Environmental Functional Area

Water, Air, Monitoring and Analysis

UCRL-AR-10204-20-02

Lawrence Livermore National Laboratory Livermore Site

Semiannual Wastewater Point Source Monitoring Report

July 2020

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Lawrence Livermore National Laboratory

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Certification

Lawrence Livermore National Laboratory Livermore Site Semiannual Wastewater Point Source Monitoring Report

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Crystal E. Quinly

Digitally signed by Crystal E. Quinly
Date: 2020.07.15 14:43:13 -07'00'

Crystal Quinly, Manager
Environmental Functional Area

Date

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Lawrence Livermore National Laboratory Livermore Site

December 1, 2019 – May 31, 2020

Executive Summary

In accordance with the *Code of Federal Regulations*, Title 40, Part 403.12(e), Lawrence Livermore National Laboratory (LLNL) submits a semiannual monitoring report regarding federally regulated wastewater generating processes (categorical processes) that discharge wastewater to the sanitary sewer system. Attachments A-2 and A-3 of the *2019-2020 Wastewater Discharge Permit #1250* granted to LLNL by the City of Livermore Water Resources Division (WRD) also mandate submission of this report.

The LLNL Livermore Site is required to monitor identified electrical and electronic components processes (40 CFR Part 469) and metal finishing processes (40 CFR Part 433) semiannually and to submit monitoring reports in January and July of each year. Under authority delegated to enforce compliance with these regulations, the WRD reviews this report.

This report provides information on the significant metal-finishing operations and electrical and electronic component operations located at the Livermore Site during the period from December 1, 2019 through May 31, 2020 and includes descriptions of the LLNL regulated (categorical) processes that discharge to the sanitary sewer. Attachments A-2 and A-3 of the *2019-2020 Wastewater Discharge Permit #1250* provide the list of categorical processes and the required self-monitoring program for point-source discharges at LLNL.

The monitoring data collected for this report documents compliance with all federal and local pretreatment limits. Compliance certification accompanies this report, as required by federal regulations.

Introduction

This semiannual monitoring report for regulated point-source discharges of wastewater is required by Title 40, *Code of Federal Regulations*, Part 403.12(e), and by Attachments A-2 and A-3 of the *2019-2020 Wastewater Discharge Permit #1250* (Permit) granted to LLNL by the City of Livermore Water Resources Division (WRD). As stipulated in the Permit, LLNL conducts a monitoring program for the federally regulated wastewater generating processes (categorical processes) that discharge to sanitary sewer. Semiannual sampling and inspection demonstrate LLNL compliance with Permit requirements. This report covers the period of December 1, 2019 through May 31, 2020.

Categorical Processes

This monitoring report documents the identified regulated processes defined under the categorical standards. One of these processes discharges directly to the sanitary sewer and is discussed in this report with accompanying monitoring results. BC Laboratories, Inc. of Bakersfield, California, an independent, state-certified contract analytical laboratory, analyzes all categorical discharge compliance samples.

Indirect or non-discharging processes (all regulated under the Metal Finishing Point Source Category) are listed in **Table 1.** Wastewater from these processes is typically contained for eventual removal and appropriate disposal by LLNL's Radioactive and Hazardous Waste Management (RHWM) Division or recycled at Building 322. Because these processes do not discharge to the sanitary sewer, they are not subject to the monitoring or discharge requirements contained in 40 CFR Part 433. The metal finishing regulations contained in 40 CFR Part 433 apply to **discharges** from any of the six defining processes, as well as the forty process operations listed. Wastewaters or spent solutions from any of the "non-discharging" processes listed in **Table 1,** or any regulated process, that are treated at LLNL's Decontamination and Waste Treatment Facility (DWTF) and discharged to the sanitary sewer must meet the categorical discharge terms and conditions. For the processes listed in **Table 1**, a statement will be submitted certifying there were no discharges either directly to the sanitary sewer or to the sewer through any building retention tank during the monitoring period. This statement is included in **Appendix 1** of this report.

The only categorical process that discharges to sewer is regulated under 40 CFR Part 469, the Electrical and Electronic Components Point Source Category. This operation is a cluster of processes located within a series of interconnected Class 100 clean rooms within the Building 153 Associate Space open-bay area. These clean rooms house a number of bench-top micro-fabrication processes used to perform research and develop prototype semiconductor devices. The bench-top, small-volume processes in support of this activity discharge into a common building wastewater retention system. This system consists of four 2,000-gallon tanks.

In addition to the Permit-driven compliance sampling which occurs semiannually, the Building 153 retention tank system is routinely monitored prior to each tank discharge. The tank contents are released to the sanitary sewer only when categorical and Permit discharge limits are met (**Table 2**). These surveillance samples are collected from each volume of the retention tank system and are analyzed by General Engineering Laboratories in Charleston, SC.

During each semiannual monitoring period, LLNL Environmental Functional Area (EFA) personnel collect samples from the Building 153 retention tank system to satisfy the Permit driven monitoring requirements. Each year, one of these semiannual sampling events is performed in conjunction with WRD Source Control staff and includes an inspection of the building cleanrooms and Associate Space. Annual compliance co-sampling took place on October 9, 2019. The samples were collected at the point of discharge into the sanitary sewer and were sent to BC Laboratories, Inc. for analysis. WRD Source Control staff last inspected the discharging processes located in Buildings 153 and the now decommissioned water-jet in Building 321C, on October 9, 2019. The resulting Inspection Report documented LLNL compliance with the categorical standards. There were no outstanding deficiencies, and no corrective actions were necessary.

The following sections contain brief descriptions of the non-discharging metal finishing processes and the Building 153 microfabrication processes. Estimates for volumes discharged to the sewer through the Building 153 retention system are included with the process descriptions. During the current monitoring period, LLNL sampling demonstrated compliance with all federal pretreatment and local discharge limits.

Metal Finishing Point Source Category

Building 321C, Room 1315: Abrasive Jet Machining (water-jet)

The Building 321C water-jet was taken out of service in February 2020 due to the age of the machine and maintenance costs. Although monitored in the past as a regulated metal finishing process under the terms of Attachment A-2 of Permit 1250, there will be no analytical data for it in this or any future Semiannual Reports. The WRD was notified on May 6, 2020 of the shut-down of this equipment.

A new water jet that uses a closed loop system will be installed in the coming months. The new water jet will not discharge to sanitary sewer, so will not be subject to categorical sampling requirements. The new water-jet will be documented in an upcoming report once it is operational, and will be listed as a non-discharging metal finishing process in **Table 1**.

Non-discharging Metal Finishing Processes

All wastewater generated by the processes listed in **Table 1** is either recycled (B322) or removed by RHWM personnel for appropriate disposal. The metal finishing rinse water from Building 322 is processed in the evaporation unit located at Building 322 and reused within that facility. Spent concentrated chemicals and hazardous waste are contained in carboys and drums, and are shipped off site by RHWM personnel. If any of these processes discharge to the sanitary sewer, either directly or indirectly, they are subject to the sampling or discharge requirements contained in 40 CFR Part 433. Sampling may be performed in conjunction with WRD Source Control staff of any volume treated at the DWTF. **Appendix 2** contains the spreadsheet, *Categorical Waste Streams Managed by RHWM*, providing the required information on regulated waste volumes shipped off site or treated by RHWM.

Table 1. Non-discharging metal-finishing processes.

Building/Room	Process
B131/Water-Jet Area	Abrasive jet machining (water-jet)
B132/1845B	Abrasive jet machining (water-jet)
B321A/1001A	Any of the 46 listed processes
B321C/1318B, 1351, 1437[a], 1437A, 1441	Electrical discharge machining and T-base lathes
B322[b]	Any of the 46 listed processes
B329/1611	Abrasive jet machining (water-jet)

[a] Does not include additive manufacturing processes.

[b] The Building 322 Plating Shop contains multiple metal-finishing processes located within a common facility. All process wastewater from Building 322 is regulated under the Metal-Finishing Category, 40 CFR Part 433.

Electrical and Electronic Components Point-Source Category

Unless otherwise indicated, wastewaters from the following processes are discharged to the sanitary sewer and must comply with the standards set forth in 40 CFR Part 469, Subpart A.

Building 153: Microfabrication Processing Laboratories

Building Description:

Building 153 at Lawrence Livermore National Laboratory contains research-scale microfabrication processing laboratories for the development of experimental semiconductor and micromechanical devices. Wastewater discharges from this facility are regulated under the Electrical and Electronic Components Point Source Category, 40 CFR Part 469, Subpart A. (The Standard Industrial Classification (SIC) Code for LLNL, a National Research Laboratory, is 8733 Noncommercial Research Organizations.)

Retention Tank System:

Most of the rinses from the wet stations contained in Building 153 are plumbed to drain to the retention tank system. This retention system consists of four 2,000-gallon tanks, with a combined capacity of approximately 8,000 gallons. Once a tank is filled to capacity, the contents of that tank are sampled and analyzed prior to each discharge. Please refer to the tables in the following discussion for a description of wastes collected by RHWM. If the results are within the limits of 40 CFR Part 469 and local limits from Attachment A-2 of the Permit, the tank contents are discharged to the sanitary sewer. If the results were not within those limits, the wastewater would be transferred to RHWM for proper disposal. All wastewater volumes during this monitoring period were discharged to the sanitary sewer following characterization.

Hybrid Electrochemistry Station:

Within the Associate Space of Building 153 is a small research-scale station that uses both semiconductor and metal-finishing processes to produce tiny hybrid electromagnetic coils (360-400 microns diameter, 5-mm length). This process was previously located in Building 197 and is part of ongoing research that uses some semiconductor technologies to produce bench scale electromagnetic coils. Although the processes are closely related to those used to develop printed-circuit boards, no solid-state electrical devices are produced, and the bench-scale hybrid electromagnetic coils do not resemble standard circuit boards.

All spent chemicals, concentrated solutions, and first rinses are containerized for disposal through RHWM facilities. Subsequent rinses are discharged to the sanitary sewer.

Facility personnel are currently evaluating continued use of this station. If the status of this station changes, those changes will be reported in future semiannual reports.

Room 1000 A–F:

Within the Room 1000 open bay are a series of interconnected Class 100 clean rooms consisting of a central corridor with six labs branching off the corridor. Each of these branches is assigned Room numbers 1000A through 1000F. In each room, wet stations and solvent stations are numbered and labeled with a list of approved chemicals and a list of approved processes. Wet stations have a drain that discharge to the retention tank system while solvent stations do not have drains (except for Wet Station #1 where waste is discharged to a 5-gallon carboy and sent to RHWM for disposal).

Room 1000A – Photolithography – The following processes are performed in Room 1000A: photolithography, positive photoresist developing, negative photo resist developing, and positive resist stripping. Waste disposal options are outlined below:

	Waste collected by RHWM	**Waste discharged to retention tank system**
Solvent Station #5		
Photolithography process	Positive photoresist, negative photo-resist, chlorobenzene, acetone and alcohols	No discharge
Wet Station #4		
Photolithography developing and positive resist stripping	Sodium and potassium based developers and positive resist strippers	Subsequent rinse water from developing and stripping and one spin rinse dryer
Solvent Station #7		
UTS Spin Track System	Positive photoresist, potassium based developers, acetone	No discharge

Room 1000B – Microstructures – Silicon etching is performed in Room 1000B; the etching process may, in the future, be moved to another location within the building Associate Space. Waste disposal options are outlined below:

	Wastes collected by RHWM	**Wastes discharged to retention tank system**
Wet Station #10		
Silicon wafer etching process	Etchants and first rinse water	Wafer rinse water

Room 1000C – Silicon – The following processes are performed in Room 1000C: Radio Corporation of America (RCA) cleaning, metal etching, oxide etching and dielectric etching. The RCA cleaning process consists of hydrogen peroxide and water solutions. One solution contains hydrochloric acid and the other ammonium hydroxide. This room contains two spin rinse dryers, which discharge directly to the sanitary sewer. Wet benches discharge to the retention tank system. Waste disposal options are outlined below:

	Wastes collected by RHWM	Wastes discharged to retention tank system
Wet Station #13		
RCA cleaning process	Etchants and first rinse water	Wafer rinse water
Wet Station #15		
Metal, poly-silicon, and thin film etchant using approved acids	Etchants and first rinse water	Wafer rinse water
Wet Station #14		
Oxide and dielectric etching processes using hydrofluoric acid	Etchants and first rinse water	Wafer rinse water
Mask cleaning process	Positive resist spin rinse dryer	Rinse water (if within limits)
Mask Cleaning	Photoresist	Mask rinse water

Room 1000D – Optic-Electronics – The following processes are performed in Room 1000D: Ultrasonic solvent, silicone application, wafer cleaning using sulfuric acid and hydrogen peroxide, polyimide, and general solvent use. The wet bench discharges to the retention tank system. Waste disposal options are outlined below:

	Wastes collected by RHWM	Wastes discharged to retention tank system
Solvent Station #6		
Ultrasonic solvent cleaning; general solvent use	Acetone, alcohols, stripping chemicals and polymers	No discharge
Solvent Station #8		
Photolithography process	Negative photoresist, polyimide, positive photoresist, polymers, and polyimide developers, rinses, acetone and alcohols	No discharge
Wet Station #7		
Wafer cleaning process	Wafer rinse water	Wafer rinse water

Room 1000E – III-V Process – The following processes are performed in Room 1000E: Photolithography, general solvent use, Gallium Arsenide (Ga-As) and Indium Phosphide (InP) wafer etching, wafer stripping, metal etching, and oxide etching. The wet bench discharges to the retention tank system. Waste disposal options are outlined below:

	Wastes collected by RHWM	Wastes discharged to retention tank system
Wet Station #12		
Ga-As & Silicon wafer processing	Wafer rinse water	Wafer rinse water
Solvent Station #11		
Photolithography process	Photoresist, polyimide, and polyimide developers, rinses, chlorobenzene, acetone and alcohols	No discharge
Mask cleaning/positive resist stripping and cleaning processes	Acetone, alcohols, stripping chemicals, polymers and photoresist	No Discharge

Room 1000F – This room is divided into three sections. In the first section, a sputtering system deposits various metals onto optics and a conformal coater deposits a nonconductive protective layer onto the metals. Isopropyl alcohol (IPA), acetone and methanol are used to clean the optics at the sink. Micro soap and deionized (DI) water are used to wash the optics in the sink. Initial and subsequent rinses are discharged to the retention tank system, and final rinse is discharged to the sanitary sewer. In the second section is a Scanning Electron Microscope (SEM) with no wastewater discharge. The third section is used for analytical characterization, testing and packaging, done with no wastewater discharge.

Hazardous Materials Staging:

Containerized hazardous and non-hazardous wastes are staged in satellite accumulation areas (SAAs) at the point of generation of each waste. When each container is full, or reaches the maximum accumulation time of 9-months, the waste is moved by RHWM to an appropriate waste accumulation area (WAA) for final disposal coordination. Wastes in these areas include gallium arsenide, sulfuric acid, nitric acid, hydrofluoric acid, hydrogen peroxide, sodium sulfate, silver or mercury.

Electroplating Bench #18:

Electroplating copper waste sent to RHWM facilities for proper disposal.

Solvent Station #17:

Solvent station used for epoxy and solvent use substrate – no wastewater discharge.

Wet Station #3:

Used for spinning silicones (PDMS) – Covered sink that discharges to the retention tank.

Solvent Station #2:

Solvent station used for photolithography of optics– waste is collected and sent to RHWM facilities for proper disposal. Station hasn't been used for the past few years; it may be removed in the future.

Lapping Staging Area:

IPA, silicon oil, methanol, and acetone are used in this area to prep Ga-As wafers for lapping at Wet Station # 01. There are no discharges and no drains.

Wet Station #1:

Wet station with lapper used for thinning Ga-As wafers, wet etching of Thallium Bromide - does not discharge to retention tank system; discharge is collected in 5-gallon carboy and sent to RHWM facilities for proper disposal.

1500 Hall – Wet Station #19:

Optic Cleaning, no regulated materials used in this process, uses micro soap and biodegradable detergent. Small volumes discharge to sanitary sewer.

Rooms 1500A, B, C and D:

One of the Room 1000 class 100 clean rooms leads to a set of modular clean rooms with the following assigned room numbers: 1500A, 1500B, 1500C, and 1500D.

Room 1500A – Deposition Tools – This Room is being expanded to accommodate the development of a flexible, biocompatible microelectrode array and ocular surgical tools for the development of implantable neural devices with the ability to record and stimulate neurons within the brain. (The microelectrode array is microfabricated by embedding microelectromechanical systems into polymers. The systems integrate micrometer-sized mechanical elements, sensors, actuators and electronics.) The non-discharging, sputtering and an Atomic Layer Deposition (ALD) tools used for conformal coatings and solvent bench, are used to spin polymers and clean the array and tools. The solvents used to clean include IPA, acetone and methanol. A polymer curing oven was introduced in this tunnel in Feb 2015. There are no discharges and no drains.

Solvent Station #9: Polymer/Polyimide spinning and developing with general solvent use; discharge is collected in 5-gallon carboy and sent to RHWM facilities for proper disposal.

Room 1500B - This Room is being expanded to accommodate for the packaging of a flexible, biocompatible microelectrode array using flip chip bonders, wire bonders, direct ink write, screen printers. Small amounts of epoxies, conductive inks, IPA, and acetone.

There will be no discharges or drains.

Room 1500C – Etching Tools and Silicone molding/coiling – Etching thin films on devices is performed at this workstation. Making silicone devices using molding methods. There are no discharges and no drains.

Room 1500D – Ion Beam and Deposition Tool – Deposition tool has no wastewater generation or drain connections.

North-west end of Associate Space – Wafer Saw-Cutting – 1-ADT Model 7100 and 1-KS Model 982 Plus. Cuts glass, quartz, silicon, polymers, plastics, sapphire, alumina, ceramic, silicon carbide, germanium and gallium nitride wafers and various thin film coatings under 10 microns thick, such as photoresist, silicon nitride, silicon oxide, gallium nitride, aluminum nitride, boron, icosahedral boron phosphide, boron phosphide, diamond, carbon, platinum, gold, titanium, silver, and aluminum. Wastewater from both saw units flows through a strainer filter into a sump pump with a sediment basin to catch particulates prior to discharge to the sanitary sewer. The combined discharge from the two saws is approximately 30 gallons a week. The strainer filter is cleaned as needed.

Room 1101 – Bioengineering Lab – Testing saline solutions compatible with human body. Solution salts rinsed down two sink drains during Electrochemistry activity. Sinks discharge to sanitary sewer.

Room 1111 - Bioengineering Lab 2 – Same activity as above but with one sink.

Room 1115 - Bioengineering Lab 3 – Bio Safety Level 2 lab (BSL2) used for bio 3D printing of cells. One sink used for washing hands and diluted 10% bleach solutions used for decontamination of biological materials, discharges to sanitary sewer.

Building 153 Retention Tank Sampling:

Analytical results from the samples collected from the Building 153 retention tank system representing this monitoring period are shown in **Table 2**. EPA Methods 624 and 625 (TTO) and 200.8 (arsenic) were performed to demonstrate compliance with discharge limits. The pH of the grab sample was measured in the field using a calibrated meter. During the current monitoring period, LLNL sampling demonstrated compliance with all federal pretreatment and local discharge limits.

Table 2. Building 153 retention tank system, sampling results (mg/L).

Date of discharge	pH[a]	Arsenic[b]	TTO[c]
12/14/19	7	<0.03	<0.010
01/08/20	6	<0.03	<0.010
01/08/20	7	<0.03	<0.010
01/22/20	7	<0.03	<0.010
02/14/20	6	<0.03	<0.010
03/03/20	7	<0.03	<0.010
3/11/20	7	<0.03	<0.010
4/28/20	7	<0.03	<0.010
05/20/20 LLNL Compliance Sample[d]	7	<0.0020	<0.010
Effluent limit[e]	**5–10**	**0.83**	**1.37**

[a] The value indicated in the table is a field measurement taken at the time of discharge to the sanitary sewer. The units of mg/L do not apply to pH measurements.

[b] Arsenic concentrations were determined on surveillance samples using SW846 3005A, EPA Method 200.8 was used on the compliance sample.

[c] The list of constituents used to establish TTO is defined under 40 CFR Part 469.12. TTO concentrations on the surveillance samples were determined using EPA Method 624, TTO concentrations on the compliance samples were determined using EPA Methods 624 and 625.

[d] Compliance sample was collected on May 20, 2020. Additional volume was added to the retention tank after the compliance sample was taken. The tank was resampled on May 26, 2020 to demonstrate compliance with discharge limits and was released on June 10, 2020.

[e] Effluent limit is the discharge limit for each analyte as stated in 40 CFR Part 469.28 or, in the case of pH, the *2019–2020 Wastewater Discharge Permit #1250*.

Appendix 1

Certification Statement for Non-discharging Categorical Processes

Appendix 1

SEMI-ANNUAL CERTIFICATION STATEMENT FOR NON-DISCHARGING CATEGORICAL PROCESSES

As the responsible individual for managing compliance with the Categorical Pretreatment Standards under 40 CFR 433, I certify, to the best of my knowledge and belief, that during the reporting period of December 1, 2019 to May 31, 2020, from the facility described as Lawrence Livermore National Laboratory:

No discharge of any wastewater to the sanitary and/or the storm sewer system has occurred from the following processes regulated under federal Categorical Standards:

- B131/Water-Jet Area: Abrasive jet-machining
- B132/1845B: Abrasive jet machining
- B321A/1001A: Any of the 46 listed processes
- B321C/1318B, 1351, 1437, 1437A, 1441: Electrical discharge machining and T-base lathes
- B322 Plating Shop: Any of the 46 listed processes
- B329/1611: Abrasive jet machining

Appendix 2, *Categorical Waste Streams Managed by RHWM*, provides the required information on regulated waste volumes shipped off-site by Radioactive and Hazardous Waste Management Division (RHWM).

Crystal Rosene

Crystal Rosene, Environmental Analyst
Environmental Functional Area
Lawrence Livermore National Laboratory

7-1-20

Date

Appendix 2

Categorical Waste Streams Managed by RHWM
December 1, 2019 – May 31, 2020

GENERATOR BUILDING	GENERATOR ROOM	DISPOSITION DATE	CONTAINER SIZE	TRACKING NUMBER	DISPOSITION TYPE	DISPOSITION	MANIFEST NUMBER
153	1000	03-FEB-20	5G	Q00312948	REUSE	packed into Q00313355	pending shipment
153	1000	03-FEB-20	5G	Q00304113	REUSE	packed into Q00317107	pending shipment
153	1000	03-FEB-20	5G	Q00312944	REUSE	packed into Q00317107	pending shipment
153	1000	03-FEB-20	5G	Q00312945	REUSE	packed into Q00317107	pending shipment
153	1000	03-FEB-20	5G	Q00312958	REUSE	packed into Q00317107	pending shipment
153	1000	17-DEC-19	5G	Q00303185	SHIPPED	Shipment SJ20-02 AL	019445585 JJK
153	1000	17-DEC-19	5G	Q00303164	SHIPPED	Shipment SJ20-02 AL	019445585 JJK
153	1000	17-DEC-19	5G	Q00303123	SHIPPED	Shipment SJ20-02 AL	019445585 JJK
153	1000	30-APR-20	5G	Q00303148	SHIPPED	Shipment SJ20-03 SAG	019445612 JJK
153	1000	30-APR-20	30G	Q00303212	SHIPPED	Shipment SJ20-03 SAG	019445612 JJK
153	1000	30-APR-20	5G	Q00303200	SHIPPED	Shipment SJ20-03 SAG	019445612 JJK
153	1000	30-APR-20	30G	Q00303186	SHIPPED	Shipment SJ20-03 SAG	019445612 JJK
153	1000	30-APR-20	5G	Q00303215	SHIPPED	Shipment SJ20-03 SAG	019445612 JJK
153	1000	27-FEB-20	5G	Q00303240	SHIPPED	Shipment SJ20-04 AL	019445606 JJK
153	1000	20-MAY-20	5G	Q00299895	SHIPPED	Shipment SJ20-05	019445621 JJK
153	1000	20-MAY-20	5G	Q00312823	SHIPPED	Shipment SJ20-05	019445621 JJK
153	1000	20-MAY-20	5G	Q00303267	SHIPPED	Shipment SJ20-05	019445621 JJK
153	1111	16-JAN-20	5G	Q00312891	REUSE	packed into Q00317100	pending shipment
153	1111	17-DEC-19	30G	Q00303147	SHIPPED	Shipment SJ20-02 AL	019445585 JJK
153	1111	17-DEC-19	5G	Q00303159	SHIPPED	Shipment SJ20-02 AL	019445585 JJK
153	1111	20-MAY-20	5G	Q00299889	SHIPPED	Shipment SJ20-05	019445621 JJK
321	1437	17-DEC-19	55 G	Q00290688	SHIPPED	Shipment SJ20-02 AL	019445585 JJK
321	1437	17-DEC-19	55 G	Q00290686	SHIPPED	Shipment SJ20-02 AL	019445585 JJK
321	1437	30-APR-20	55 G	Q00290693	SHIPPED	Shipment SJ20-03 SAG	019445612 JJK
321	1437	27-FEB-20	55 G	Q00290695	SHIPPED	Shipment SJ20-04 AL	019445606 JJK
321	1437	27-FEB-20	55 G	Q00290689	SHIPPED	Shipment SJ20-04 AL	019445606 JJK
321	1437	20-MAY-20	55 G	Q00290697	SHIPPED	Shipment SJ20-05	019445621 JJK
321	1437	20-MAY-20	55 G	Q00299568	SHIPPED	Shipment SJ20-05	019445621 JJK
322	100	27-FEB-20	55 G	Q00310099	SHIPPED	Shipment SJ20-04 AL	019445606 JJK
322	100	20-MAY-20	55G	Q00308035	SHIPPED	Shipment SJ20-05	019445621 JJK
322	100	20-MAY-20	55G	Q00308037	SHIPPED	Shipment SJ20-05	019445621 JJK
322	100	20-MAY-20	55G	Q00310071	SHIPPED	Shipment SJ20-05	019445621 JJK
322	100	20-MAY-20	55G	Q00310074	SHIPPED	Shipment SJ20-05	019445621 JJK
322	100	20-MAY-20	55G	Q00310072	SHIPPED	Shipment SJ20-05	019445621 JJK
322	100	20-MAY-20	55G	Q00310073	SHIPPED	Shipment SJ20-05	019445621 JJK
321C	1451	27-FEB-20	55 G	Q00290685	SHIPPED	Shipment SJ20-04 AL	019445606 JJK

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