

Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedure for Collection of Freshwater Sediment Core Samples Using a Box or KB Corer

Version 1.2

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Date -

EAP038

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Signatures on File

Please note that the Washington State Department of Ecology's Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical and administrative experts. Their primary purpose is for internal Ecology use, although sampling and administrative SOPs may have a wider utility. Our SOPs do not supplant official published methods. Distribution of these SOPs does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, manufacturer, or supplies is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the author or by the Department of Ecology.

Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure, or process.

SOP Revision History

| Revision Date | Rev number | Summary of changes | Sections | Reviser(s) |
|---------------|------------|--------------------|---------------|----------------|
| 10/17/11 | V1.0 | Recertified | | Kammin |
| 8/16/12 | V1.1 | Updated hyperlink. | 7.3 | Callie Mathieu |
| 7/14/15 | V1.2 | Updated Sections. | 6.3, 6.4, 6.7 | Callie Mathieu |
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Environmental Assessment Program

Standard Operating Procedure for Collection of Freshwater Sediment Core Samples Using a Box or KB Corer

1.0 Purpose and Scope

- 1.1 This document is the Environmental Assessment Program (EAP) Standard Operating Procedure (SOP) for obtaining freshwater sediment core samples using the two sediment-coring devices available through EAP. This SOP covers sediment collection for studies requiring representative, vertical sediment samples for use in chemical or biological analyses. Sediment core samples are usually divided into cross-section subsamples to provide a chronological history of analytes.

2.0 Applicability

- 2.1 This SOP should be followed for all freshwater sediment core collection activities performed within the Department of Ecology's (Ecology) Toxics Studies Unit. This SOP does not apply to sample collection in marine or estuarine waters, which should generally conform to recommendations by the Puget Sound Estuary Program (PSEP, 1996) and Ecology (Ecology, 2003).

3.0 Definitions

- 3.1 Sediment Core Sample – A vertical sample of relatively undisturbed sediments obtained by a sediment corer. The following sediment-coring devices are owned by Ecology:
- 3.1.1 Box Corer – A sediment-coring device containing an 11x11x50 cm acrylic liner. This coring device has a pair of jaws at the base of the apparatus held open by a spring-loaded pin. The pin is released once the corer contacts the sediments. Upon retrieval, the jaws close and collect the sediments. The depth of the sample is controlled by weights loaded on top of the device. A fine mesh screen located at the top of the acrylic liner allows water to flow through the jaws during descent, and rubber flaps on the top side of the mesh screen block water from passing through the sediment sample upon retrieval.
- 3.1.1.1 The box corer is best suited for studies requiring large amounts of sediments (> 100g) when the core is sectioned into 1-cm intervals. Disadvantages of the box corer include the requirement of a winch to raise and lower the device and the immobile extruding table. These two factors limit the use of the box corer to the RV Skookum.
- 3.1.2 Modified KB Corer – A gravity corer containing a 6.35 cm diameter by 61 cm acrylic tube. A core sample is obtained by lowering the sampler into the sediments and sending a messenger weight to trip the spring-loaded suction cup, sealing the top of the core tube. This coring device uses suction to hold the sediment sample inside the core tube during retrieval. The depth of the sample is controlled by the distance the device is allowed to fall before entering the sediments.

3.1.2.1 The corer is deployed and recovered by hand, making it a portable sampling device. The KB corer is best suited for studies that do not require large amounts of sediments across 1-cm intervals or where the RV Skookum cannot be launched. The modified KB corer is not a good sampler choice for soupy or very soft sediments because the suction force cannot hold in the sample. It also may be difficult to obtain a core sample in extremely firm substrates, such as clay.

3.1.3 Other samplers not currently owned by Ecology include: piston, chamber, freeze, vibra- hammer, and pneumatic corers.

4.0 Personnel Qualifications/Responsibilities

4.1 The Field Lead directing sample collection must be knowledgeable concerning all aspects of the project specific Quality Assurance Project Plan (QAPP) to ensure that credible and useable data are collected. All field staff should be briefed by the Field Lead on the sampling goals and objectives prior to arriving at the site. For most projects, the Project Manager will also be the Field Lead.

4.2 All field staff must be familiar with the project Safety Plan.

4.3 Sampling from an Ecology boat requires one person on board to be a qualified Boat Operator as described in Interim Ecology Policy 11-60. All other persons on board (crew) must be familiar with Chapter 3 of the EAP Safety Manual, "Boating." The safety responsibilities of the Boat Operator and crew are described in Section 9.0, Safety.

4.4 Sampling from Ecology's RV Skookum requires all persons on board to be familiar with Skookum safety procedures and operation of the winch/A-frame.

5.0 Equipment, Reagents, and Supplies

5.1 Coring Equipment

5.1.1 In addition to all necessary equipment required for a safe and organized field outing, the following will be needed specifically for sediment core collection:

5.2 Box corer:

5.2.1 Multiple pre-cleaned acrylic liners

5.2.2 Extruding table

5.2.3 Extruding device with rubber extruder

5.2.4 Hand crank

5.2.5 Core slicer

5.2.6 Acrylic liner section

5.2.7 Lead weights

5.3 Modified KB corer:

- 5.3.1 Core tube
- 5.3.2 Extruder
- 5.3.3 Sectioning apparatus
- 5.3.4 Stage
- 5.3.5 Rubber stopper
- 5.3.6 Spatula
- 5.3.7 Screwdriver
- 5.3.8 Large plastic tub
- 5.4 Siphon tubing
- 5.5 Measuring device
- 5.6 Non-talc, disposable nitrile gloves
- 5.7 Cleaning brush
- 5.8 Deionized water
- 5.9 Ice chests with extra ice
- 5.10 Field logs (on Rite-in Rain paper)
- 5.11 Plastic bags (Ziploc, garbage)
- 5.12 Preprinted sample container labels, with extra blank labels
- 5.13 Chain of Custody tags and forms
- 5.14 Pencils, indelible ink pens (fine and regular)
- 5.15 Tape (duct and masking)
- 5.16 Clipboard with cover
- 5.17 Maps, charts, aerial photographs
- 5.18 GPS unit
- 5.19 Cell phone
- 5.20 Stainless steel spoons and mixing bowls (if processing on boat)

- 5.21 Sediment Sample Containers – appropriate containers for project-specific analyses are listed in Table 1 of the Manchester Environmental Laboratory Lab Users Manual. The number of containers is project-specific.

Table 1. Ecology Sediment-Coring Devices.

| Sediment Corer | Construction Materials | Liner dimensions (cm) | Maximum Penetration Depth (cm) |
|-----------------------|---|------------------------------|---------------------------------------|
| Box corer | Stainless steel sampler; acrylic liner | 11 x 11 | 50 |
| Modified KB corer | Plexiglass core tube, stage, and sectioning apparatus | 6.35 diameter | 55 |

5.22 **Box Corer**



Figure 1: Box corer and extruding device pictured left to right



Figure 2: Pictured left to right acrylic liner (50 cm), acrylic liner section, lead weight,, slicing plate, hand crank.

5.23

Modified KB Corer



Figure 3. Pictured left to right are extruder, core tube with sectioning apparatus, and sampling housing apparatus.



Figure 4. Modified KB corer with suction cup engaged.

5.24 Decontamination Equipment

5.24.1 Acetone

5.24.2 Hexane

5.24.3 10% Nitric Acid

5.24.4 Liquinox

5.24.5 Deionized Water

5.24.6 Scrub brushes

5.24.7 Nitrile Gloves

5.24.8 Butyl Gloves

5.24.8.1 For information on selecting appropriate gloves for protection from specific chemicals, consult the table posted in the Ecology Headquarters Cleaning Room. This information is also available at <http://www.des.umd.edu/ls/gloves.html>. Heavy gloves may also be necessary for handling rope or wire used to lower and retrieve grab samplers.

5.24.9 Wash bottles

5.24.10 Waste bottles

5.24.11 Small funnel to pour acetone into wash/waste bottle

5.24.12 Cellular Sponges (3"x 5") - must be new, uncontaminated

- 5.24.13 Large tub
- 5.25 Safety Equipment**
- 5.25.1 Life-vests and other boat safety equipment (see "Boat Checklist" in the EA Safety Manual)
- 5.25.2 Safety goggles
- 5.25.3 First aid kit
- 5.25.4 Steel-toed boots
- 5.25.5 Hard hats (required for deck work on the RV Skookum)
- 5.25.6 Drinking water
- 5.25.7 Communications equipment (cell phone or radio)

6.0 Summary of Procedure

- 6.1 The box corer and modified KB corer are operated from a boat platform. Due to the weight of the box corer and the custom-built extruding apparatus, the RV Skookum is the only boat equipped for the box corer, and further discussion relating to the box corer applies to this scenario.
- 6.2 The KB corer can be used from any boat providing adequate work space and the ability to reach 2 – 3 feet into the water to plug the core tube. Therefore, it is essential to have a working area close to the water surface. Summaries involving the KB corer apply to this scenario.

6.3 Pre-sampling Trip Preparation

- 6.3.1 Reserve a boat and make arrangements for qualified Boat Operator.
- 6.3.2 Prepare all sample containers, ice chests, and buckets.
- 6.3.3 File a field and float plan.
- 6.3.4 When using the box corer, mount the extruder table on the Skookum before launching. To secure the table you need to work under the stern.
- 6.3.5 Pre-clean the acrylic liners, core tube (for modified KB corer), core slicers, and any other devices coming into contact with sediments before use in the field. The following cleaning procedure is suggested (Ecology, 2008) for sediment sampling. However, individual projects may require additional or different decontamination procedures depending on the analytes of interest. Staff should follow EAP Standard Operating Procedures for Decontaminating Field Equipment for Sampling Toxics in the Environment (Ecology, 2014).
 - 6.3.5.1 Wash using Liquinox detergent.
 - 6.3.5.2 Rinse three times with tap water.
 - 6.3.5.3 Wash with 10% nitric acid (for metals analyses).
 - 6.3.5.4 Rinse with deionized water.
 - 6.3.5.5 In fume hood, rinse with hexane (for organics analyses).

6.3.5.5.1 This step is intended to remove trace organics from the sampling equipment, although EPA (2001) also recommends it for field samples of "unknown composition". Many sources, including EPA (2001), recommend only an acetone rinse. Because the acetone molecule has both polar and non-polar components, it is a good solvent for a broad range of chemicals. However, acetone may damage acrylic material and therefore should not be used on the acrylic liners. Hexane is a good solvent for organic compounds and is recommended particularly for analyses of dioxins and PCBs.

6.3.6 Air dry in fume hood and wrap with aluminum foil (shiny side of foil facing out)

6.3.7 Note: Sediment core subsamples are generally processed in the laboratory. If mixing or compositing is done in the field, make sure to include stainless steel spoons and bowls in the decontamination procedure.

6.4 Sample Collection

6.4.1 Box Core Sample Collection

6.4.1.1 In general, sediment cores should be taken from deep and flat areas of the lake, particularly if an age/depth profile is going to be calculated. The following is a step-by-step procedure for collecting a core with the box corer.

6.4.1.1.1 Deployment

6.4.1.1.1.1 Ensure that the box corer is secured to the cable operated by the winch at the stern of the boat. The winch/A-frame is used to control movement of the corer.

6.4.1.1.1.2 Secure the acrylic liner inside of the box corer by tightening the threaded liner stopper. Tightening this will not allow the liner to move while penetrating the sediment. Secure the mesh screen onto the top of the acrylic liner.

6.4.1.1.1.3 Open the jaws on the box corer and set the spring-loaded pin to deploy when the device contacts the sediments.

6.4.1.1.1.4 Lower the box corer gently into the sediments until there is slack in the cable. Quickly put tension back on the line by retrieving the device.

6.4.1.1.2 Retrieval

6.4.1.1.2.1 Using the winch/A-frame place the box core, with the jaws closed, on top of the extruding device so that the bolts on the box corer slide into open slots of the extruding device. Remove any weights placed in the corer and open the jaws quickly so that the liner falls over the extruding plate. Leave the mesh screen on during this process. (Figure 5).

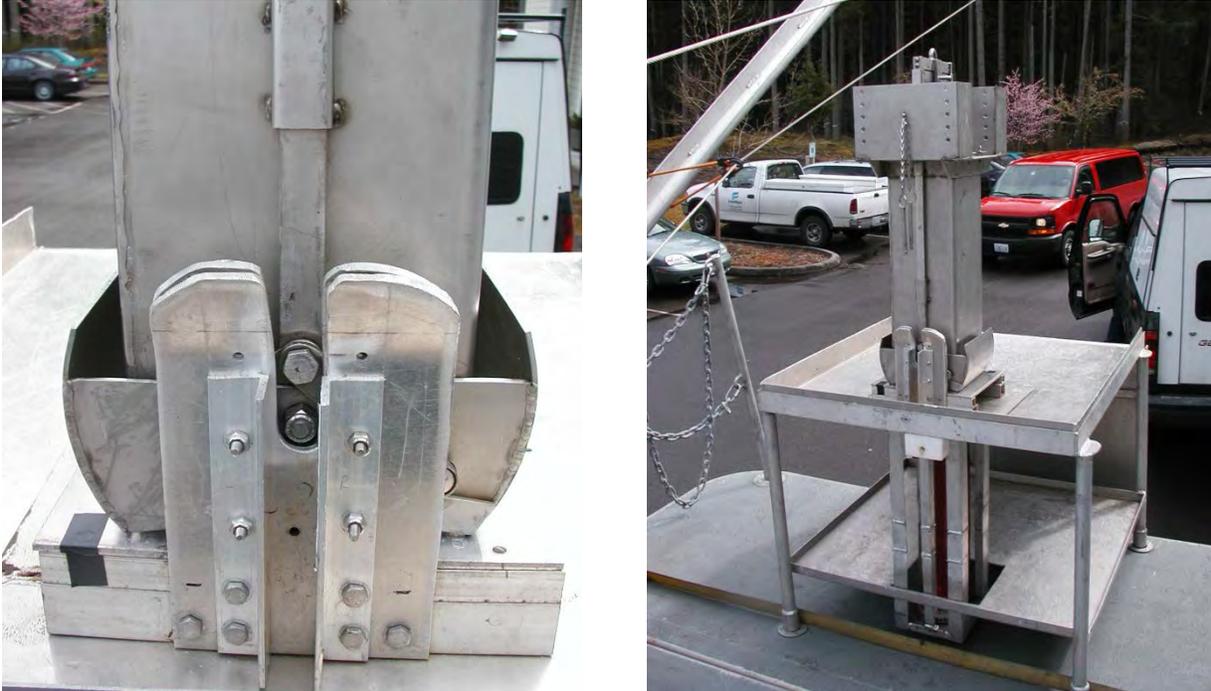


Figure 5. Sediment core placed over the extruding device ready to remove the corer over top of the liner.

- 6.4.1.1.2.2 Remove the mesh screen and place the acrylic liner section on top of the box corer. After loosening the liner stopper, remove the box corer from the acrylic liner by having two people on either side of the box corer simultaneously push down on the liner section with their fingers while pulling upwards on the box corer. **NOTE. Don't forget to loosen the knob securing the liner to the coring device.**
- 6.4.1.1.2.3 Once the bottom of the acrylic liner is exposed, a third person can insert the nail pins into the bottom of the extruder apparatus to firmly hold the liner against the extruder table while the coring device is lifted off. This will allow for the liner to stay in position over the extruding plate while removing the box coring device.
- 6.4.1.1.2.4 At this point it may be helpful to wash the outside of the acrylic liner to get a better view of the sediments. If sufficient depth is achieved and the sediment water interface appears undisturbed, then proceed to sample processing.
- 6.4.1.1.3 Tips for sample collection:
 - 6.4.1.1.3.1 Avoid penetrating sediments at a high speed. Adjust depth by adding or removing lead weights from the top of the box corer.
 - 6.4.1.1.3.2 Handle the sample extremely carefully while transferring to the sediment extruding device.
 - 6.4.1.1.3.3 Try to work when the winds are calm, particularly if the lake is deep. If winds are high, it may be difficult to drop the sampling device straight down. If sediments are sloped in

the acrylic liner then the device entered the sediments at an angle or the lake bottom is sloped.

6.4.1.1.3.4 Keep the core that provides sufficient depth for the project while preserving the sediment water interface.

6.4.2 **Modified KB Core Sample Collection**

6.4.2.1 The following outlines the step-by-step procedure for collecting a sediment core with a modified KB corer.

6.4.2.1.1 Deployment

6.4.2.1.1.1 Determine the water column depth of the sampling location using a depth finder or weighted line.

6.4.2.1.1.2 Place the core tube inside the sampling housing apparatus and tighten the hose clamps around the tube. Make sure the tube is held tightly in the housing apparatus.

6.4.2.1.1.3 While keeping the messenger weight on board, lower the corer through the water column. Keep track of the depth of the corer by counting the meters on the calibrated line.

6.4.2.1.1.4 When the bottom of the corer reaches approximately 0.5 m above the substrate, let the line drop quickly and allow the corer to settle into the sediments.

6.4.2.1.1.5 To prevent the corer from tilting and disturbing the sample, keep a slight tension on the line when the corer is settling into the sediment.

6.4.2.1.1.6 Release the messenger weight down the line.

6.4.2.1.2 Retrieval

6.4.2.1.2.1 Once the messenger hits the corer, slowly lift the corer up through the water column until the core tube and rubber seal are just below the water surface.

6.4.2.1.2.2 One crew member should hold the corer while another reaches under the water surface to plug the core tube with the rubber stopper. Make sure to keep the core tube and rubber seal under the water surface while plugging the bottom of the tube.

6.4.2.1.2.3 It may be necessary to tilt the corer slightly to reach the bottom of the tube. In order to keep the sample intact, do not tilt the corer more than 45 degrees when placing the rubber stopper at the bottom of the corer.

6.4.2.1.2.4 Once the bottom of the liner is plugged, slowly lift the corer into the boat, and place in a large tub.

- 6.4.2.1.2.5 While the housing apparatus is still on the core tube, check to make sure that sufficient depth was achieved and that the sediment water interface is undisturbed.
- 6.4.2.1.2.6 Loosen the hose clamps, and lift the sampling housing apparatus off of the core tube. One person should hold the core tube while another crew member takes the housing apparatus off.
- 6.4.2.1.2.7 Tips for sample collection:
 - 6.4.2.1.2.7.1 Adjust the line release height to attain different core depths. For firmer substrates it may be necessary to release the line at a height greater than 0.5m above the sediment in order to allow deeper penetration.
 - 6.4.2.1.2.7.2 Keep spare rubber stoppers on board. They are easily dropped when plugging the core tube.

6.5 Field Decontamination

- 6.5.1 For most sampling applications, rinsing the equipment between grabs with site water is normally sufficient (PSEP, 1997a), using a scrub brush to remove any sediment that does not rinse off easily. Rinsing can be performed by dipping the grab in the water or using pumped water.
- 6.5.2 When changing waterbodies or sampling in severely contaminated sediments, decontaminate with acid washes described in pre-sampling preparation.

6.6 Collecting Sediment from the Sampler

- 6.6.1 After retrieving the core sample, check the sample for acceptability. A sample is considered acceptable if it is not over-filled with sediment, overlying water is present and not excessively turbid, the sediment surface is relatively flat, and the desired core length has been retrieved. It is important that the sediment-water interface remains intact while processing the sample.
- 6.6.2 Unacceptable samples should be dumped overboard at a location away from the station. Acceptable samples should be sub-sampled using the following techniques:
 - 6.6.2.1 Begin by measuring the penetration depth of the coring device and length of the core. For penetration depth, measure from the bottom of the corer to the highest point on the outside of the device where sediments exist. To measure core length, record the length of the sediment core inside the liner. These two measurements can be used to estimate core shortening.

6.7 Box Corer

- 6.7.1 Siphon as much of the overlying water as possible without disturbing the sediments. Extrude the sediment core until it is level with the top of the liner by turning the crank on the table. Take the nail pins out, while securing the liner with your hands, until the extruder foot has risen above the pin holes in the liner.
- 6.7.2 For sectioning, hold the acrylic liner piece flush against the sediment filled liner, and extrude the desired amount of sediment into the liner piece by turning the cranking wheel. Seventeen turns of the crank equals 1 cm. Carefully slice the extruded sediment against the liner using the slicing plate and the liner piece to hold the sample (Figure 6).

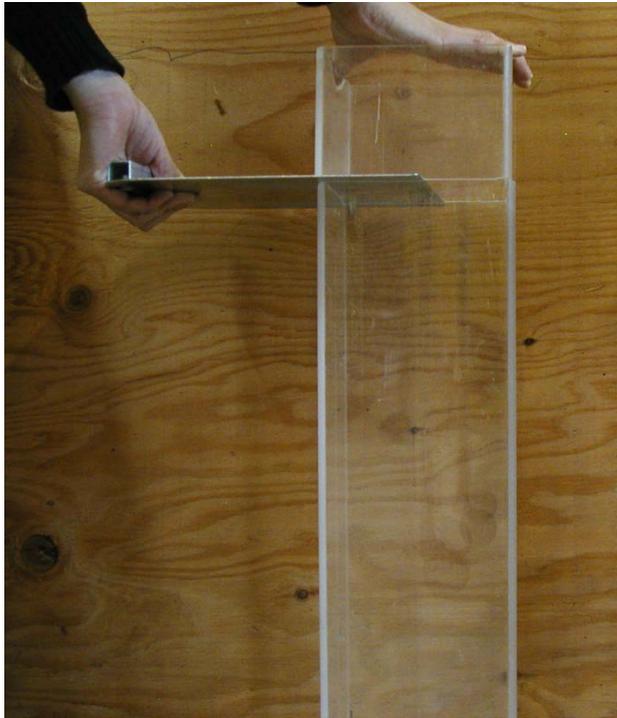


Figure 6. Slicing sediment intervals using the plate slicer and the acrylic liner section.

- 6.7.3 Remove sediments coming in contact with the liner, and fill sample jars with the remaining sediment. Clean the plate slicer with ambient water after slicing each section.
- 6.8 Modified KB Corer**
- 6.8.1 Position the extruder under the rubber stopper at the bottom of the core tube, and extrude the water into the large tub by gently pressing down on the core tube.
- 6.8.2 Siphon off the rest of the water without disturbing the sediment, and place the stage and sectioning apparatus on top of the core tube.
- 6.8.3 Hold the extruder in place and gently press down on the core tube so that the core sample is extruded up into the sectioning apparatus. For 1 cm sections, extrude the sediment core up to the 1 cm calibration on the sampling apparatus.

6.8.4 Slide the sampling apparatus onto the adjacent surface of the stage and transfer to the sample container using a spatula.

6.8.5 The sectioning apparatus can be calibrated to obtain different sediment core section depths.

7.0 Records Management

7.1 Complete the field log for each station sampled. Include a visually descriptive assessment of each acceptable sample (sediment interval), together with any unusual characteristics such as odor, debris, color. An example of a sediment-coring log is included in Figure 7.

| Section (cm) | | Description | Chemical Analyses | Field ID | MEL Sample Number |
|--------------|--|-------------|-------------------|----------|-------------------|
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Figure 7. Sediment core field log.

- 7.2 Close out the Float Plan with the designated contact at the end of the sampling work.
- 7.3 The Field Work Plan & Contact Person Form and Float Plan Form can be obtained at EAP’s SharePoint site.
- 7.4 There are three forms for ordering laboratory services from Manchester Environmental Laboratory (MEL):
 - 7.4.1 Pre-Sampling Notification (PSN) form

This form is used to give the laboratory notice of what you are planning to collect and submit and the analyses required. You can copy this form from the MEL Laboratory Manual or use the form on EAP's intranet under Manchester and use it for submittal.

7.4.2 Sample Container Request (SCR) form

This form is used to order sample containers needed for your sampling event(s), and is usually submitted along with the Pre-Sampling Notification form. You can copy this form from the MEL Laboratory Manual or use the form on EAP's intranet under Manchester and use it for submittal.

7.4.3 Laboratory Analyses Required (LAR) form

The LAR is the formal request of the sampler for specific analytical work, and this form must accompany all samples entering the laboratory. **The LAR also serves to document the chain-of-custody.** This form is to be filled out in triplicate. Request these forms from the Sample Management Unit at Manchester.

7.5 The Laboratory Manual also includes instructions for filling out these forms.

8.0 Quality Control and Quality Assurance Section

8.1 Chain-of-custody procedures should follow those recommended by the PSEP (1996b). They should be initiated when the first sample is collected and followed until all samples are relinquished to the analytical laboratory. Chain-of-Custody forms should provide an unbroken trail of accountability that ensures the physical security of samples, data, and records. The Laboratory Analyses Required (LAR) form will serve as the Chain-of- Custody Form. At the end of each day all sample containers should be checked against the Chain-of-Custody forms. It is important to verify the station identification number, collection date, collection time, and if applicable, lab numbers as part of the QA/QC procedures.

9.0 Safety

- 9.1 **Never compromise your personal safety or that of a field partner to collect a sample.** Always plan ahead to avoid falling and drowning hazards. Always wear appropriate safety gear such as life vests. When working with winches, cables and similar machinery, gloves, hard hats, safety glasses, and steel-toed boots are also important safety items.
- 9.2 When deploying the coring device from an overhead crane (as on the RV Skookum), wear a life vest and protective helmet any time the grab is suspended from the deck or at the water's surface. Do not touch the cable while the grab is being raised or lowered.
- 9.2.1 Knowledge of the contents of this standard operating procedure is required.
- 9.2.2 The following forms must be completed to document field personnel, sampling locations, overnight lodging, itinerary, contact person(s), and emergency contacts:
- 9.2.2.1 Float plan
 - 9.2.2.2 Contact person designation
 - 9.2.2.3 Field Sampling Notification
- 9.3 Boat Safety
- 9.3.1 A qualified EA boat operator will be required for all sampling from a boat. Boat operations will conform to all requirements in Chapter 3 (Boating) of the EA Safety Manual. It is the responsibility of the boat operator to brief the crew on their responsibilities for the safe operation of the boat and use of its sampling gear. Crew members must have current First Aid/CPR certification.

10.0 References

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- 10.2 Ecology (Washington State Department of Ecology). 2005. Manchester Environmental Laboratory Lab Users Manual.
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- 10.7 PSEP (Puget Sound Estuary Program), 1996. Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound. Prepared by Tetra Tech, Inc. for U. S. Environmental Protection Agency Region 10, Office of Puget Sound.
- 10.8 PSEP (Puget Sound Estuary Program), 1997a. Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound. Prepared for U. S. Environmental Protection Agency, Seattle, WA.
- 10.9 Tetra Tech EM Inc. 2003. Literature Review and Report: Surface-Sediment Sampling Technologies. Prepared for USEPA National Exposure Research Laboratory. www.epa.gov/aboutepa/about-national-exposure-research-laboratory-nerl

MSDS Number: **A0446** * * * * * *Effective Date: 02/01/07* * * * * * *Supersedes: 05/20/04*

ACETONE

1. Product Identification

Synonyms: Dimethylketone; 2-propanone; dimethylketal

CAS No.: 67-64-1

Molecular Weight: 58.08

Chemical Formula: (CH₃)₂CO

Product Codes:

J.T. Baker: 5008, 5018, 5356, 5580, 5965, 5975, 9001, 9002, 9003, 9004, 9005, 9006, 9007, 9008, 9009, 9010, 9015, 9024, 9036, 9125, 9254, 9271, A134, V655

Mallinckrodt: 0018, 2432, 2435, 2437, 2438, 2440, 2443, 2850, H451, H580, H981

2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | |
|------------|---------|-----------|-------|
| Hazardous | | | |
| ----- | ----- | ----- | ----- |
| - | | | |
| Acetone | 67-64-1 | 99 - 100% | Yes |

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

-

Health Rating: 2 - Moderate

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 0 - None

Contact Rating: 3 - Severe

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD;
PROPER GLOVES; CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:

Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache. Higher concentrations can produce central nervous system depression, narcosis, and unconsciousness.

Ingestion:

Swallowing small amounts is not likely to produce harmful effects. Ingestion of larger amounts may produce abdominal pain, nausea and vomiting. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms are expected to parallel inhalation.

Skin Contact:

Irritating due to defatting action on skin. Causes redness, pain, drying and cracking of the skin.

Eye Contact:

Vapors are irritating to the eyes. Splashes may cause severe irritation, with stinging, tearing, redness and pain.

Chronic Exposure:

Prolonged or repeated skin contact may produce severe irritation or dermatitis.

Aggravation of Pre-existing Conditions:

Use of alcoholic beverages enhances toxic effects. Exposure may increase the toxic potential of chlorinated hydrocarbons, such as chloroform, trichloroethane.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse.

Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

5. Fire Fighting Measures

Fire:

Flash point: -20C (-4F) CC

Autoignition temperature: 465C (869F)

Flammable limits in air % by volume:

lcl: 2.5; ucl: 12.8

Extremely Flammable Liquid and Vapor! Vapor may cause flash fire.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. This material may produce a floating fire hazard. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

Acetone:

-OSHA Permissible Exposure Limit (PEL):
1000 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):

500 ppm (TWA), 750 ppm (STEL) A4 - not classifiable as a human carcinogen

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless, volatile liquid.

Odor:

Fragrant, mint-like

Solubility:

Miscible in all proportions in water.

Specific Gravity:

0.79 @ 20C/4C

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

56.5C (133F) @ 760 mm Hg

Melting Point:

-95C (-139F)

Vapor Density (Air=1):

2.0

Vapor Pressure (mm Hg):

400 @ 39.5C (104F)

Evaporation Rate (BuAc=1):

ca. 7.7

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Concentrated nitric and sulfuric acid mixtures, oxidizing materials, chloroform, alkalis, chlorine compounds, acids, potassium t-butoxide.

Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Oral rat LD50: 5800 mg/kg; Inhalation rat LC50: 50,100mg/m³; Irritation eye rabbit, Standard Draize, 20 mg severe; investigated as a tumorigen, mutagen, reproductive effector.

| Ingredient | ---NTP Carcinogen--- | | IARC Category |
|-------------------|----------------------|-------------|---------------|
| | Known | Anticipated | |
| Acetone (67-64-1) | No | No | None |

12. Ecological Information

Environmental Fate:

When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.

Environmental Toxicity:

This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ACETONE

Hazard Class: 3

UN/NA: UN1090

Packing Group: II

Information reported for product/size: 188L

International (Water, I.M.O.)

Proper Shipping Name: ACETONE

Hazard Class: 3
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 188L

15. Regulatory Information

```
-----\Chemical Inventory Status - Part 1\-----
Ingredient                                     TSCA  EC   Japan  Australia
-----
Acetone (67-64-1)                             Yes   Yes   Yes    Yes
```

```
-----\Chemical Inventory Status - Part 2\-----
Ingredient                                     Korea  DSL   NDSL  Phil.
-----
Acetone (67-64-1)                             Yes   Yes   No    Yes
```

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-----\Federal, State & International Regulations - Part 1\-----
Ingredient                                     -SARA 302-  -SARA 313-
RQ      TPQ      List  Chemical Catg.
-----
Acetone (67-64-1)                             No    No    Yes   No
```

```
-----\Federal, State & International Regulations - Part 2\-----
Ingredient                                     CERCLA  -RCRA-  -TSCA-
                                         5000    261.33  8(d)
-----
Acetone (67-64-1)                             5000    U002    No
```

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: No Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 2[Y]E

Poison Schedule: None allocated.

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

Label Hazard Warning:

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY

CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

Label Precautions:

- Keep away from heat, sparks and flame.
- Keep container closed.
- Use only with adequate ventilation.
- Wash thoroughly after handling.
- Avoid breathing vapor.
- Avoid contact with eyes, skin and clothing.

Label First Aid:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)



From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HEXANES

1. Product Identification

Synonyms: Normal Hexane; Hexyl Hydride

CAS No.: 110-54-3 (n-hexane)

Molecular Weight: 86.18

Chemical Formula: CH₃(CH₂)₄CH₃ n-hexane

Product Codes: 9277, 9306, 9309, 9367, N169

2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|--------------------|----------|---------|-----------|
| Hexane | 110-54-3 | > 95% | Yes |
| Methylcyclopentane | 96-37-7 | 1 - 2% | Yes |
| 2-Methylpentane | 107-83-5 | 1 - 2% | No |
| 3-Methylpentane | 96-14-0 | 1 - 2% | No |
| Pentane | 109-66-0 | 0 - 2% | No |

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)

Flammability Rating: 4 - Extreme (Flammable)

Reactivity Rating: 2 - Moderate

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

Potential Health Effects

The health hazards addressed are for the major component: n-hexane.

Inhalation:

Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Greater exposure may cause muscle weakness, numbness of the extremities, unconsciousness and death.

Ingestion:

May produce abdominal pain, nausea. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms expected to parallel inhalation.

Skin Contact:

May cause redness, irritation, with dryness, cracking.

Eye Contact:

Vapors may cause irritation. Splashes may cause redness and pain.

Chronic Exposure:

Repeated or prolonged skin contact may defat the skin and produce irritation and dermatitis. Chronic inhalation may cause peripheral nerve disorders and central nervous system effects.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance. May affect the developing fetus.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Call a physician.

Ingestion:

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Remove any contaminated clothing. Wipe off excess from skin. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

BEI=2,5-hexadione in urine, sample at end of shift at workweeks end, 5 mg/g creatine. Also, measure n-hexane in expired air. Analgesics may be necessary for pain management, there is no specific antidote. Monitor arterial blood gases in cases of severe aspiration.

5. Fire Fighting Measures

Fire:

Flash point: -21C (-6F) CC

Autoignition temperature: 224C (435F)

Flammable limits in air % by volume:

lcl: 1.1; ucl: 7.5

Extremely Flammable Liquid and Vapor! Vapor may cause flash fire. Dangerous fire hazard when exposed to heat or flame.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with oxidizing materials may cause extremely violent combustion. Explodes when mixed @ 28C with dinitrogen tetroxide. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water may be ineffective.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool. Vapors can flow along surfaces to distant ignition source and flash back. Vapor explosion hazard exists indoors, outdoors, or in sewers.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand,

earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from direct sunlight and any area where the fire hazard may be acute. Store in tightly closed containers (preferably under nitrogen atmosphere). Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

N-Hexane [110-54-3]:

-OSHA Permissible Exposure Limit (PEL): 500 ppm (TWA)

-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA), Skin
other isomers of hexane

-ACGIH Threshold Limit Value (TLV): 500 ppm (TWA), 1000 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

The following properties are for n-hexane, the major component.

Appearance:

Clear, colorless liquid.

Odor:

Gasoline-like odor.

Solubility:

Insoluble in water.

Specific Gravity:

0.66

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

ca. 68C (ca. 154F)

Melting Point:

ca. -95C (ca. -139F)

Vapor Density (Air=1):

3.0

Vapor Pressure (mm Hg):

150 @ 25C (77F)

Evaporation Rate (BuAc=1):

9

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Heat will contribute to instability.

Hazardous Decomposition Products:

May produce acrid smoke and irritating fumes when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong oxidizers.

Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

N-Hexane: Oral rat LD50: 28710 mg/kg. Irritation eye rabbit: 10 mg mild. Investigated as a tumorigen, mutagen and reproductive effector.

-----\Cancer Lists\-----

| Ingredient | ---NTP Carcinogen--- | | IARC Category |
|------------------------------|----------------------|-------------|---------------|
| | Known | Anticipated | |
| Hexane (110-54-3) | No | No | None |
| Methylcyclopentane (96-37-7) | No | No | None |
| 2-Methylpentane (107-83-5) | No | No | None |
| 3-Methylpentane (96-14-0) | No | No | None |
| Pentane (109-66-0) | No | No | None |

12. Ecological Information

Environmental Fate:

When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is not expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has an estimated bioconcentration factor (BCF) of less than 100. This material has a log octanol-water partition coefficient of greater than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HEXANES
Hazard Class: 3
UN/NA: UN1208
Packing Group: II
Information reported for product/size: 215L

International (Water, I.M.O.)

Proper Shipping Name: HEXANES
Hazard Class: 3
UN/NA: UN1208
Packing Group: II
Information reported for product/size: 215L

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

| Ingredient | TSCA | EC | Japan | Australia |
|------------------------------|------|-----|-------|-----------|
| Hexane (110-54-3) | Yes | Yes | Yes | Yes |
| Methylcyclopentane (96-37-7) | Yes | Yes | No | Yes |
| 2-Methylpentane (107-83-5) | Yes | Yes | Yes | Yes |
| 3-Methylpentane (96-14-0) | Yes | Yes | Yes | Yes |
| Pentane (109-66-0) | Yes | Yes | Yes | Yes |

-----\Chemical Inventory Status - Part 2\-----

| Ingredient | Korea | --Canada-- | | Phil. |
|------------------------------|-------|------------|------|-------|
| | | DSL | NDSL | |
| Hexane (110-54-3) | Yes | Yes | No | Yes |
| Methylcyclopentane (96-37-7) | Yes | Yes | No | Yes |
| 2-Methylpentane (107-83-5) | Yes | Yes | No | Yes |
| 3-Methylpentane (96-14-0) | Yes | Yes | No | Yes |
| Pentane (109-66-0) | Yes | Yes | No | Yes |

-----\Federal, State & International Regulations - Part 1\-----

| Ingredient | -SARA 302- | | -----SARA 313----- | |
|------------------------------|------------|-----|--------------------|----------------|
| | RQ | TPQ | List | Chemical Catg. |
| Hexane (110-54-3) | No | No | Yes | No |
| Methylcyclopentane (96-37-7) | No | No | No | No |
| 2-Methylpentane (107-83-5) | No | No | No | No |
| 3-Methylpentane (96-14-0) | No | No | No | No |
| Pentane (109-66-0) | No | No | No | No |

-----\Federal, State & International Regulations - Part 2\-----

| Ingredient | CERCLA | -RCRA- | -TSCA- |
|-------------------|--------|--------|--------|
| | | 261.33 | 8(d) |
| Hexane (110-54-3) | 5000 | No | No |

| | | | |
|------------------------------|----|----|-----|
| Methylcyclopentane (96-37-7) | No | No | No |
| 2-Methylpentane (107-83-5) | No | No | No |
| 3-Methylpentane (96-14-0) | No | No | No |
| Pentane (109-66-0) | No | No | Yes |

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: No
 SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
 Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 3[Y]E

Poison Schedule: None allocated.

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

Label Hazard Warning:

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.

Label Precautions:

- Keep away from heat, sparks and flame.
- Keep container closed.
- Use only with adequate ventilation.
- Wash thoroughly after handling.
- Avoid breathing vapor or mist.
- Avoid contact with eyes, skin and clothing.

Label First Aid:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

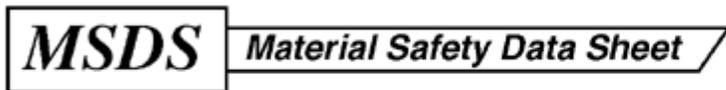
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Attachment 3. MSDS for Nitric Acid from J.T. Baker

MSDS Number: N3666 * * * * * Effective Date: 01/10/06 * * * * * Supersedes: 02/12/04



From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID 10% R. S.

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO₃ (10% solution)
Product Codes: H262

2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | |
|-------------|-----------|---------|-------|
| Hazardous | | | |
| ----- | ----- | ----- | ----- |
| - | | | |
| Nitric Acid | 7697-37-2 | 10% | Yes |
| Water | 7732-18-5 | 90% | No |

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)

Flammability Rating: 0 - None

Reactivity Rating: 2 -

Contact Rating: 4 - Extreme (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:

Corrosive! May cause irritation of the nose, throat, and respiratory tract including coughing and choking. Higher concentrations or prolonged exposure to vapors of nitric acid may lead to pneumonia or pulmonary edema.

Ingestion:

Corrosive. May cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.

Skin Contact:

Corrosive! May cause redness, pain, and severe skin burns.

Eye Contact:

Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns

and permanent eye damage.

Chronic Exposure:

Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:

May react explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc.

Fire Extinguishing Media:

Water or water spray.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Increases the flammability of combustible, organic and readily oxidizable materials.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require

reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from combustible, organic, or any other readily oxidizable materials. Protect from freezing.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

For Nitric Acid:

OSHA Permissible Exposure Limit (PEL):

2 ppm (TWA)

ACGIH Threshold Limit Value (TLV):

2 ppm (TWA); 4 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). Canister-type respirators using sorbents are ineffective.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear to pale yellow solution.

Odor:

Suffocating, acrid.

Solubility:

Infinitely soluble.

Density:

1.054

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100 (as water and acid)

Boiling Point:

ca. 101C (ca. 214F)

Melting Point:

ca. -3C (ca. 27F)

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

No information found.

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity**Stability:**

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

Conditions to Avoid:

Heat and incompatibles.

11. Toxicological Information

For Nitric Acid: Investigated as a mutagen and reproductive effector.

| Ingredient | ---NTP Carcinogen--- | | IARC Category |
|-------------------------|----------------------|-------------|---------------|
| | Known | Anticipated | |
| Nitric Acid (7697-37-2) | No | No | None |
| Water (7732-18-5) | No | No | None |

12. Ecological Information**Environmental Fate:**

No information found.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID (WITH 10% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 2.5L

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID (WITH 10% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 2.5L

15. Regulatory Information

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-----\Chemical Inventory Status - Part 1\-----
Ingredient                                     TSCA  EC   Japan  Australia
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Nitric Acid (7697-37-2)                       Yes   Yes  Yes    Yes
Water (7732-18-5)                             Yes   Yes  Yes    Yes

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-----\Chemical Inventory Status - Part 2\-----
Ingredient                                     Korea  DSL  NDSL  Phil.
-----
Nitric Acid (7697-37-2)                       Yes   Yes  No    Yes
Water (7732-18-5)                             Yes   Yes  No    Yes

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-----\Federal, State & International Regulations - Part 1\-----
Ingredient                                     -SARA 302-  -SARA 313-
RQ  TPQ  List  Chemical Catg.
-----
Nitric Acid (7697-37-2)                       1000 1000  Yes    No
Water (7732-18-5)                             No   No    No     No

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-----\Federal, State & International Regulations - Part 2\-----

| Ingredient | CERCLA | -RCRA- | -TSCA- |
|-------------------------|--------|--------|--------|
| Nitric Acid (7697-37-2) | 1000 | 261.33 | 8(d) |
| Water (7732-18-5) | No | No | No |

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
 SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
 Reactivity: Yes (Mixture / Liquid)

Australian Hazchem Code: 2PE

Poison Schedule: S6

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**

Label Hazard Warning:

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Label Precautions:

- Do not get in eyes, on skin, or on clothing.
- Do not breathe vapor or mist.
- Use only with adequate ventilation.
- Wash thoroughly after handling.
- Store in a tightly closed container.
- Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

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