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MEMORANDUM

TO: LCA Board of Directors
FROM: Liesel Gross, CEO
Andrew Moore, Director of Plant Operations
DATE: February 7, 2022
RE: 1,4 Dioxane Discharge from LCA Wastewater System

Attached: Fact Sheet, Agency for Toxic Substances and Disease Registry

This memo provides background information on an incident that occurred in 2021 regarding the discharge of 1,4 Dioxane from Lehigh County Authority's wastewater system. It is important to note that 1,4 Dioxane is currently not regulated by either the U.S. Environmental Protection Agency (EPA) or the Pa. Department of Environmental Protection (DEP). Additional information on 1,4 Dioxane is provided in the attached fact sheet prepared by the Agency for Toxic Substances and Disease Registry.

Incident Review

In February 2020, the New Jersey American Water Company notified the Delaware River Basin Commission (DRBC) of the detection of 1,4 Dioxane at their water system intake along the Delaware River. In efforts to locate the source, boat runs were conducted to collect samples throughout the Delaware River. This work tracked a source to the Lehigh River in late 2020. Additional sampling was conducted in the Lehigh River, which indicated the source was near Allentown.

On April 27, 2021, DEP conducted a sampling event at the Kline's Island Wastewater Treatment Plant (KIWWTP). The samples collected were requested by the DRBC, but LCA was not informed of what was being analyzed and the request did not appear to be out of the ordinary in any way. However, in late May 2021, DEP notified LCA that the unregulated chemical 1,4 Dioxane was detected in the KIWWTP effluent from this sampling event, at a concentration of 0.317 milligrams per liter (mg/L). A meeting with DEP and DRBC was scheduled for June 30, 2021 to review the situation.

In the intervening month after learning of the situation, but prior to the scheduled meeting, LCA undertook its own investigation to determine the source of the 1,4 Dioxane discharge. Because the chemical is unregulated, LCA had no previous wastewater data available, but pursued several different points of investigation.

- We began by researching sampling protocols and preservation requirements for wastewater samples to be tested for 1,4 Dioxane. Based on this information, we determined a sample drawn from the LCA Pretreatment Plant (PTP) on May 6, 2021 was still available, met the preservation requirements, and could be tested. Lab analysis indicated this sample contained 1,4 Dioxane at a concentration of 0.474 mg/L. This confirmed that the PTP had received waste containing this chemical, which would narrow the investigation.

- An additional LCA PTP effluent sample was collected on May 27, 2021 and resulted in a concentration of 1.860 mg/L, confirming the source was coming from the LCA PTP.

- The KIWWTP effluent was also sampled and resulted in an effluent concertation of 0.296 mg/L.

Based on this data, the conclusion was drawn that 1,4 Dioxane was being discharged into the PTP, passing through the PTP and traveling to the KIWWTP where downstream dilution was occurring to lower the overall concentration of 1,4 Dioxane in the KIWWTP effluent being discharged to the Lehigh River.

To narrow down the likely source of 1,4 Dioxane in the PTP effluent, LCA took the following steps:

- Research was conducted on the types of industries that are most likely to have this chemical present in their waste stream. This information was then cross-checked against all industrial users with active discharge permits with LCA.

- In early June 2021, multiple samples were collected from hauled waste streams of interest, based on their permits and suspected makeup of their discharges to the PTP.

- One industry sampled was Coim USA, Inc. The sample collected on June 1, 2021 was from a discharge to the PTP of approximately 6,300 gallons of hauled waste containing a 1,4 Dioxane concentration of 6,740 mg/L.

- These lab results were received on June 18, 2021, and Coim USA, Inc. was immediately suspended from discharging to the LCA via a letter dated the same day.

- Following the suspension of Coim USA's permit, the LCA PTP effluent was sampled on July 8, 2021, showing a 1,4 Dioxane concentration of 0.024 mg/L.

The immediate elimination of nearly all 1,4 Dioxane in the PTP effluent following Coim USA's permit suspension indicates the primary source of the discharge had been identified and eliminated from the waste stream. It is important to note that low levels of 1,4 Dioxane in wastewater are to be expected due to the broad array of household products that contain this chemical.

On June 30, 2021, LCA met with representatives from DEP and DRBC as scheduled to discuss the presence of 1,4 Dioxane in LCA's effluent at KIWWTP (by way of the PTP). LCA informed the agencies of the actions taken during the prior month since LCA was informed of the issue. A sampling program was developed to confirm the reduction of 1,4 Dioxane in LCA's wastewater effluent.

On August 11, 2021, LCA was contacted by New Jersey's DEP regarding Coim USA. LCA provided multiple documents including applications, manifests, lab results, correspondence, and permits relating to Coim USA, per their request. LCA is not aware of additional actions that may be taken by any regulatory agency regarding Coim USA.

On August 12, 2021, the PA DEP collected a sample for 1,4 Dioxane at the KIWWTP effluent, although results have not been made available to LCA. Additional samples were collected by LCA on September 28, 2021, with results showing a concentration of 1,4 Dioxane of <0.003 mg/L (considered to be non-detectable).

Samples results continued to be non-detectable for the remainder of 2021. Sampling for 1,4 Dioxane at the LCA PTP and KIWWTP effluent will continue quarterly moving forward.

Overview of LCA's Waste Hauler Program

Shortly after the PTP was built by the County of Lehigh in 1990, a waste hauler program was developed to allow liquid waste from haulers to be trucked in and discharged into the plant. The program was intended to optimize the use of existing capacity in this facility, which was designed to treat high-strength waste.

When LCA assumed operational responsibility for the PTP in 2006, the program was continued, and refined over the years to meet new regulatory requirements. The program was most recently updated in 2018 to align the hauler permitting process with LCA's industrial waste program run from the KIWWTP. The program requires all haulers and waste streams to be permitted and monitored at discrete times throughout the year. LCA's industrial waste program includes monitoring for 130 regulated contaminants.

In 2021, more than 58 million gallons (MG) of hauled waste were accepted at the PTP, as follows:

Industrial Waste	14 MG
Landfill Leachate	6 MG
WWTP Plant Sludges	13 MG
Hauled Septage	26 MG

The waste hauler program provides approximately $2.8 million of revenue to the PTP operation, which offsets capital improvement costs and lowers rates to all users of the system. The program provides valuable public service benefit by providing effective treatment of these challenging waste streams in a manner that meets all current regulatory requirements.

Questions & Discussion

The incident described in this memo illustrates the risks associated with LCA's waste hauler program, as well as challenges associated with the current regulatory framework for emerging contaminants. LCA's Board of Directors may wish to discuss the following questions, or other topics, at its upcoming meeting on February 14, 2022:

- Besides suspending Coim USA's permit, should LCA take any additional action?
- Should the waste hauler program be modified in any way to better address risks?
- How should LCA adjust its compliance program with respect to unregulated contaminants?

1,4-Dioxane - ToxFAQs™

CAS # 123-91-1

This fact sheet answers the most frequently asked health questions (FAQs) about 1,4-dioxane. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to 1,4-dioxane occurs from breathing contaminated air, ingestion of contaminated food and drinking water, and dermal contact with products such as cosmetics that may contain small amounts of 1,4-dioxane. Exposure to high levels of 1,4-dioxane in the air can result in nasal cavity, liver, and kidney damage. Ingestion or dermal contact with high levels of 1,4-dioxane can result in liver and kidney damage. 1,4-Dioxane has been found in at least 31 of 1,689 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is 1,4-dioxane?

1,4-Dioxane is a clear liquid that easily dissolves in water. It is used primarily as a solvent in the manufacture of chemicals and as a laboratory reagent. 1,4-Dioxane is a trace contaminant of some chemicals used in cosmetics, detergents, and shampoos. However, manufacturers now reduce 1,4-dioxane from these chemicals to low levels before these chemicals are made into products used in the home.

What happens to 1,4-dioxane when it enters the environment?

- 1,4-Dioxane can be released into the air, water, and soil at places where it is produced or used as a solvent.
- In air, 1,4-dioxane rapidly breaks down into different compounds.
- In water, 1,4-dioxane is stable and does not break down.
- In soil, 1,4-dioxane does not stick to soil particles, so it can move from soil into groundwater.
- Fish and plants will not accumulate 1,4-dioxane in their tissues.

How might I be exposed to 1,4-dioxane?

- Breathing air, drinking water, or eating foods that contain 1,4-dioxane. During showering, bathing, or laundering, 1,4-dioxane in tap water may volatilize and you can be exposed to 1,4-dioxane vapors.
- Your skin may contact 1,4-dioxane when you use cosmetics, detergents, bubble baths, and shampoos containing 1,4-dioxane.

How can 1,4-dioxane affect my health?

Few studies are available that provide information about the effects of 1,4-dioxane in humans. Exposure to very high levels of 1,4-dioxane can result in liver and kidney damage and death. Eye and nose irritation was reported by people inhaling low levels of 1,4-dioxane vapors for short periods (minutes to hours).

Studies in animals have shown that breathing vapors of 1,4-dioxane affects mainly the nasal cavity, liver, and kidneys. Ingesting 1,4-dioxane or having skin contact with 1,4-dioxane also affects the liver and kidneys.

How likely is 1,4-dioxane to cause cancer?

The limited number of studies available does not show whether 1,4-dioxane causes cancer in humans. Laboratory rats that breathed vapors of 1,4-dioxane during most of their lives developed cancer inside the nose and abdominal cavity. Laboratory rats and mice that drank water containing 1,4-dioxane during most of their lives developed liver cancer; the rats also developed cancer inside the nose. Scientists are debating the degree to which the findings in rats and mice apply to exposure situations commonly encountered by people.

The (DHHS) U.S. Department of Health and Human Services considers 1,4-dioxane as reasonably anticipated to be a human carcinogen.

1,4-Dioxane

CAS # 123-91-1

How can 1,4-dioxane affect children?

There are no studies of children exposed to 1,4-dioxane. However, children might experience health problems similar to those in adults if they were exposed to high concentrations of 1,4-dioxane.

Scientists do not know whether exposure of pregnant women to 1,4-dioxane can harm the unborn child.

How can families reduce the risk of exposure to 1,4-dioxane?

1,4-Dioxane may be a contaminant in cosmetics, detergents, bath products, shampoos, and some pharmaceuticals. 1,4-Dioxane is not intentionally added, but may occur as an unintentional byproduct in some ingredients that may be listed on the product label, including: PEG, polyethylene, polyethylene glycol, polyethoxyethylene,-eth or -oxynol . Many products on the market today (foods, pharmaceuticals, cosmetic products, detergents, etc.) contain 1,4-dioxane in very small amounts. However, some cosmetics, detergents, and shampoos may contain 1,4-dioxane at levels higher than recommended by the FDA for other products. Families wishing to avoid cosmetics containing the ingredients listed above may do so by reviewing the ingredient statement that is required to appear on the outer container label of cosmetics offered for retail sale.

1,4-Dioxane has been detected in some drinking water supplies. Bottled water may be less likely to be contaminated with 1,4-dioxane, and consumers should contact the bottler with specific questions on potential contaminants.

Is there a medical test to determine whether I've been exposed to 1,4-dioxane?

1,4-Dioxane and its breakdown products can be measured in your blood and urine, and positive results indicate you have been exposed to 1,4-dioxane. These tests do not predict whether exposure to 1,4-dioxane will produce harmful health effects. The tests are not routinely available at your doctor's office because they require special equipment, but the doctor can collect the samples and send them to a special laboratory. The tests need to be conducted within days after the exposure because 1,4-dioxane and its breakdown products leave the body fairly rapidly.

Has the federal government made recommendations to protect human health?

EPA has determined that exposure to 1,4-dioxane in drinking water at concentrations of 4 milligrams per liter (4 mg/L) for one day or 0.4 mg/L for 10 days is not expected to cause any adverse effects in children.

The Occupational Safety and Health Administration (OSHA) has set a limit for of 100 parts 1,4-dioxane per 1 million parts of air (100 ppm) in the workplace.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for 1,4-Dioxane. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.