

Protocols for UNBC Internal Users

Applicable to: All UNBC employees, faculties, students and researchers using the NALS's facilities, equipment, materials, and chemicals.

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NALS Manager Approval:

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Date: March 23, 2025

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Scope and Applicability

This protocol document applies to all UNBC users, including employees, faculties, students, and researchers utilizing the Northern Analytical Laboratory Services (NALS) facilities. It provides a comprehensive guide to ensure proper understanding and use of NALS resources and services. The document covers key topics such as an introduction to the NALS, including details on its accreditation; an overview of the NALS team members; a list of available instrumentation and equipment; instructions on how to contact NALS and submit an analysis request; and the procedure for receiving training on NALS instruments. This protocol serves as a reference to ensure consistent and effective use of NALS facilities and services.

Introduction

Founded in 2016, the Northern Analytical Laboratory Services (NALS) at the University of Northern British Columbia serves as a comprehensive hub for scientific analysis in Prince George, BC. Equipped with advanced instrumentation, NALS performs qualified analyses across biological, chemical, and physical sciences for various sectors. NALS' team of dedicated analytical lab specialists have impressive track records in environmental testing (water, soil, mineral, ambient air, and gas) and materials characterization. On top of that, our experienced analysts are ready to tackle non-routine testing challenges by developing customized methods and ensuring accurate, defensible results.

The NALS is a Standard Council of Canada (SCC) accredited (ISO 17025:2017) and Provincial Health Officer Approved Water Microbiology Testing lab. As such, there are strict requirements on the lab access, document control, and tracking of instruments, equipment, materials, and chemicals. Adherence to the protocols discussed in this document is required for everyone to ensure that the NALS can continue to offer accredited services to the UNBC and beyond.

To view our SCC Scope of Accreditation, you can visit:

https://scc-ccn.ca/system/files/2025-01/asb_soa_151251_v3_2025-01-30_en_0.pdf

To serve as a British Columbia's Qualified Laboratory, the NALS participates in Proficiency Testing Programs on a regular basis, as follows:

- Industrial Hygiene Proficiency Analytical Testing (IHPAT) Program (Quarterly)
- Environment and Climate Change Canada Proficiency Testing Program (Bi-annually)
- Clinical Microbiology Proficiency Testing Program (3x per year)

NALS Team

Working under the supervision of Dr. Hossein Kazemian as the lab director, the NALS has three dedicated Analytical Lab Specialists and one Quality Assurance Officer, as follows:

1) NALS Director: Dr. Hossein Kazemian

Office# 4-257; Phone: 250-960-5168; Email: hossein.kazemian@unbc.ca

2) Quality Assurance Officer: Dorna Sobhani

Office# 4-246; Phone: 250-960-5667; Email: dorna.sobhani@unbc.ca

3) Analytical Lab Specialist: Erwin Rehl

Office# 4-246; Phone: 250-960-6637; Email: erwin.rehl@unbc.ca

4) Analytical Lab Specialist: Charles Bradshaw

Office# 4-229; Phone: 250-960-6154; Email: charles.bradshaw@unbc.ca

5) Analytical Lab Specialist: Mya Schouwenburg

Office# 4-229; Phone: 250-960-5713; Email: mya.schouwenburg@unbc.ca

For more information about the backgrounds and specialties of our team members, visit: <u>nals.unbc.ca</u>

Hours of operation: 9 am to 4 pm Monday to Friday.

*Please note that the NALS labs are closed for statutory holidays.

NALS Facilities

The NALS operates in five laboratories, located in the Research Laboratory building of the UNBC Prince George campus, including rooms 4-234 (Main Lab), 4-212 (Side Lab), 4-333 (Materials Testing Lab), 4-414 (Bacteriological Safety Lab), and 4-311 (Microscopy Lab). Below is a list of the NALS's analytical instruments/equipment with a brief description of their application. For the latest updates on the availability and operational status of each equipment and any inquiry about using and/or borrowing equipment, testing services, training, etc. please contact NALS.

Room# 4-234 (Main Lab)		
Instrument	Application	
Milli-Q Advantage 17000 (Water Purifier)	Type I water \$0.50/L	
Agilent 8890 GC with 7000D TQ MS and Markes Thermal Desorption TD100-XR	GC with triple quad mass spec for hydrocarbons by liquid injections, headspace, and thermal desorption	
Agilent 8890 GC with valved inlet and sample loop for gas samples	GC for gas samples (CO ₂ , CO, CH ₄ , H ₂ , O ₂ /Ar, N ₂ , H ₂ S, ethane, propane, butane, NO ₂)	
Agilent Technologies 8800 Séries ICP-QQQ	Trace metals quantification in low matrix samples (waters and acid digests)	
Agilent Technologies 5100 ICP-OES SVDV	General use metals analyses including S and P (waters and acid digests)	
Laser Ablation (NWR 266 ESI)	Can be coupled to Agilent 8800 ICP-QQQ	
DIONEX ICS-6000 Ion Chromatography	Anions (F, Cl, Br, NO ₂ , NO ₃ , SO ₄ , PO ₄) in water (not available for salt extracts)	
Varian CP-3800 Gas Chromatograph (GC-FID)	General use GC for liquid injection with FID (Autosampler not working)	
HP 6890A Gas Chromatograph GC-FID	General use GC for liquid injections with FID detector, appropriate for hydrocarbons/extracts	
Agilent Technologies 1200 Series HPLC with VWD	HPLC with a refractive index detector and a UV/Vis detector (one detector type at a time)	
Auto-Analyzer 3 (Digital Colorimeter)	Set up for high throughput, ammonium N, can be adapted for other wet quantification methods	

Costech Instruments Elemental Combustion System (EA)	Total C, N, H of solids. Liquids can be done manually.
Delta V Advantage Isotope Ratio Mass Spectroscopy (IRMS)	Isotope ratio of C and N coupled with EA for bulk materials
HP 6890A Gas Chromatograph GC FID	GC coupled to IRMS for single component stable isotope analyses
OI-Analytical Aurora Model 1030w	For total or dissolved inorganic and organic carbon in water samples
ORION 420A pH Meter	рН
Orion A214 pH ICE meter	pH or ISE applications
Oakton Con700	Conductivity meter
Oakton T100IR	Turbidity Meter
HERATHERM Oven	Clean oven for glassware and moisture content on non-VOC containing samples
Thermolyne 6000 Series Furnace	Up to 1000C muffle furnace
Nabertherm 3000 Series Furnace	Up to 1200C muffle furnace with option of N $_2$ blanket gas
A&D Electronic Balance (ER-182A)	1-3kg balance
Sartorius Micro Digital Balance	0.01mg to 3g weighing
Sartorius Secura 225D Balance	1mg to 225g weighing
Sartorius MC5 Digital Balance	5g Microbalance
CEM Mars 6 Microwave digester	Microwave digester for difficult solids (No HF or perchloric)
SCP Block digester	Programable block digestion for 15mL or 50mL SCP digestion tubes
Humidity and Temperature-controlled Weighing Chamber	Traceable Weighing of Air Filters
PARR Manual Bomb Calorimeter	Calorimeter for Higher Heating Value on 0.2-1g samples
Room# 4-212 (Side Lab)	

Instrument	Application
HACH UV/VIS DR6000 spectrophotometer	General Use Spectrometer with multi-path length carousel
HACH DRB200	Hot block digester for vials or HACH kits
Malvern Mastersizer 3000 HYDRO LV (Wet Chemistry) and AERO S (Dry Chemistry)	Particle size analyzer for materials suspended in water or air between 0.01-2000um
VWR Ultrasonic Cleaner	Ultrasonic water bath
DIONEX ICS-5000 Ion Chromatography and Agilent Technologies 7500cx Series ICP-MS	Chromium speciation of clean samples (potentially other metals species too)
Kinematica Polymix PX-MFC-90D	Small grinder mill
Rotary Tumbler	Tumbler for 50mL conical tubes
Retsch RM 200 Ball Mill	Ball mill for small hard samples
Retsch Mixer Mill Type MM 200	Automated mortar and pestle for certain samples
N-EVAP 112 Nitrogen Evaporator	For evaporating solvent off samples in test tubes
Fisher Scientific Iso Temp Water Bath	General use water bath
Lab-Line Instruments Ambi-Hi-Lo Chamber	Incubator suitable for BOD
Metler PB1502-S fact	<1.5kg Balance
Eppendorf 5804 Centrifuge	Centrifuge for 50mL conical tubes
Room# 4-333 (Materials Testing Lab)	
Instrument	Application
Rigaku MiniFlex XRD	General use XRD for powders with ICDD database
Rigaku NexQC EZ Quant	Bench top ED XRF for qualitative assessment of elements >Na in powders or flat solids

Micrometrics 3Flex	BET, surface area, pore space, ads/des isotherm, and chemisorption on dry powders
Nova 2000e Surface area and pore size analyzer	BET, surface area and pore space on dry powders
TA Instruments Discovery TGA	Thermogravimetric analysis of samples (<30mg) up to 900C in Al or Pt pan in air or N_2
TA Instruments DSC Q2000	Differential scanning calorimetry up to 400C
TA Instruments DMA 800	Dynamic mechanical analysis of certain shape materials
Sartorius BP121S Digital Balance	120g Analytical Balance
Blue M Dry Type Incubator	Small incubator
Economy Model 2EG Gravity Convection Incubator	Small incubator
Carver 6-ton press	Pressing powders, but needs dies and platens
Nexus 670 FT-IR	General use FT-IR for KBr and salt disks in Optical path (No ATR attachment)
Geiger Counter Model 3 Survey Meter	For XRD verification
FreeZone6 Freeze Dryer	Freeze drying (already frozen) samples
Thermo Scientific Sorvall RC6+ Centrifuge (MAX 22,000rpm)	Centrifugation up to 34000g
CarboQC At line CO2 meter	Measure dissolved CO_2 gas in water
Room# 4-311 (Microscopy Room)	
Instrument	Application
Hitachi 5000 SEM	Scanning Electron Microscope with EDS analysis capability
DENTON Vacuum Desk V Gold Coater	Gold coating for non-conductive SEM samples
Meji Techno Optical Microscope	General use dissecting microscope
Neomet Unitron Optical Microscope	Microscope

Olympus CH 30 Light Microscope	General use optical microscope
Keyence VHX-500F digital microscope	Digital microscope (donated without lens)
Keyence VK-9510 profile microscope	Digital microscope (donated without computer)
Room# 4-414 (Bacteriological Lab)	
Instrument	Application
Instrument IDEXX Sealer plus	Application Seals IDEXX trays
Instrument IDEXX Sealer plus General Purpose Incubator	Application Seals IDEXX trays Risk Group II incubator

Contacting the NALS

Questions about the NALS services (routine and/or non-routine), sample(s) analysis, price quotes, turnaround times, using or borrowing equipment, materials, and chemicals, requesting a lab tour, or receiving training on instruments should be directed to the NALS employees. Inquiries can be sent to the communal NALS email at <u>nals@unbc.ca</u>.

Samples Analysis Request

Samples submitted to the NALS for analysis are put into a project queue. Samples are not considered submitted until they are received by a NALS employee, and an Analysis Request form is completed. Turnaround time depends on the type of analyses requested, number of samples, and the number of projects ahead of you in the queue. Analysis Request forms are available in paper copies at the NALS main lab (4-234) or can be downloaded from the NALS website.

Instructions for submitting sample(s)

- 1. Request permission from your supervisor to submit samples for analysis. Please note that the NALS employees reserve the right to contact your supervisor to confirm that you have permission to submit the samples, and who is responsible for the invoice payment.
- Clearly label your samples. If your sample(s) IDs contain more than 3-4 characters & numbers, please label your sample containers numerically (Sample 1, Sample 2, etc.), and email your Sample ID List to <u>nals@unbc.ca</u>. (If there is any extra time needed to sort out and label your samples, you will be charged Technician Time at \$50/hour).
- 3. Complete the client information, billing information, and sample submission information on the Analysis Request form.
- 4. Bring your samples to the NALS main lab (4-234) and submit them to one of the NALS employees. The NALS accepts samples Monday to Friday 9 am to 4 pm.
- 5. The NALS employee will attach a project ID to your analysis request form and confirm the analysis you would like done.
- 6. Sign the Analysis Request form to confirm that you agree to everything in the form as written.
- 7. Clearly notify the NALS employee if you need the rest of your samples back. If so, please collect your samples from the main lab as soon as you receive your analysis results and confirm that you do not need any re-run of the samples.

It is recommended to write down the project ID to make it easier to discuss the project with a NALS employee in the future. Analysis reports will be sent out via email (with your supervisor cc'd) along with the invoice. After receiving your analysis results, collect the remaining of your samples (if you need them) from the NALS main lab (4-234). If they do not hear from you, your samples will be discarded two weeks after the receipt of your Analysis Report.

Training on NALS Instrumentation

NALS is committed to supporting the UNBC research community by providing access to state-ofthe-art analytical instrumentation. To facilitate hands-on training, NALS offers two pathways for students and researchers to gain proficiency in these techniques:

- ENSC 400/600 Course (Starting Fall 2026) Designed for senior undergraduate and graduate students from various disciplines, including Environmental Science, Chemistry, and Engineering, this course provides structured training on analytical techniques available at NALS. It equips students with essential skills for research and professional applications. The course will be offered once per year, and eligible students can register through the UNBC course registration system.
- Ad Hoc Training for Researchers Graduate students, postdoctoral fellows, research associates, and faculty members requiring training on specific instruments can request customized training sessions. Faculty members should contact NALS directly, while students and postdocs must coordinate requests through their supervisors. Training sessions will be scheduled based on availability and will be subject to internal rates for technician time and any consumables used.

Additional Notes:

- 1. All the NALS users need to pass the Chemical Safety Orientation. To inquiry about the orientation schedules, please email the UNBC Chemical Safety Officer, Jordan Wilbey (jordan.wilbey@unbc.ca).
- 2. All the NALS users need to read and sign the NALS User Agreement Form. The form can be downloaded from the NALS website or be provided by the NALS QA Officer, Dorna Sobhani (dorna.sobhani@unbc.ca). After completing and signing the form, please send it to the NALS QA Officer.
- 3. Some instruments, such as XRD, require users to complete an X-ray safety orientation and obtain an X-ray badge. The supervisor is responsible for covering the associated badge fee.
- 4. Any NALS user who damages or breaks any equipment while using or borrowing it is financially responsible for the repair or replacement costs. If the user is unable to cover the costs, their supervisor will be held accountable for the payment.

For more information or to request training, please contact NALS.