

PREPARE YOUR SAMPLE:

The purpose of this document is to provide the requirements for proper sample preparation. The list of requirements is extensive since proper sample preparation is critical to the analysis. GEL has sampling technicians that can collect your samples depending on the geographic location, and we are happy to discuss this service with you. However, we are providing this document as a guide if you would like to collect the samples yourself.

1. Search through the "Parameter" column to locate the parameter that you need to have analyzed at the laboratory. This list is divided into the following analytical categories to make your search more efficient: Inorganics, Bacteriology, Organics, and Radiochemistry.
2. Once you have located the Parameter, determine the container type that will be necessary. This will require a combination of the values in the "Container", "Min. Volume" and "Preservation" columns. For example, the parameter "Adsorbable Organic Halides " will require 50 ml of a liquid sample in a amber glass bottle containing a small amount of acid to ensure that the sample is preserved at a pH < 2. This bottle will need to be kept between 0 ≤ 6°C until it arrives at the laboratory.
3. It is always a good practice to ship your samples to the laboratory as soon as possible. There are some analyses that are required to be performed within specified regulatory holding times. This will be listed in the "Holding Time" column, as applicable. Based on the holding time for the tests you need, please ship the sample as far in advance of the holding time as possible to allow the laboratory ample time for preparation and analysis.
4. Complete the Chain of Custody form with the sample information, date and time of collection, etc. The Chain of Custody form is also available for download on our website. This document must accompany the samples at all times until it arrives at the laboratory and each change of possession must be signed and dated in the appropriate fields.
5. Repeat steps 1-4 for all remaining parameters and samples.
6. Package the samples according to the preservation requirements and in a manner that will prevent breakage.
7. Ship the samples to the following address to the attention of your designated project manager:
 GEL Laboratories, LLC
 2040 Savage Road
 Charleston, SC 29407

Notes:

There are some analyses that can be performed from the same container as other analyses. This may allow you to reduce the amount of sample volume or the number of bottles. There may also be method-specific and/or project-specific requirements for additional sample volume to be used for quality control.

Please contact a GEL Project Manager at (843) 556-8171 if you have any questions concerning this procedure or the requirements in this document.

SAMPLE STORAGE AND PRESERVATION REQUIREMENTS:

Parameter	Container ¹	Preservation	Holding Time ²	Min. Volume ⁵
<u>INORGANICS</u>				(Liquid / Solid)
Acidity	P,G	0 ≤ 6° C	14 days	25 mL / NA
Adsorbable Organic Halides (AOX)	G, amber	0 ≤ 6° C, HNO ₃ to pH < 2	>3days and < 6 mos from collection	50 mL / 1 g
Alkalinity	P,G	0 ≤ 6° C	14 days	50 mL / NA
Biochemical Oxygen Demand (BOD) and	P,G	0 ≤ 6° C	48 hours	500 mL / NA

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Carbonaceous Oxygen Demand (CBOD)				
Boiling Point	P,G	0 ≤ 6° C	None	60 mL / NA
Bromide	P,G	0 ≤ 6° C	28 days	10 mL / 4 g
Carbon Dioxide	P,G	0 ≤ 6° C	Immediate	50 mL / NA
Chemical Oxygen Demand (COD)	P,G	0 ≤ 6° C, H ₂ SO ₄ to pH < 2	28 days	2 mL / NA
Chlorine by Bomb Calorimeter	P,G	0 ≤ 6° C	None	NA / 0.5 g
Chloride	P,G	0 ≤ 6° C	28 days	10 mL / 4 g
Color	P,G	0 ≤ 6° C	48 hours	50 mL / NA
Conductivity	P,G	0 ≤ 6° C	28 days	25 mL / NA
Corrosivity by pH	P,G	None	Immediate	25 mL / 5 g
Corrosivity to Steel	P,G	None	None	1000 mL / NA
Cyanide amenable to chlorination	P,G	0 ≤ 6° C, NaOH to pH > 12, 0.6 g ascorbic acid ³	14 days ⁴	50 mL / NA
Cyanide, Reactive Releasable	G, amber	Zero headspace	7 days liquids, 28 days solids	10 mL / 10 g
Cyanide, total, available, free or Weak Acid Dissociable	P,G	0 ≤ 6° C, NaOH to pH > 12, 0.6 g ascorbic acid ³	14 days ⁴	50 mL / 1 g
Dissolved Oxygen	G (bottle and top)	None, Zero headspace	Immediate	25 mL / NA
Flashpoint	P,G	None	None	50 mL Closed Cup 2 mL / 2 g Setflash
Fluoride	P,G	0 ≤ 6° C	28 days	25 mL / 4 g
Fluorine by Bomb	P,G	0 ≤ 6° C	None	NA / 0.5 g
Hardness	P,G	HNO ₃ or H ₂ SO ₄ to pH < 2	6 months	50 mL / NA
Heating Value	P,G	None	None	NA / 0.5 g
Hydrazine	P,G	HC1 to pH < 2	Immediate	50 mL / NA
Nitrogen-Ammonia	P,G	0 ≤ 6° C, H ₂ SO ₄ to pH < 2	28 days	100 mL / 5 g
Nitrate	P,G	0 ≤ 6° C	48 hours	10 mL / 4 g
Nitrite	P,G	0 ≤ 6° C	48 hours	10 mL / 4 g
Nitrate/Nitrite	P,G	0 ≤ 6° C, H ₂ SO ₄ to pH < 2	28 days	4 mL / 4 g
Nitrogen - Total Kjeldahl and Organic	P,G	0 ≤ 6° C, H ₂ SO ₄ to pH < 2	28 days	100 mL / 5 g
Odor	G	0 ≤ 6° C, Zero headspace	Immediate	200 mL
Oil and Grease	G	0 ≤ 6° C, HCl or H ₂ SO ₄ to pH < 2	28 days	1000 mL
Orthophosphate	P,G	Filter immediately, 0 ≤ 6° C	48 hours	25 mL / 4 g
Paint Filter Liquids Test	Any	None	None	100 mL / 100 g
Percent (%) Moisture	P,G	0 ≤ 6° C	None	2 mL / 5 g
Perchlorate by Ion Chromatography	P,G	0 ≤ 6° C	28 days	10 mL / 1g
Total Phenols	G, amber	0 ≤ 6° C, H ₂ SO ₄ to pH < 2	28 days	50 mL / 1 g
pH	P,G	None	Immediate	25 mL / 5 g
Total Phosphorus	P,G	0 ≤ 6° C, H ₂ SO ₄ to pH < 2	28 days	20 mL / 1 g
Residual Chlorine	P,G	0 ≤ 6° C	Immediate	25 mL / NA
Residue, Total	P,G	0 ≤ 6° C	7 days	25 mL / NA
Residue, Filterable (TDS)	P,G	0 ≤ 6° C	7 days	25 mL / NA
Residue, NonFilterable (TSS)	P,G	0 ≤ 6° C	7 days	1000 mL
Residue, Volatile and Fixed (% Ash)	P,G	0 ≤ 6° C	7 days	25 mL / 1 g
Residue, Settleable	P,G	0 ≤ 6° C	48 hours	1000 mL / NA
Salinity	P,G	0 ≤ 6° C	28 days	25 mL / NA
Specific Gravity	P,G	0 ≤ 6° C	7 days	50 mL / NA
Sulfate	P,G	0 ≤ 6° C	28 days	10 mL / 4 g
Sulfide	P,G	0 ≤ 6° C, add ZnAc and NaOH to pH > 9	7 days	200 mL / 20 g
Sulfide, Reactive Releasable	G, amber	Zero headspace	7 days liquids,	10 mL / 10 g

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Sulfite	P,G	EDTA	28 days solids Immediate	50 mL / NA
Sulfur by Bomb	P,G	0 ≤ 6° C	None	NA / 0.5 g
Surfactants	P,G	0 ≤ 6° C	48 hours	100 mL / NA
Total Halogens	P,G	0 ≤ 6° C	None	1 mL / 1 g
Total Organic Carbon	G, amber	0 ≤ 6° C, HCl or H ₂ SO ₄ to pH < 2, Zero headspace	28 days	50 mL / 5 g
Total Organic Halides	G	0 ≤ 6° C, H ₂ SO ₄ to pH < 2	28 days	50 mL / 1 g
Total Petroleum	G	0 ≤ 6° C, H ₂ SO ₄ to pH < 2	28 days	1000 mL / NA
Hydrocarbons				
TCLP (Toxicity Characteristic leaching Procedure) and Synthetic Precipitation Leaching Procedure (SPLP)	P,G depending on test	0 ≤ 6° C, depends on test	14 days, VOA 14 days, SVOA 28 days Mercury 180 days non-Hg metals	105 g or 130 g for full TCLP list
Turbidity	P,G	0 ≤ 6° C	48 hours	50 mL / NA
Viscosity	P,G	0 ≤ 6° C	None	7 mL to 500 mL
Metals – Liquids (except chromium VI and mercury)	P, (G as long as no B or Si is required)	HNO ₃ to pH < 2	6 months	50 mL
Metals – Solids ⁸ (except chromium VI and mercury)	P, (G as long as no B or Si is required)	None	6 months	2 g
Chromium VI – Liquids	P,G	0 ≤ 6° C	24 hours	25 mL
Chromium VI - Liquids	P,G	0 ≤ 6° C, (NH ₄) ₂ SO ₄ , pH = 9.3 to 9.7	28 days	25 mL
Chromium VI - Solids ⁸	P,G	0 ≤ 6° C	7 days for extraction	1 g
Mercury - Liquids	P,G	HNO ₃ to pH < 2	28 days	50 mL
Mercury - Solids ⁸	P,G	0 ≤ 6° C	28 days	2 g
Mercury – Low Level Liquids	P,G	HCl or BrCl	90 days when preserved w/in 48 hrs or oxidized w/in 28 days	50 mL
<u>BACTERIOLOGY</u>				
Coliform, fecal	P,G	0 ≤ 6° C, 0.008% Na ₂ S ₂ O ₃	6 hours	100 mL / NA
Standard Plate Count	P,G	0 ≤ 6° C, 0.008% Na ₂ S ₂ O ₃	24 hours	100 mL / NA
Coliform, total - Wastewater	P,G	0 ≤ 6° C, 0.008% Na ₂ S ₂ O ₃	6 hours	100 mL / NA
Coliform, total - Groundwater	P,G	0 ≤ 6° C, 0.008% Na ₂ S ₂ O ₃	24 hours	100 mL / NA
Coliform, total - Drinking water	P,G	0 ≤ 6° C, 0.008% Na ₂ S ₂ O ₃	30 hours	100 mL / NA
<u>ORGANICS</u>				
BTEX - Water	G, teflon-lined septum	0 ≤ 6° C, zero headspace, HCl to pH < 2, 0.008% Na ₂ S ₂ O ₃ ⁷	14 days	3x40 mL
BTEX - Solids ⁸	G, teflon-lined septum	0 ≤ 6° C	48 hours for preservation and 14 days for analysis	3x5 g EnCores or 2 low and 1 high level vials
Volatiles - Drinking Water	G, teflon-lined cap	0 ≤ 6° C, zero headspace, HCl to pH < 2	14 days	3x40 mL
Volatiles (including 2 chloroethylvinylether) -	G, teflon-lined cap	0 ≤ 6° C, zero headspace, unpreserved	7 days	3x40 mL

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Wastewater Volatiles - Wastewater/groundwater Volatiles - Solids ⁸	G, teflon-lined cap EnCore Sampler	0 ≤ 6° C, zero headspace, unpreserved 0 ≤ 6° C	7 days 48 hours for preservation 14 days for analysis	3x40 mL 3x5 g EnCores
Volatiles - Concentrated Waste	G, teflon-lined septum	None	14 days	1x40 mL
Base/Neutral and Acid Extractables and 1,4- Dioxane – Liquids	Amber G, teflon-lined cap	0 ≤ 6° C, 0.008% Na ₂ S ₂ O ₃ ⁷	7 days for extraction 40 days after extraction for analysis	1000 mL / 50 g
Base/Neutral and Acid Extractables and 1,4- Dioxane- Solids ⁸	G, teflon-lined cap	0 ≤ 6° C	14 days for extraction 40 days after extraction for analysis	1000 mL / 50 g
Base/Neutral and Acid Extractables - Concentrated Waste	G, teflon-lined cap	None	7 days for extraction 40 days after extraction for analysis	1000 mL / 50 g
TPH-GRO	G, teflon-lined cap	0 ≤ 6° C, HCl to pH < 2, zero headspace	14 days	3x40 mL
TPH-DRO	G, teflon-lined cap	0 ≤ 6° C	14 days	1000 mL / 50 g
Chlorinated Herbicides - Water	Amber G, teflon-lined cap	0 ≤ 6° C, 0.008% Na ₂ S ₂ O ₃ ⁷	7 days for extraction 40 days after extraction for analysis	1000 mL
Chlorinated Herbicides - Solids ⁸	G, teflon-lined cap	0 ≤ 6° C	14 days for extraction 40 days after extraction	50 g
Organochlorine Pesticides by SW-846 EPA 8081	Amber G, teflon-lined cap	0 ≤ 6° C, 0.008% Na ₂ S ₂ O ₃ ⁷	7 days for extraction 40 days after extraction for analysis	1000 mL / 50 g
Organochlorine Pesticides by EPA 608 only	Amber G, teflon-lined cap	0 ≤ 6° C, 0.008% , Na ₂ S ₂ O ₃ ⁷ , NaOH and H ₂ SO ₄ preserve to pH 5.0 to 9.0 (for prep >72 hrs and <7days)	Unpreserved Prep within 72 hrs Preserved prep within 7 days 40 days after extraction for analysis	1000 mL / NA
PCBs and PCB Congeners	Amber G, teflon-lined cap	0 < 6° C, 0.008% Na ₂ S ₂ O ₃ ⁷	365 days for extraction 365 days after extraction for analysis	1000 mL / 50 g
PCBs in Oil	G, teflon-lined cap	None	365 days for extraction 365 days after extraction for analysis	1x40 mL
Total Petroleum Hydrocarbon	G, teflon-lined septum	0 ≤ 6° C	14 days	1000 mL / 50 g
Industrial Solvents	G, teflon-lined septum	0 ≤ 6° C	14 days	1x40 mL
Glyphosate 1,4-Dioxane in Drinking Water by EPA 522	P G, teflon-lined	None <10°C during transport, Sodium sulfite (50mg/L),	30 days 28 days for extraction at 0 ≤ 6°	10 mL 100 mL to 500 mL

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	septum	sodium bisulfate (1g/L)	C (not frozen) and 28 days after extraction for analysis at -5° C, protected from light	
Dioxin Screen	G, teflon-lined cap	0 ≤ 6° C	7 days for extraction 40 days after extraction for analysis	1000 mL / 50 g
EDB and DBCP	G, teflon-lined septum	0 ≤ 6° C, HCl to pH < 2 0.4% Na ₂ S ₂ O ₃	7 or 14 days	3x40 mL / NA
Polyuclear Aromatic Hydrocarbons	Amber G, teflon-lined septum	0 ≤ 6° C	7 days for extraction 40 days after extraction for analysis	1000 mL / 30 g
Nitroaromatics and Nitroamines	Amber G, teflon-lined septum	0 ≤ 6° C	7 days for extraction 40 days after extraction for analysis	1000 mL / 2 g
Nitroaromatics and Nitroamines by MIS Prep (solid samples)	Protect from light	0 ≤ 6° C until air drying 22 ± 4° C (or cooler) after drying	14 days for extraction, 40 days after extraction for analysis	Entire Sample
RDX Breakdown	Amber G, teflon-lined septum for liquids and teflon-lined cap for solids	0 ≤ 6° C	7 days to extraction for liquids 14 days to extraction for solids 40 days to analysis after extraction	1000 mL / 2 g
Low Level Perchlorate Haloacetic Acids	P G, amber, teflon-lined septum	0 ≤ 6° C 0 ≤ 6° C, zero headspace, ammonium chloride	28 days 14 days to extraction, 7 days after extraction for analysis	10 mL / 2 g 3x60 mL
Dissolved Gases	G, teflon-lined septum	0 ≤ 6° C, HCl to pH < 2, zero headspace	7 days if unpreserved, 14 days if preserved	2x40 mL
Perfluorinated Alkyl Acids	Poly-propylene	0 ≤ 6° C, Trizma® at 5g/L	14 days	250 mL
<u>RADIOCHEMISTRY</u>				
Americium – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Americium - Solids ⁸	P,G	None	6 months	20 g
Calcium-45 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	500 mL
Calcium-45 - Solids ⁸	P,G	None	6 months	20 g
Carbon-14 Liquids & Solids ⁸	P,G	None	6 months	500 mL / 20 g
Cesium 134 – Drinking Water	P,G	HCl to pH < 2	6 months	2000 mL
Chlorine-36 Liquids & Solids ⁸	P,G	None	6 months	500 mL / 20 g
Curium - Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Curium - Solids ⁸	P,G	None	6 months	20 g
Gamma Isotopes - Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	2000 mL
Gamma Isotopes - Solids ⁸	P,G	None	6 months	200 g
Gross Alpha & Beta – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	500 mL

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Gross Alpha & Beta, Rapid - Liquids	P,G	HNO₃ or HCl to pH < 2	48 – 72 hrs	500 mL
Gross Alpha & Beta - Solids ⁸	P,G	None	6 months	20 g
Iodine-129 - Liquids & Solids ⁸	P,G	None	6 months	1000 mL / 50 g
Iodine -131 - Liquids	P,G	None	8 days	1000 mL
Iron 55 -Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	500 mL
Iron 55 - Solids ⁸	P,G	None	6 months	20 g
Lead-210 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Lead-210 - Solids ⁸	P,G	None	6 months	200 g
Neptunium - Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Neptunium - Solids ⁸	P,G	None	6 months	20 g
Nickel-59 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Nickel-59 – Solids ⁸	P,G	None	6 months	20 g
Nickel-63 - Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Nickel-63 - Solids ⁸	P,G	None	6 months	20 g
Phosphorus-32 –Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Phosphorus-32 - Solids ⁸	P,G	None	6 months	20 g
Plutonium – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Plutonium - Solids ⁸	P,G	None	6 months	20 g
Polonium - Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Polonium - Solids ⁸	P,G	None	6 months	20 g
Promethium-147/ Samarium-151 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Promethium-147/ Samarium-151 - Solids ⁸	P,G	None	6 months	20 g
Radium-223 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	2000 mL
Radium-224 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	2000 mL
Radium-226 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Radium-228 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Radon-222 – Liquids	G	None, Zero headspace	4 days	2x40 mL
Selenium-79 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	500 mL
Selenium-79 - Solids ⁸	P,G	None	6 months	20 g
Strontium-89/90 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Strontium-89/90 - Solids ⁸	P,G	None	6 months	20 g
Sulfur-35 - Liquids	P,G	None	6 months	500 mL
Sulfur-35 - Solids ⁸	P,G	None	6 months	20 g
Technetium-99 – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Technetium-99 – Solids ⁸	P,G	None	6 months	20 g
Thorium – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Thorium - Solids ⁸	P,G	None	6 months	20 g
Total Activity Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	100 mL
Total Activity - Solids ⁸	P,G	None	6 months	20 g
Total Alpha Radium – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	500 mL
Total Alpha Radium - Solids ⁸	P,G	None	6 months	20 g
Total Uranium - Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	100 mL
Total Uranium - Solids ⁸	P,G	None	6 months	20 g
Tritium – Drinking Water	G	None	6 months	250 mL
Tritium – Electrolytic Liquids	P,G	None	6 months	2000 mL
Tritium – Liquids & Solids ⁸	P,G	None	6 months	250 mL / 20 g
Uranium – Liquids	P,G	HNO ₃ or HCl to pH < 2	6 months	1000 mL
Uranium - Solids ⁸	P,G	None	6 months	20 g

¹ P = Polyethylene; G = Glass

² Samples should be analyzed as soon as possible after collection. The holding times listed are maximum times that samples may be held before analysis and be considered valid.

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³ Used only in the presence of residual chlorine.

⁴ Maximum holding time is 24 hours when sulfide is present. All samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If present, remove by adding cadmium nitrate powder until a negative spot test is obtained. Filter sample and add NaOH to pH 12.

⁵ Minimum amount of sample needed to prepare and analyze for the parameter. Some parameters may be combined into one analysis, others may need additional amount if quality control is being requested for site-specific samples. Please check with GEL's Project Manager for proper sample amounts based on project specific requirements.

⁶ Volatiles Groundwater/Wastewater: If samples are to be analyzed for vinyl chloride, styrene, or 2-chloroethylvinyl ether for soil or water, separate samples must be collected without acid preservation and analyzed within 7 days. For aqueous samples to be analyzed for acrolein and acrylonitrile, the samples should be analyzed within 7 days.

⁷ Chapter 4 of SW-846 specifies that 10% solution of sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) is used to remove residual chlorine from liquid samples prior to preservation. The $\text{Na}_2\text{S}_2\text{O}_3$ is added at the ration of 0.8 mL of $\text{Na}_2\text{S}_2\text{O}_3$ to 1 liter of sample. For Volatile Organic Analyses (500, 600 and 8000 series methods) collected from locations containing residual chlorine, treat the samples by collecting first in 125 mL container which has been pre-preserved with 4 drops of 10% $\text{Na}_2\text{S}_2\text{O}_3$. Gently swirl the sample to mix and then transfer to a 40 mL VOA vial, zero headspace, pre-preserved with HCl. Store at $0 \leq 6^\circ \text{C}$. For Semivolatile organics (500, 600 and 8000 series methods) collected from locations containing residual chlorine, collect the samples in pre-preserved containers with 0.8 mL of $\text{Na}_2\text{S}_2\text{O}_3$. Store at $0 \leq 6^\circ \text{C}$. If a sample was collected in an un-preserved container, notify the lab by notation on the Chain of Custody that the samples are from a chlorinated source and require dechlorination prior to sample preparation. Addition of $\text{Na}_2\text{S}_2\text{O}_3$ to non-chlorinated samples will not cause harm to the samples.

⁸ Solids matrix typically applies to soils, sludges and sediments. Some tests have been developed for filters, miscellaneous solid waste, plant and animal tissue, also referred to as solids. Contact GEL to verify a particular matrix for the test of interest.