is acceptable and no results need to be changed. Verify each lab blank has 4 valid results, if not work with the spectroscopist to investigate.
10. Filters with multiple valid analyses (QC code 1) also appear on the <https://shiny.aqrc.ucdavis.edu/qCarbonTouchScreen/> website. It is normal for lab blanks to appear on this list and no results need to be changed.

9.11.3 Check for Pre-Analysis Flags

The pre-analysis flag queue should be processed once a week when analyzing routine samples. The pre-analysis flag queue has the option to auto-process flags and comments. The auto-process option should only be used after verifying the automatic filter status, qualifier codes and parameters are appropriate. Auto ME-1 and Auto-ME-2 can always be applied without any further verification, these apply a flag indicating a punch still had visible deposit after undergoing analysis. Reference the “Lab Flag Management” page on the CSN web app to see a list of flags, filter statuses, qualifier codes and parameters that are applied when a flag is processed.

1. Go to the CSN web app, <https://csn.aqrc.ucdavis.edu/>
2. Click on Analyses, then Carbon and from the Carbon dropdown select, “Queue”. See figure 17 for example queue.

Figure 17. Pre-Analysis Flagging Queue.

	Batch	Filter	Flags	Comments	Analysis Ids	
Process	A0000089	F291101	LE-2	• Filter dropped <u>SSup</u> on counter after taking punch.	77972,77975	Auto
Process	A0000090	F289925	FI-1	• Deposit is scratched		Auto
Process	A0000091	F295345	LE-3	• First punch contaminated with deposit from other sample. Second punch taken.	80712	Auto

3. In the batch column look for any entries pertaining to the batch being completed.

4. Read the comment entered by the lab analyst and confirm it applies to the flag selected. A description of the flags is available in the Carbon dropdown menu under “Lab Flag Management”. If the flag is appropriate for the comment entered then the auto button can be used.
5. If the flag selected is not appropriate for the comment entered then the flag should not be auto-processed. For example, if a punch is dropped prior to analysis and a comment is entered stating “First punch dropped on floor, not analyzed. Second punch was taken for analysis (this punch was not dropped)”. The lab analyst then selected the LE-2 flag (for a dropped sample). If this flag is auto-processed it will apply the flag and comment to the punch that was analyzed, this punch was not dropped on the floor. In this case the comment should be applied to the filter not the specific analysis. The comment is added to the filter on the filter details screen. This flag will remain in unprocessed in the queue.
6. Analyzed punches with ME-1 and ME-2 flags are taped to a printed sheet in the lab; please file these completed sheets with the COC for each batch.

A summary is emailed to the lab manager and spectroscopist verifying all filters have a valid analysis, duplicates are reconciled and pre-analysis flags have been applied where needed. Fill out the Batch Completeness template located here, U:\IMPROVE_Lab\Carbon Analysis Lab\Daily Operation files\Batch Completeness. Save as the current batch and email the completed file to the lab manager and spectroscopist for review. Additionally, include any outstanding filter analysis issues that cannot be resolved in the batch completeness email. The lab manager or spectroscopist will approve the completed file and then another email is sent to the CSN QA officer releasing the batch for validation.

10. QUALITY ASSURANCE AND QUALITY CONTROL

Not applicable.

11. REFERENCES

Not applicable.