



ST JOHN'S ISLAND

NATIONAL MARINE LABORATORY

NATIONAL UNIVERSITY OF SINGAPORE

RESEARCH USER HANDBOOK

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STAFF DIRECTORY:

Roles and responsibilities	Name of staff/Designation	Email address	Contact No.
Registration and Access for Facilities	#Mr Ahmed (Admin Manager)	tmsaha@nus.edu.sg	(65) 9823 1782 (65) 8418 3071
Finance and Administrative matters			
Facilities Management	Mr Razali (Facility Manager)	tmsmrd@nus.edu.sg	(65) 8126 5040
Boat transportation to SJINML	#Mr Jackson Chan (Facility Manger, Aquaria)	tmscks@nus.edu.sg	(65) 9695 0338
Use of Aquaria			
Biosafety and IACUC matters	#Dr Maria Yung (Lab Manager)	maria.yung@nus.edu.sg	(65) 9823 1775
Use of BSL2-certified Aquaria			
Laboratory Usage	*Ms Lim Lay Peng (Lab Manager)	tmslpl@nus.edu.sg	(65) 9823 1775
	*Ms Helen Wong (Lab Manager)	tmswpsh@nus.edu.sg	(65) 9046 7044
Organism Supply and Culture Facilities	#Ms Serina Lee (Lab Manager)	tmslscs@nus.edu.sg	(65) 9046 7044
Chemical Store, Histology and SEM	#Ms Gan Bin Qi (Lab Manager)	tmsgbq@nus.edu.sg	(65) 9046 7044
Field work	#*Mr Sebastian Yeo (Field Support Officer)	tmsyjhs@nus.edu.sg	
R/V Galaxea	Mr Wong Ann Kwang (Steersman)	tmswak@nus.edu.sg	(65) 9795 6179
Outreach Officer	Ms Joyce Leo, Assistant Manager	tmslshjb@nus.edu.sg	
Education/Outreach	Mr Chua Sek Chuan (Snr Manager, Education)	tmscsc@nus.edu.sg	(65) 9224 4022
Overnight stay in SJINML	Ms Kam Pang Jen (Management Support)	tmskampj@nus.edu.sg	(65) 9823 1772

*FIRST AIDERS (including AED operations) in SJINML

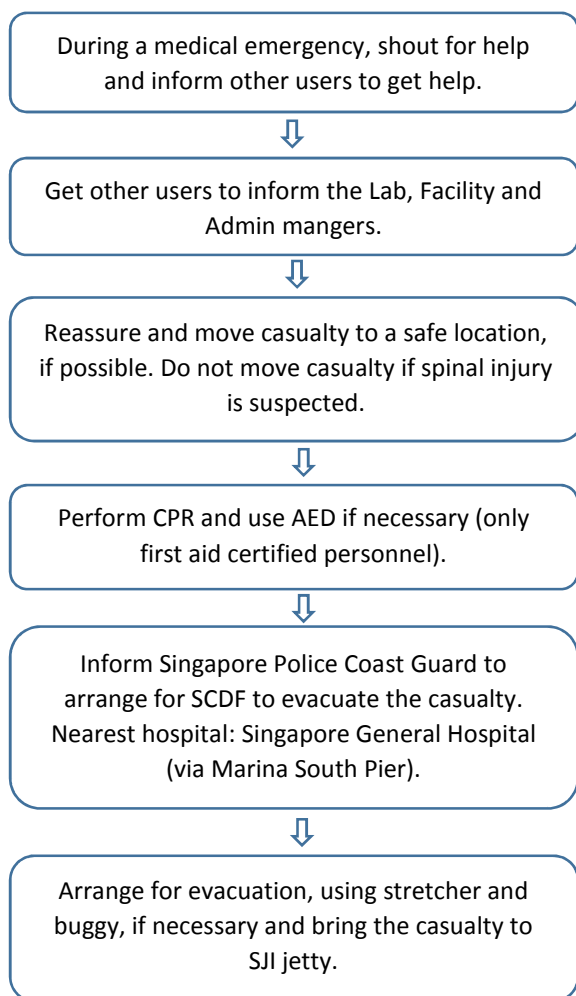
#FIRE WARDEN

Emergency SOP & Telephone numbers

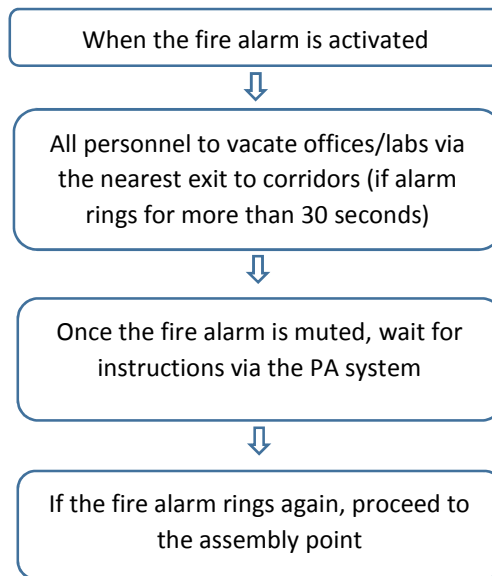
Classification of injuries:

1. Major injuries examples: head/spinal injuries and unconscious casualties. Please refer to the flowchart below
2. Moderate injuries examples: fractures. Evacuate via Singapore Island Cruise.
3. Minor injuries: minor cuts, Please inform Lab Managers

Emergency Evacuation



In the event of a Fire



Assembly Point

AED, Stretcher and Buggy are located in the Admin area.

Emergency Telephone Numbers:

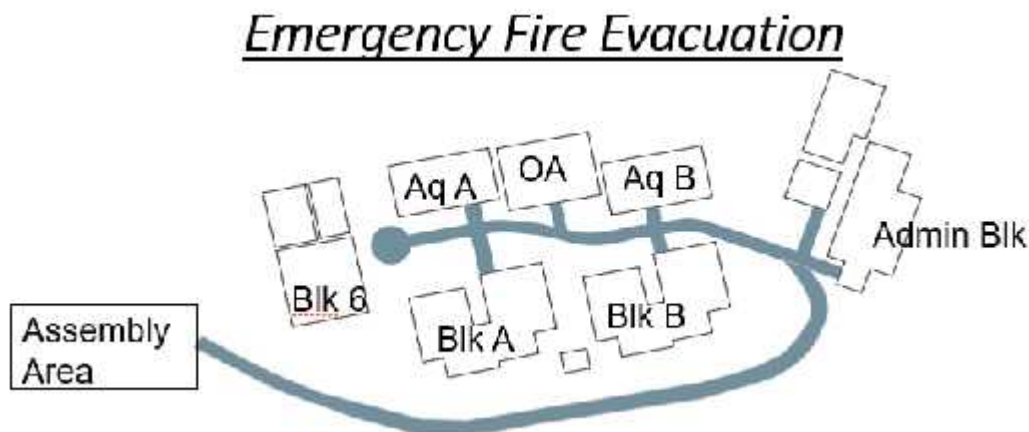
Mr Ahmed s/o Aliyar (Administration)	9823 1782/8418 3071
Mr Razali (General)	8126 5040
Mr Jackson Chan (Facility)	9695 0338
Mr Johnson (Facility Maintenance)	9223 7087
SJINML Security Guard	9197 6841
SCDF (ambulance)	995
Police Coast Guard	6375 0000/6377 5539
Singapore Island Cruise (24 hrs)	9777 6111

Power Failure

- a. Stay calm; do not panic
- b. Turn off all electrical appliances and equipment wherever possible;
- c. Check if the power failure is confined within the laboratory or block, or if it is institute-wide;
- d. Contact Facility Manager;
- e. Seawater supply may be interrupted if power is not supplied to the seawater pumps at Block 6; appropriate measures (e.g., activation of standby diesel generators to power aerators and refrigerators) will be activated. Please contact Facility Manager if you require assistance.

Fire

- a. Shout "Fire! Fire!" and activate the fire alarm by breaking the glass panel of the fire alarm call point;
- b. Put out the fire only if it is safe to do so, using the fire extinguisher and/or fire hose-reel;
- c. Seek assistance if needed;
- d. Call facility manager for instructions.



Medical Emergencies

1. Remove casualty to safe location and render first aid to casualty where possible, except in the event of potential spinal injury;
2. Contact Facility Manager or First Aiders; prepare for evacuation from St John's Island if necessary.
3. AED and stretcher are available in the Admin Office.

Emergency Evacuation

Evacuation to Singapore can be effected through a ferry operator (currently Singapore Island Cruise) or the Police Coast Guard; in the former case, arrangements must be made with the Singapore Civil Defence Force (SCDF) to have an ambulance (if needed) pick up the casualty at Marine South Pier (MSP).

In the event that the casualty cannot be moved (e.g., due to a spinal/head injury), please contact Police Coast Guard to activate SCDF and a paramedic brought over to the island for safe evacuation.

National Research Foundation (NRF) - National Research Infrastructure (NRI)

NRF introduced NRI framework in April 2015 to guide the development of selected research facilities that are to be operated as a national resource. The NRI framework enables continued investment in infrastructure upgrades to enable research development in a cost-effective way, in order that researchers in Singapore have ready access to critical research infrastructure and services to conduct cutting-edge research, and sustain R&D capabilities in Singapore.

The key guiding principles for operation of NRIs are:

- a) *Open Access* - NRIs, which has a host institution, must be made available to all research entities, public and private, in Singapore. The facility, including use of all equipment and technical support, should be made available for external entities to access and use on an equitable basis. The funding of NRIs is predicated on opening access to a larger user base and making the provision of research infrastructure services more cost-effective.
- b) *Collaborative Platform* - NRIs must serve as a platform for collaborative and inter-disciplinary research among local and international, and public and private researchers. This encourages synergies from interdisciplinary and collaborative research, which can drive the development of novel approaches and new technologies.
- c) *Charging Model* - Users of NRIs are charged depending on the degree of use and type of services required. The charges are used to cover operating costs of NRIs.

St John's Island National Marine Laboratory as a NRI

The St. John's Island National Marine Laboratory (SJINML), operated by the Tropical Marine Science Institute of National University of Singapore (NUS), is Singapore's only offshore marine research facility. The marine laboratory was opened on 3 October 2002 as a research facility of NUS. It is strategically located next to the Sisters' Islands Marine Park, Singapore's first marine nature reserve. The high quality seawater aquaria at SJINML provides unique opportunities for high impact research in marine science.

Based on considerations of its strategic research value and potential user base, SJINML was designated a National Research Infrastructure on **28 March 2016**. Operation of SJINML as a NRI commenced on **1 June 2016**, with facilities opened to all researchers commencing **22 August 2016**.

Mission

Singapore is strategically located at the crossroads between the Pacific and Indian Ocean. Its unique position in the tropical South China Sea offers unprecedented opportunity for rapidly advancing research discovery in tropical marine science, to secure Singapore's competitiveness in the global maritime industry and strengthen Singapore's blue economy in the long term. As one of the busiest transshipment hub in the world, Singapore is seamlessly connected to over 600 ports in 120 countries. This connectivity presents challenges for human health and marine environment management. The mission of SJINML as a NRI is to serve as a national resource and focal point for marine science expertise, supporting marine science research that meets our strategic national needs for the future.

As an NRI, it aims to:

- a) Enhance the quality of national marine science research by facilitating multi-disciplinary research interactions through provisions of quality access to research expertise, facilities and specialist training support;

- b) Conduct research that supports national agencies for projects of strategic significance;
- c) Increase high-impact research outputs in sustainability research;
- d) Catalyse collaborations that enhance strategic national and international research programs; and
- e) Implement manpower training programs to support future national needs in marine science.

Management

NUS as the host institution and facility owner is responsible for the primary management of SJINML and its facilities. SJINML will be managed by TMSI on behalf of NUS Office of the Deputy President (Research and Technology).

The Facility Governing Board of SJINML, appointed by NRF, guides the strategic development and business plan of the Facility, and directs changes where necessary to ensure the Facility achieves its strategic goals. The Board has oversight of financial governance and access policies of the Facility. It will review and approve the equitable access and charging policies to foster external usage and collaboration.

Under the NRI framework, personnel present at SJINML consist of:

- a) *“Programme Personnel”*, referring to employees of the Host Institution who manage the operations of the NRI; and
- b) *“Research Personnel”*, referring to any persons who use the Facility and its Equipment to perform research including those of the Host Institution, as well as persons from other third parties.

The Facility Director is responsible for day-to-day management of SJINML. The Facility Director is supported by program personnel overseeing: Administration, Facilities Management, Laboratory Management and Research. Research Personnel form the user base and main body of the Facility that sustains the scientific mission and research continuity at SJINML.

A) NRI Registration and Access Policy

- **EQUITABLE, OPEN ACCESS TO ALL RESEARCHERS**
- **A COLLABORATIVE RESEARCH ENVIRONMENT**
- **A SAFE WORK ENVIRONMENT**
- **PROMOTING ENVIRONMENT SUSTAINABLE PRACTICES**

1. User Registration

- All research personnel must first register to access facilities at SJINML by filling up a Facilities Request Form (Appendix A). This step is taken to ensure that research personnel at SJINML have adequate training to undertake their research activities in a safe manner.
 - The Facilities Request Form will be reviewed by the relevant Laboratory Managers to ascertain that SJINML has adequate facilities to support the proposed research projects.
 - **Medical evacuation to a hospital on mainland may take more than an hour: if you have an existing medical condition that places you at higher risk, please speak to the Admin Manager/Facility Director. We will advise if appropriate contingency measures are available to support your work on SJINML.**
 - Research proposals and projects are subjected to approval based on the following criteria:
 - **Small projects** requiring basic use of SJINML facilities (*value <\$10,000 per month) - approval from the Facility Director;
 - **Mid-sized projects** involving several full time researchers and commitment of resources (value >\$100,000 per year) - approval from the Facility Director in consultation with an Advisory Panel member;
 - **Large projects** (value >\$1m per year) involving several researchers and significant commitment of SJINML infrastructure require approval of SJINML Governing Board.
- *value of project in this instance refers to the research users estimated expenditure for facilities use and installation of new infrastructure/equipment.

2. Terms of Use and User Agreement Forms

- For NUS research personnel, SJINML admin office will send Research User and the Principal Investigator (or the authorized signatory for the relevant NUS WBS account) an email approving your use. All NUS researchers are required to abide by terms and conditions set out in the SJINML Handbook. NUS staff and students are expected to abide by all NUS' policies when they are present on SJINML premises.
- For personnel from non-NUS organizations, RESEARCH FACILITIES USE AGREEMENT Form (Appendix B) and/or INDEMNITY FORM (Appendix C) is required. Once your use is approved, the Admin Manager will work with you to ensure that appropriate legal agreement is in place. The forms must be completed, signed by the Research User and authorized signatory for the User's host institution before research may commence.

3. Safety Training Requirements

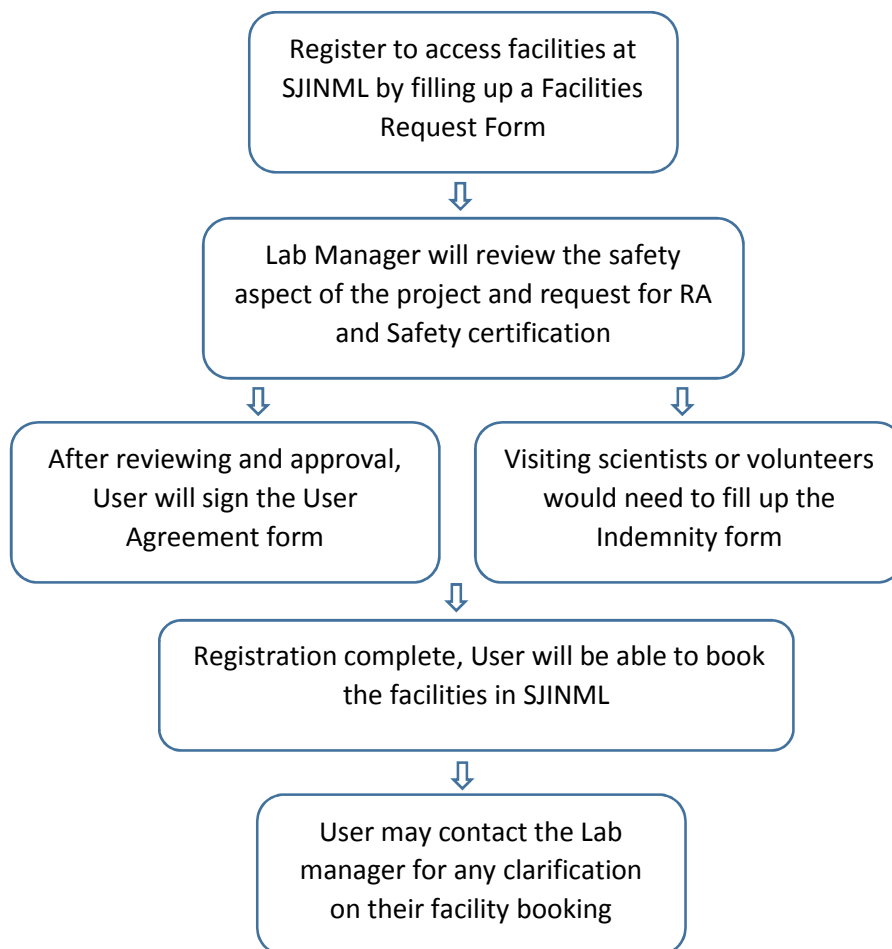
- All research users are required to hold valid safety training certificates as determined during registration, for entry into laboratories.
 - Chemical safety training from A*Star, SIT, NTU, NUS and SingHealth has been harmonized. Any other certifications not from aforementioned institutions will not be accepted.
 - Biological safety training has to be conducted via NUS OSHE until further notice.
- Where safety training is lacking, the research personnel will be required to complete the necessary training requirement before commencement of work.
- Research personnel are expected to submit a copy of endorsed Safety Risk Assessment form to the respective laboratory manager before commencing work.

- It is mandatory for all full-time research personnel to attend the SJINML Safety Briefing conducted by SJINML twice annually.

4. Booking of Facilities

- After registration is completed, the Research User will be able to book for access to required facilities.
- Note that charging of bench fees (*See next point*) and use of facilities will be based on the number of days in the Booking, not actual usage. As such, it is imperative that Research Personnel must cancel his booking at least 7 working days before the actual dates.
- Booking cancellations made ≥ 7 working days will incur no charge. Booking cancellations made between 3 to 7 working days will incur a 50% charge. No refunds will be made for bookings cancelled < 3 working days.
- To foster a positive spirit of cooperation and resource sharing, research personnel should not block book resources consecutively for ≥ 7 working days. If you have special requirements, please approach the Administrative Manager to assist to arrange for special provisions.

Registration and Facilities use process



Note that charging of bench fees and use of facilities will be based on the number of days in the Booking, not actual usage.

- Booking cancellations made ≥ 7 working days will incur no charge.
- Booking cancellations made between 3 to 7 working days will incur a 50% charge.
- No refunds will be made for bookings cancelled < 3 working days.

5. Schedule of Bench Fee Rates (Updated as of 17 February 2017)

USER TYPE	Cost (SGD)*
Short term/Daily Rate user	
Student (hot desking; Open Plan Office)	12.00
Researcher Type A (general user; Open Plan Office)	60.00
Researcher Type B (senior staff; Private Office)	70.00
Visiting Scientist (non-resident; Open Plan Office)	80.00
Visiting Scientist (Resident; no office, with Dormitory)	100.00
Non-academic/commercial user (Open Plan Office)	100.00
Use of Aquarium only (no personnel on site; basic use of aquaria)	20.00
Long term user	
Project student (4-6 months; <80 days)	960.00
Postgraduate Student (per annum)	3,600.00
Researcher Type A (per annum)	18,000.00
Researcher Type B (per annum)	21,000.00
Aquaria only (1m ³) (per annum)	6,000.00
Add-ons	
Bench space (Daily, per m ²)	5.00
Aquarium usage (Daily per m ³)	5.00
*excluding GST	

The basic bench fee includes:

- Daily ferry transport to/from St John's Island
- Desk space
- Shared use of research laboratories with basic equipment, aquaria (<1m³ in 2 m²) and bench space (<1 m²)
- Use of kitchen and dining facilities

Bench fees excludes:

- Laboratory consumables
- Meals
- Basic safety Personal Protective Equipment (PPE). Researchers are expected to bring their own PPE as required for their research.
- Disposal of hazardous waste (e.g. chemical, biological, bulky refuse)

Notes

- Open Plan Office refers to offices where there are several staff and students in each room. Some may be long term, some hot desking.
- Private Office refers to offices with <3 senior staff sharing an office.
- Long term user refers to staff/students that are based full time in SJINML. They will be given a fixed desk and bench space, as well as space to keep things on site.
- Short term/daily rate users are expected to make bookings for each day they come to use the lab. They are expected to remove their belongings from the desk and lab bench at the end of each day.
- Government agency staff enjoy the same bench fee rates as for academic users.

- For projects requiring >5m² laboratory bench and/or >5m³ aquaria facilities, the researcher is advised to approach Admin Manager with a proposal describing the intended usage and expected outcomes of the research for senior management approval (see Pg. 7).

6. Additional Facilities

Facilities	Cost (SGD)*
Research Vessel (R/V) Galaxea	
<i>Academic users</i>	
Daily rate for weekdays	700.00
Daily rate for weekends or public holidays	1,400.00
Additional fuel usage (per litre)	1.00
Marine Park Outreach & Education Centre (MPOEC)	
Dormitory (per bed)	30.00
Seminar Room (per day) <i>Max 70 pax</i>	250.00
Classroom (per day) <i>Max 20 pax</i>	250.00
*excluding GST	

Use of R/V Galaxea:

Research users may use the Galaxea for all dive and field work. The vessel has the capacity to hold 9 pax and 3 crews (steersman, engine driver and deckhand) for its trip, with a maximum speed of 24 knots. Overtime penalty applies for any trip extending before/ after operation hours (0900 hrs to 1700 hrs) for weekdays and for weekends, before 0900hrs and after 1600 hrs. Overtime charges would apply on an hourly basis at \$100/hr for weekday and weekend. Additional fuel usage incurred will be charged at \$1 per L. For Non-academic user, additional 60% overhead charge will be applied.

Requests for field trips before/after the operational and weekend/public holidays must be submitted at least 2 weeks prior to the intended use date. The use of R/V Galaxea is solely used for the purpose of research and education, and STRICTLY NOT for recreational or personal uses. See Section I on Field Work Safety.

B) General Information

1. TRANSPORTATION

Boat to and from St. John's Island (SJI):

- a. Ensure you have booked your travel in advance. For booking, please contact Facility Manger (Aquaria).
- b. SJINML researcher transport ferry (Singapore Island Cruise)
 - i. Departure from Marina South Pier (MSP) to SJI:
 - Mondays to Fridays at 0800 hrs
 - ii. Departure from St John's Island (SJI) public jetty to MSP
 - Mondays to Fridays at 1700 hrs
 - iii. Midday boat – priority to core staff and contractors. Limited seats are available for booking by researchers on Tuesdays and Fridays, on a first come first serve basis. Please check for availability at the Admin Office.
 - From MSP to SJI at 1200 hrs
 - From SJI to MSP at 1230 hrs
- c. The journey time is about 20-25 minutes.
- d. Ferry service is currently not available on Saturdays, Sundays and public holidays. If you require access on weekend and public holidays, please approach relevant Lab Manager.
- e. Please record your name and affiliation on the attendance book (available on board).
- f. For safety reasons, please ensure you wear proper footwear (at least sandals with backstraps) when boarding or alighting the vessel.
- g. In addition to the above services, public ferry services are available from Marina South Pier.
http://www.islandcruise.com.sg/ferry_schedule.html

Usage of buggies within SJI:

- a. Electric buggies are available to transport passengers, and heavy or bulky items between the Facility and the public jetty. Paths are narrow and steep; drive slowly and carefully. Never overload the buggies. Passenger buggies can carry a maximum load of 380kg (approx. 5 adults), while the cargo buggy has a maximum load of 500kg.
- b. Please contact the Admin Office prior to usage for registration.
- c. For safety and insurance reasons, only research personnel with valid Class 3 driving licences are allowed to drive the buggies. Please register with the Admin Office.

2. USE OF RESEARCH LABORATORIES (See also: Section on Laboratory Safety)

- a. Please ensure you have permission from the relevant Laboratory Manager for access prior to Commencement of Work.
 - i. Relevant Laboratory Managers will be assigned to users during the initial facility registration process
 - ii. All users will have to attend introductory briefing prior to commencement of work (mandatory)

- b. Pending renovation works, as of 25 September 2016, research requiring Biosafety Level 2 and/or IACUC facilities may not be conducted at SJINML until further notice.
- c. Please ensure you have valid Safety Training certificates, as specified in your registration, at all times.
- d. Under the framework of the Workplace Safety & Health Act, safety risk assessments for research activities must be conducted before commencement of any work. A copy of the relevant risk assessment should be filed with the Lab Manager before commencement of work.
- e. Note the nearest locations of exits, fire extinguisher, fire hose-reel, fire alarm call point, eyewash, emergency shower, first aid kit and chemical spill kit.
- f. No work with radioactive materials of any kind is allowed on SJINML premises.
- g. If you intend to bring any chemicals and regulated biological materials to SJINML, please inform the Lab Manager at least 4-6 weeks in advance.
- h. Appropriate procedures for waste disposal should be discussed with the relevant managers prior to commencement of work.
- i. Dispose of waste chemicals and sharp objects shall be handled with care. Toxic waste and organic solvents must never be poured down the sink. Waste bottles are available from the laboratory manager (more information on waste disposal under Laboratory Safety).
- j. Any liquids and solid waste contaminated with biological material should be decontaminated prior to disposal.
- k. Researchers planning to conduct any work with fish, vertebrate and cephalopods, must have appropriate clearance and approval from NUS-Institutional Animal Care and Use Committee (IACUC). Please approach Laboratory Manager if you require IACUC-approved facilities.
- l. Please keep your workspace clean and tidy. Proper Personal Protective Equipment (PPE) should be in place. Such as Lab coat, covered shoes, etc.
- m. Personnel must wash their hands after handling biological materials, and before they leave the laboratory working areas.
- n. Covered footwear is required to be worn in all laboratories.
- o. Eating, drinking, smoking, applying cosmetics and handling contact lenses is prohibited in the laboratory working areas.
- p. Storing foods or drinks anywhere in the laboratory working areas is prohibited.
- q. Laboratory personnel are expected to have appropriate training in the research procedures for their projects. Junior researchers must be accompanied and supervised by a trained researcher.
- r. It is recommended that researchers should not work alone after office hours.
- s. Avoid running experiments unattended overnight. Where necessary and safety precautions put in place, the set up must be accompanied with a note containing information of the biological / chemical hazards involved, name of researcher and his/her contact number in case of an emergency.
- t. See Section F on Laboratory Safety

3. USE OF SEAWATER AQUARIA (AQUARIUM A, B, OPEN AQUARIUM)

- a. Please ensure you have permission from the Facilities Manager (Aquaria) for access prior to Commencement of Work.
- b. *As our aquaria facilities will be undergoing renovations, as of 25 September 2016, no research activities requiring BSL 2 and IACUC approval may be conducted at SJINML until further notice.* Note that any research involving fish, cephalopods or any other vertebrate animal requires clearance and approval from NUS-Institutional Animal Care and Use Committee (IACUC).
- c. Please ensure you have valid Safety Training certificate covering your activities at all times.
- d. Please ensure that you familiarize yourself with the SJINML emergency response plan and aquarium system before work commencement.

- e. Ensure that you have conducted relevant risk assessments for all your activities before commencement of any work. A copy of the relevant risk assessment should be filed with the Facilities Manager (Aquaria).
- f. No toxic and/or hazardous substances may be used in this facility. If you are introducing any chemicals into the aquarium for any purpose, consult your aquaria facility manager prior to any use of such substances. Appropriate safety measures must be in place, including ensuring that such substances do not affect other users nor cause harm to the environment. As the aquarium is a flow-through system, any substance introduced into the tanks will find its way to the sea.
- g. All users must label their tanks clearly indicate their name(s), affiliation, emergency contact number, title of project, number of tanks/troughs used and duration of occupancy on the side of the aquarium(s). Unlabelled tanks will be treated as not-in-use and will be assigned to other users without notice.
- h. Display the correct colour code tags from the lab managers for your tank system requirements (blue: running water, green: aeration, white: lighting).
- i. Ensure your experiment setup does not pose any hazard to others i.e. tripping hazard, electrocution and electric fire hazard, as well as falling objects hazards.
- j. Electrical equipment must be used with extreme care and caution in the aquariums; all electrical contacts must be protected from moisture and seawater. Dry your hands before handling any electrical contacts. Keep electrical devices away from tanks. Secure them safely so that they do not fall. Do not overload power sockets.
- k. Wear appropriate covered footwear (e.g., non-slip track shoes, safety boots, sandals with back straps or booties; slippers and flip-flops are not allowed) in the aquarium. The floor may be wet and slippery, and sharp edges may be present. Injury due to slips and falls will be serious, and head injuries may occur. Be alert when working in the aquarium and exercise caution at all times.
- l. Do not drain tank water onto the floor. Siphon water directly into the aquarium drainage system. Do not discharge any seawater into garden areas.
- m. Do not discharge items such as sands, pebbles, stones etc. into the aquarium discharge system because they will clog the piping system.
- n. Use the designated washing area for washing items, equipment and sorting of animals.
- o. No storage of items in the aquarium without approval from the Aquarium Facility Manager. Any items stored must be clearly labelled with the user's name, contact number and storage period. Unlabelled items will be treated as unwanted waste and may be disposed at the discretion of the Aquaria Facility Manager. A penalty fee will be imposed for disposal of items left behind by researchers.
- p. Practice good housekeeping. Keep the surrounding areas dry and neat.
- q. Do not tamper with other users' tanks.
- r. Do not change any aquarium settings (e.g. flow rates, aerations etc) in the main feed without permission from the aquarium facility manager or else will be penalised.
- s. Tighten the air valves in experimental tanks when not in use.
- t. Never touch any marine organisms that you do not recognize. Use PPE at all times when handling living materials and when cleaning tanks. If you have been stung, alert First Aiders and seek medical treatment immediately.
- u. When you have completed your work, please ensure that you leave the tank clean and dry so that it is ready for use by the next user. All rubbish and biological waste must be disposed of in a suitable and safe manner. An inspection will be carried out by the Aquarium Facility Manager and the user on the last day of usage (Refer to Appendix B).

4. USE OF DORMITORY AND KITCHEN BLOCK

Dormitories:

- a. All Users must register to stay overnight. Please enquire at the Admin Office for room availability. Bedlinen and keys to rooms are available from the Management Support personal
- b. Students planning to stay overnight must be accompanied by at least one staff.
- c. A nominal sum of \$30 per night is chargeable to dormitory users;
- d. Please leave footwear outside the rooms;
- e. Do not leave valuables unattended;
- f. Note the locations of exits, fire extinguisher, fire hose-reel, fire alarm call point, and first aid kit nearest you.
- g. A washing machine and dryer are available for your use free of charge on the ground floor; please read instructions before operating the equipment. If in doubt, please contact Mr Razali.
- h. Hot and cold drinking water from floor-standing dispensers are available.
- i. No food and drink in the dormitories.

Toilets

- a. Please do not dispose of sanitary napkins and paper towels into toilet bowls as our sewage system cannot cope with such material.
- b. If you intend to wash mud and sand off yourself after a field trip, please use suitable wash points available in Aquarium A and B as well as outside the pantries at Blocks A and B.

Kitchen

- a. No naked flames allowed in the kitchen.
- b. Please ensure you understand how to operate the kitchen equipment before using it. All hobs must be turned off before leaving the kitchen; do NOT leave cooking unattended;
- c. Please keep the cooking utensils clean and cooking area tidy;
- d. Please wash all utensils and crockery after each use;
- e. Wipe the stove clean after each use;
- f. Note that we have facilities set aside for Muslim staff. Please observe appropriate "halal" etiquette.
- g. Please remove all foodstuff from the refrigerators before you leave the institute.
- h. Dispose of liquids into sink and not into pantry bins.
- i. Ensure that all food waste is disposed into the bin located in the Kitchen.

Pantry Areas

- a. No cooking is allowed in the pantry areas.
- b. Please wash all utensils and crockery after each use;
- c. Dispose of liquids into sink and not into pantry bins.
- d. Ensure that all food waste is disposed into the bin located in the Kitchen.

5. USE OF OFFICES

- a. A desk will be assigned to User after registration. This space is intended only for writing and computer work and may not be used for any kind of laboratory research work. Do not bring any

research samples or chemicals into the offices. Do not use your desk space as storage space for laboratory consumables.

- b. Lab coat and gloves should not be worn into the office.
- c. Users should refrain from eating in the office. Please ensure you keep your desk clean. Any kind of packaging used to contain food and all food waste must be discarded in the bins in the kitchen.
- d. Observe good safety practices - avoid use of multi-pin plugs, and overloading power points with multiple devices. Do not leave electrical devices on when you are not in the office. Switch off all power points when you leave in the evening.
- e. Hot-desking: Please ensure you remove all your belongings when you have completed your workday.
- f. Researchers are advised not leave confidential documents lying unsecured at your desk.

6. USE OF FACILITIES IN THE MARINE PARK OUTREACH & EDUCATION CENTRE (MPOEC)

The Marine Park Outreach and Education Centre aims to promote awareness of marine conservation and environment sustainability through public education and outreach. The Centre was established in collaboration with the National Parks Board in 2015, with the opening of the Sister's Island Marine Park Public Gallery.

For booking of facilities of the MPOEC, please contact Outreach officer or Management Support Personnel.

For arrangement of visitor programs and educational workshops, please contact Snr Manager, Education.

Note that the first floor Public Gallery area is open to the public between 10am – 4pm daily. Please keep valuables secured, and ensure the rooms are locked when there is no one present.

Seminar Room

- a. The maximum capacity for this room is 70 pax.
- b. No eating and drinking in the seminar room

Meeting Room

- c. The maximum capacity for this room is 15 pax.
- d. Only light refreshments are allowed in the meeting room

Teaching Lab, 2nd Floor

- e. The maximum capacity for this room is 20 pax.
- f. No eating and drinking allowed in the teaching lab

Deck Area

- a. Maximum capacity is 20-30 pax

Nparks Gallery and Aquaria

- a. Maximum capacity in the Gallery Area is 20 pax.
- b. Do not tamper with the displays

Safety Briefing for SJINML events

The person in charge of the event is required to provide a safety briefing. This must include:

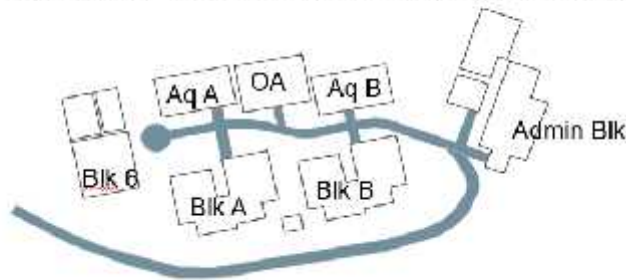
- a. Call to the attention of everyone present before the beginning of an event, the location of exits. State exits that are not locked.
- b. Announce the following: “For your own safety, please pay attention now to your nearest exit. In case of emergency, walk; do not run to the exit.”

Please refer to Admin Office for copy of the presentation “Safety Briefing for Visitors”.

Safety at Public events:

- a. Please ensure you have conducted and filed appropriate safety risk assessment. Indemnity forms should be issued for programs wherein non-NUS members are present.
- b. Research activities involving the use of chemicals and hazardous materials may not be conducted at MPOEC premises. Hazardous chemicals and equipment may not be stored at the MPOEC. Where workshops may require specific chemicals/equipment, please seek approval from Admin Office before commencement of the activity. These materials should only be brought into the building when required and should not be stored at MPOEC.
- c. Catering for events – Please inform the Admin Office at least 2 weeks in advance if you intend to organise a function and/or intend to organise catering for any events to be held in SJINML premises.

Location of Admin, Office/Lab Blocks & Aquarium



7. USE OF RESEARCH VESSEL & DIVING FACILITIES

- a. The Research Vessel Galaxea (SR 3049Z) is a 12m work boat, installed with an “A-Frame” and winch along with 600m of steel cable. The vessel is capable of carrying a maximum of 12 Pax on board inclusive of the 3 crew members namely the steersman, engine driver and deckhand/safety diver. The boat is installed with navigational aid (Raymarine E120 and depth sounder). Cruising speed is about 15 knots. The vessel is equipped with an A-frame and hydraulic winch that can lift loads up to 400 kg.
- b. R/V Galaxea is reserved solely for research and educational work activities, and STRICTLY NOT to be used for any recreational or personal activities.
- c. All persons who will board R/V Galaxea for work must be registered with St John’s Island National Marine Lab (SJINML) as a Research User, including volunteers and any visiting scientists. This step is intended to ensure safety and insurance compliances are in order for all staff, researchers and facilities.
- d. Given the limitations for rapid emergency medical evacuation at sea, if you have any medical conditions which may place you at higher risk either during the field trip or during an emergency evacuation at sea, you are strongly advised to re-consider participating in the trip. Individuals are responsible for discussing any known medical conditions with their supervisor and Field Support

Officer (FSO), bearing in mind the liability they pose to themselves and others in the research mission. For safety reasons, all researchers working on board R/V Galaxea are expected to be able to swim.

- e. All researchers must have appropriate safety training required to complete the fieldwork planned on board, with safety risk assessments duly completed and approved by your Project PI. Risk assessment should include the use of life jacket for work on the boat. Note that any research activities involving vertebrates and cephalopods require approval from your institutional IACUC. Please ensure you have completed the relevant training and obtained the approvals for your research before commencing work.
- f. All researchers are expected to observe good work practices that minimize any harmful impact to the environment. This includes appropriate discretion in the design of your research and competent conduct of research activities at sea. Do not litter. No refuse shall be thrown overboard.
- g. Research Permits: Please ensure you have all the necessary research permits for collection of marine samples. Information on research permits for collection of marine life may be found on the National Parks Board website: <https://www.nparks.gov.sg/biodiversity/resources-and-research-permits>. Note that Research Permit Applications may take up to 3 months for approval.
- h. Entry into Restricted Areas: Users are also expected to apply for permits (including names of crew) for entry into restricted areas and provide the Vessel Steersman a copy of the permit one day before the field trip. Users are also to refrain from sampling at sites very close to the Port Limit.
- i. Dive Policy: As of 1 January 2017, NUS registered divers may use R/V Galaxea for research diving on condition that they provide copy of approval from NUS Office for Safety Health & Environment. Researchers from other institutions who wish to conduct research diving off R/V Galaxea should contact SJINML Administration and advise us of your institutional dive policy. This step is to ensure researchers have the appropriate training and area adequately insured.
- j. Safety First Policy. Working on a vessel at sea is inherently dangerous. As such, every member on board must be safety conscious at all times. Insofar as safety is concerned, the Vessel Steersman has been assigned authority to suspend any activities, which he deems unsafe. Research users are expected to take heed of all safety instruction from the crew. For diving activities, the dive supervisor reserves right to cancel the dive if sea conditions are unsafe. In the case of serious injury or medical emergency, scientific work will be terminated. The vessel will proceed immediately to evacuate the patient to the nearest ferry point for transfer to hospital. SJINML management reserves the right to suspend any researchers from conducting work on R/V Galaxea with immediate effect if their activities are deemed unsafe or inappropriate.

BOOKING PROCEDURE:

- k. Step 1: All users must register with SJINML Admin as a Research User (see below). For safety compliance, only registered users may board the vessel.
- l. Only one person needs to fill up a Request Form for each trip but he/she must declare all the personnel participating in the field trip. All personnel must be registered SJINML Research Users.
- m. The Work Request Form (Appendix D) must be submitted to FSO at least 1 week before the field trip.
- n. The booking calendar will be opened for bookings in 3 month blocks. Bookings are accepted as early as 3 months in advance and at least 3 days before the intended use. This allows the crew to plan for maintenance activities.
- o. Block booking is discouraged. As SJINML facilities are shared resources, in general, we will only grant a block booking if the booking does not obstruct other users from completing their work. If you require consecutive booking for more than 3 days in a week, please email Admin Manager with justification.

- p. Cancellations: Once you have made a booking, you will be charged the full fee of \$700/day whether or not you actually use the vessel on that day. As such, users are advised to cancel bookings (email FSO) as soon as possible if, for any reason your field trip cannot proceed. Booking cancellation made more than 7 days before the booking date will not incur charges. Any booking cancellation between 3 to 7 days before the booking date will incur a 50% charge. No refund will be provided for cancellations less than 3 days prior to the booking date. No penalty will be imposed if you are able to transfer your booking to another user.
- q. Multiple Users requesting the Same Date: SJINML has only limited resources to be shared. As such, we seek all users' cooperation to facilitate different activities of our marine science community. In event that multiple users require the same date for work, the FSO will inform the relevant parties. We encourage users to collaborate and agree on a mutually acceptable alternative plan. If no resolution is reached within 10 days of the booking date, a ballot will be taken. The results of the ballot will be final.

BOAT USE CHARGES:

- r. Per day rate for weekdays is S\$700 inclusive of 300L fuel (equivalent to 2–3 hrs cruising) and three (3) crew comprising the steersman, engine driver, and deckhand.
- s. Per day rate for weekends and public holidays is S\$1,400 inclusive of 300L fuel (equivalent to 2–3 hrs cruising) and three (3) crew comprising the steersman, engine driver, and deckhand.
- t. A surcharge of \$1.00 per litre will be imposed for fuel consumption exceeding 300 litres per trip. For example, a return trip from Raffles Lighthouse to Republic of Singapore Yacht Club (RSYC) consumes about 300L of diesel.
- u. 60% additional charge will be levied for non-academic users.
- v. Operation Hours are from 0900 hrs–1700 hrs on weekdays. Please ensure you arrive at the marina early and are ready to set off by 9am. Ensure you complete your work in a timely manner so that the vessel is able to return to RSYC and disembark by 5pm. These timings are to ensure the crew have sufficient time to prepare the vessel before/after a trip, and get off work on time every day.
- w. Overtime charges on weekday will apply to any service after 1700 hrs or before 0900 hrs and for weekends, any services after 1600 hrs or before 0900 hrs. In due respect to the crew who have families, please ensure you plan for and complete your work on time. Note that there are strict rules regarding employment of non-academic staff after hours. As such, if you require use of R/V Galaxea after operation hours, please apply to FSO at least 2 weeks in advance, so appropriate staff arrangements can be made. SJINML management reserves the right to suspend any users who persistently incur overtime without prior arrangement.
- x. Disembarking at an alternative location: In event that you require the vessel to be berthed at a different location overnight, please ensure that you have made all the arrangements with the marina to host our vessel, as well as appropriate transport provisions for the crew. All expenses are to be borne by the project. The staff's travel to an alternate marina will be chargeable to the user. If you choose to embark/disembark from an alternative location, note that the start/end time for your trip will still be based on the time of departure/arrival of R/V Galaxea at RSYC. Overtime charges will apply if the crew have to work outside operation hours in order to reach the alternate pickup point.
- y. Bookings on weekends and public holidays are possible but strongly discouraged, given strict NUS guidelines for employment of non-academic staff outside office hours. Overtime charges will apply. If you must use the vessel after operation hours, please apply at least 2 weeks in advance so that suitable arrangements can be made.

SAFETY

- z. Under Workplace Safety & Health Act, a risk assessment must be conducted for all research activities including fieldwork. Please submit a copy of your risk assessment to the FSO prior to commencement of work. Please ensure that you have all PPE required for use of equipment on board (e.g. safety shoes, gloves, helmet, etc) as specified in the Risk Assessment submitted.
- aa. The crew on board Galaxea will not be responsible for equipment loss or damage, or loss of personal valuables. Research users are expected to take appropriate measures to safeguard equipment and personal belongings, including taking appropriate insurance for sensitive and high value equipment.
- bb. As Singapore waters are heavily patrolled by the coast guard, all Singaporean and Permanent Residents are advised to carry their personal identity card and non-citizens should bring their passport/FIN card when conducting fieldwork at sea.
- cc. Users are strongly encouraged to check their field equipment and materials prior to the start of the field trip (before 9am) so that the field trip can commence on time. No waiver of charges will be provided if the trip is called off due to problems with the researcher's equipment on the day of the booking.
- dd. For safety reasons, the winch on board R/V Galaxea should ONLY be operated by the crew of R/V Galaxea. If you have special requirements, please inform FSO at least 1-2 weeks in advance of your booking date.
- ee. If you will be using any chemicals or hazardous materials for your research and will be carrying these on board R/V Galaxea, please seek permission from FSO at least 2 weeks before your trip. Please provide a copy of the MSDS, relevant permits and safety risk assessment. Work closely with FSO to ensure that appropriate safety controls and emergency procedures are in place before commencing trip. Research users are responsible for supplying all the required chemical spill kits and PPE.
- ff. Any accidents, injuries or illnesses are to be immediately brought to the attention of the Vessel Steersman.
- gg. ***Only research personnel from NUS are allowed to use R/V Galaxea for research diving, on condition that they provide evidence (such as copies of risk assessment, approved dive plan and medical certificate) that they have conformed to the NUS Dive Safety Policy. Access for other organisations will only commence after the dive code covering scientific research is approved by MOM, subject to conditions set by the respective institutional safety office***
- hh. See below sections I on DIVE SAFETY

8. APPLICATION OF RESEARCH PERMITS FOR RESEARCH PROJECTS CONDUCTED IN SINGAPORE

- a. Note that St John's Island, as well as other islands in the vicinity, are gazetted as Marine Nature Areas by the National Parks Board.
- b. Please refrain from indiscriminate collection of marine animals and plants.
- c. Before Commencement of Work, please ensure that you have appropriate research collection permits and conduct your work in a responsible manner.
- d. Information on research permits may be found on the National Parks Board website: <https://www.nparks.gov.sg/biodiversity/resources-and-research-permits>
- e. Note that Research Permit Applications may take up to 3 months for approval.
- f. Please inform the relevant Lab Manager at least 7 working days in advance, if you intend to bring in any marine organisms into the facility for research, in particular organisms governed by specific legal and health safety regulations.

9. GOOD ETIQUETTE IN A SHARED WORKSPACE

As our research community consist of people from different races and cultures with different social practices, we seek the cooperation of all personnel to be respectful of etiquette in common spaces

- a. Respect your peers - Everybody comes from a different background and has a different level of knowledge; but everybody deserves the same level of respect and courtesy.
- b. Cleanliness in the lab - when working in shared spaces, respect others by keeping the area clean and remove messes as soon as you have finished your work. Always keep your workspace and desk space clean. Take extra care with common equipment and tools so they may remain in good condition for the next user. Ensure you do not infringe on others' space.
- c. No pets are allowed in the SJINML facilities, office and laboratory. Avoid feeding wild animals (including stray animals) on the premises as leftover food encourages pests.
- d. Switch your personal devices (computers, cell phones, radios) to silent mode when you are working in the office and lab. If you need to conduct a long conversation on your cell phone, step out of the office/lab.

10. EXTERNAL CONTRACTORS AND VENDORS

- a. All contractors must report to the Admin Manager for clearance before entering the research facilities.
- b. Please seek approval from Admin Office before commencement of any contract work in SJINML.
- c. The contractor shall provide the particulars by filling up the Contractor Particulars Form, Contractor/visitor/Supplier Declaration Form and comply with the requirements by filling up the Contractor Acknowledgement Form. A work schedule, equipment tool list and risk assessment must be submitted for the work undertaken.
- d. Formal approval is required if work involves any of the following:
 - Hot work
 - Working at heights > 3m
 - Scaffolding Work
 - Lifting with Mobile Crane
 - Confined Space
- e. Contractor should not store any unnecessary materials on SJINML and should remove all materials and equipment after the work has been completed.

11. OTHER INFORMATION

- a. Smoking: in line with NUS' Smoking-free campus policy, no smoking is allowed in all buildings and enclosed areas.
- b. Personal protective equipment – these are expected to be provided for and maintained by the User's research grant and/or parent organisation.
- c. Members of public and persons not registered as Research Personnel (= "Casual Visitors") may not enter the research areas, but confine their visit and activities to the MPOEC block only.
- d. Children and minors in the workplace – No minor or child < age 13 is allowed into any research area where hazards associated with research may be present, unless the parent/guardian has obtained written permission from the Facility Director.

C) WORKPLACE SAFETY

Providing a Safe Work Place for Everyone is Our First Priority

The National University of Singapore (NUS) is committed to ensuring a high standard of occupational safety and health (OSH) for our staff, students and visitors to the campus in association with its research, teaching and service activities. This commitment is demonstrated through implementation of the following policy statements.

Policy Statement

1. Legal Compliance

NUS is committed to comply with all applicable occupational safety and health legislation, guidelines and standards that it subscribes to; and other corporate policies that it adopts which are related to its OSH hazards.

2. Implementation of Occupational Safety and Health Management System and Programmes

NUS shall proactively identify, assess and control the OSH hazards associated with its activities to prevent injuries and ill health to staff, students and visitors. This shall be achieved through the implementation of an OSH management system and various OSH programmes, standards and directives at the University, faculties and departments. The specific requirements of managing OSH risks are detailed in the various NUS OSH manuals. We seek your cooperation to observe all OSH guidelines provided in this handbook to ensure a safe work environment all for users of SJINML.

3. Safety Culture

NUS is committed to building a positive OSH culture and learning experience for all staff and students through the adoption of OSH best practices and systems.

4. Regular Review

The University's OSH management system shall be reviewed periodically to ensure its relevance and effectiveness in order to achieve improvement in its OSH performance.

Work Safety

Our staff are committed to ensure that safety system & procedures are developed and implemented to prevent injury & ill health, to protect University's properties and ensure a healthy and safe working environment at SJINML. To this end, we seek the cooperation of all research users of the St John's Island National Marine Laboratory.

- a. Medical evacuation to a hospital on mainland may take more than an hour: if you have an existing medical condition that puts you at higher risk, please speak to the Admin Manager/Facility Director. We will advise if appropriate contingency measures are available.**
- b. Remain vigilant and keep yourself informed of conditions affecting safety and health.
- c. Actively participate in training programs and safety briefings, as well as regular fire drills and evacuation training.
- d. Adhere to safety and health practices in the laboratory.
- e. Report to the Lab Manager or Admin Manager if you observe any serious hazards in the workplace, classroom or laboratory.
- f. Familiarize yourself with the attached Safety & Health information.
- g. Ensure you conduct risk assessment for all work-related activities before you start work. Seek advice from our Lab Managers if you are not sure how to proceed with this. (Refer to Appendix C).
- h. It is not recommended to work alone in the facility.
- i. Familiarize with the safety and health regulations applicable to your research activities.
- j. Ensure you know where the nearest first aid kit and location of the Automatic External Defibrillator (AED). Only trained personnel can operate the AED.
- k. Report all accidents and incidents to the Admin Manager within 24hrs.
- l. Keep a list of the Emergency Numbers with you at all times. (Refer to staff directory)
- m. Transport of chemicals and hazardous substances into SJINML will require application at least 4-6 weeks in advance. PIs are responsible for the safe transportation of chemicals into the facility. Admin charges will apply if additional license is required for its transport and storage in SJINML. For more details, please refer to section G and H
- n. As there are currently no BSL2 containment facilities is available, use of biological agents and toxins under BATA and GMOs is prohibited until further notice.**
- o. Use of radioactive substances is also prohibited.**

D) Acts and Legislations

APPLICABLE LEGISLATION

The following information describes the requirements for all researchers undertaking laboratory-based research projects.

Workplace Safety & Health Act

The Workplace Safety and Health Act (WSHA) stipulate the workplace safety and health obligations to be fulfilled, as well as responsibilities of every person in the workplace.

The WSH (General Provisions) Regulations stipulate provisions for statutory examination for pressure vessels, protection for working at height, lock-out procedures and safe work practices for hazardous substances. The WSH (Incident Reporting) Regulations provides requirements for notification and reporting of death, injuries, dangerous occurrences, and occupational diseases.

The WSH (First Aid) Regulations require first aid resources to be provided in the workplace. The WSH (Risk Management) Regulations specifies requirements for risk management which include the conduct of risk assessment and implementation of control measures.

Details about the WSHA and the subsidiary legislation are available at the Ministry of Manpower website. <http://www.mom.gov.sg/workplace-safety-and-health/workplace-safety-and-health-act>

Fire Safety Act

The Fire Safety Act and its subsidiary legislation specify requirements for fire protection facilities in buildings, appointment of Fire Safety Manager, and provision of fire emergency response plans for the occupants. Specifically, the transport, storage and usage of petroleum and flammable materials (PFM) are regulated under the Fire Safety (Petroleum and Flammable Materials) Regulations.

All research users must declare to the Lab Manager all PFMs they intend to use, and comply with Lab Manager's instructions on use, storage and disposal of PFMs.

Environment Protection and Management Act

The Environmental Protection and Management Act (EPMA) and its subsidiary legislation govern environmental pollution: air, water, land, and boundary noise, management of hazardous substances as well as energy conservation for refrigerators and air-conditioners.

The EPM (Hazardous Substances) Regulations require application for a Hazardous Substance Permit from the National Environment Agency (NEA) to purchase, store and/or use scheduled hazardous substances (refer to Management of Hazardous Substances for more information). The EPM (Ozone Depleting Substances) Regulations prohibit the importation from and exportation of ozone depleting substances (ODS) to certain countries. The EPM (Air Impurities) Regulations control the emission of dark smoke and other air pollutants from any trade, industry, process, fuel burning equipment or specified industrial plant. The EPM (Trade Effluent) Regulations specify the limits for discharge of trade effluent into a watercourse and controlled watercourse. More details are available at: <http://www.nea.gov.sg/anti-pollution-radiation-protection/chemical-safety/hazardous-substances>

All research users must declare to the Lab Manager all chemicals they intend to use at SJINML, and comply with Lab Manager's instructions on use, storage and disposal of chemicals.

Environmental Public Health Act

The Environmental Public Health Act (EPHA) and its subsidiary legislation govern environmental health issues. Specifically, the EPH (General Waste Collection) Regulations and EPH (Toxic Industrial Wastes) Regulations provide requirements for the storage and collection of general wastes and toxic industrial wastes. More information available at: <http://www.nea.gov.sg/anti-pollution-radiation-protection/chemical-safety>

All research users must declare to the Lab Manager all chemicals they intend to use at SJINML, and comply with Lab Manager's instructions on use, storage and disposal of chemicals. Do not dispose of any chemicals in the sink or into seawater discharge.

Sewerage and Drainage Act

The Sewerage and Drainage Act (SDA) and its subsidiary legislation govern the installation and maintenance of the public sewer and connecting drainage. Specifically, the SD (Trade Effluent) Regulations regulate the discharge of wastewater into public sewers. More information available at: <http://www.nea.gov.sg/anti-pollution-radiation-protection/water-pollution-control/allowable-limits>

Do not dispose of any chemicals or waste into the sink, into seawater discharge or into the sea. More information available at: <http://www.mpa.gov.sg/web/portal/home/port-of-singapore/maritime-legislation-of-singapore/prevention-of-pollution-of%20the-sea-act> for the Prevention of Pollution of the Sea Act.

Chemical Weapons (Prohibition) Act

The Chemical Weapons (Prohibition) Act requires application of licence to use, develop, produce, acquire, stockpile, retain or transfer specified chemicals covered under the Chemical Weapons Convention (CWC). The Act also requires declaration of processing, consumption and storage of scheduled chemicals to be made annually to the Singapore Customs. The list of controlled chemicals can be found in the National Authority (Chemical Weapons Convention) website: <https://www.customs.gov.sg/businesses/chemical-weapons-convention/controlled-chemicals>

Please inform the Lab Manager if you intend to bring any chemicals listed under the CWC to SJINML, at least 2 months in advance.

Poisons Act

The Poisons Act regulates the importation, possession and sales of potent medicinal substances (poison) to prevent misuse/ illicit diversion of poisons. Application of Form A Poison Licence from the Health Science Authority (HSA) is required for the purpose of import, possess for sale, sell or offer for sale any poisons. However, Poison Licence is not required if the poisons are purchased from local vendors. For more info, click the link:

http://www.hsa.gov.sg/content/hsa/en/Health_Products_Regulation/Manufacturing_Importation_Distribution/Overview/Audit_and_Licensing_Of_Importers_Wholesale_Dealers_and_Exporters/Poisons_Form_A_Poisons_licence.html

Please inform the Lab Manager if you intend to bring any chemicals listed under the Poisons Act at least 1 month in advance.

Arms and Explosives Act

Under the Arms and Explosives Act, application of licence from the Singapore Police Force (SPF) is required for the possession, control, import, export and manufacture or dealing with gun, arms, explosives, poisonous or noxious gas or substances, and these include explosive precursors (EP). Please refer to Arms & Explosives Licence for more details on application for licence and for the list of EP at <http://www.police.gov.sg/e-services/apply/licenses-and-permits/arms-and-explosives>

Please inform the Lab Manager if you intend to bring any chemicals listed under the Arms & Explosives Act at least 1 month in advance.

Misuse of Drugs Act

The Misuse of Drugs Act controls the manufacture, supply and possession of precursor chemicals necessary in the manufacture of controlled drugs as well as provides regulations on the import, export and trans-shipment of these chemicals. Under the Misuse of Drugs (Controlled Equipment, Material and Substances) Regulations, application of permit from the Central Narcotic Bureau (CNB) is required for the import or export of controlled drugs, and controlled equipment, materials or substances useful for manufacturing controlled drugs.

Please inform the Lab Manager if you intend to bring any controlled substances listed under the Misuse of Drugs Act at least 2 months in advance.

Radiation Protection Act

The Radiation Protection Act and its subsidiary legislation regulate the manufacture, possession, use, import and export of irradiating apparatus and radioactive materials. Application of licence from the Centre for Radiation Protection and Nuclear Science (CRPNS), part of National Environment Agency, is required for lasers of certain class, ultrasound apparatus of certain power output, ionizing irradiating apparatus such as x-ray, and radioactive materials.

As of 1 September 2016, no radioactive substances may be transported into SJINML. Research with radioactive materials including radio-isotopes may be conducted on the premises.

Biological Agents and Toxins Act

The Biological Agents and Toxins Act (BATA) administered by the Ministry of Health (MOH) came into force on 3 January 2006 in Singapore. The BATA prohibits and otherwise regulates the possession, use, import, trans-shipment, transfer and transportation of biological agents, inactivated biological agents and toxins that are of public health concern. For more information on biosafety and list of organisms listed under BATA, please refer to: https://www.moh.gov.sg/content/moh_web/biosafety.html

Researchers intending to undertake work with any biological materials covered under BATA must first seek permission from SJINML Administration to ensure appropriate safety compliances are in place before commencing work.

WHO Laboratory Biosafety Manual

MOH has also adopted the Laboratory Biosafety Manual, 3rd Edition, by the World Health Organization (WHO) as the national guidelines for biosafety to supplement the BATA. The Manual provides guidance on a range of topics, including laboratory biosecurity, laboratory equipment, good microbiological techniques, biotechnology, other safety issues such as chemical, fire and electrical safety, safety organization and training, and checklist.

All research staff are required to exercise guidelines for biosafety given in the WHO Lab Biosafety Manual. <http://www.who.int/csr/resources/publications/biosafety/en/Biosafety7.pdf>

Singapore Genetic Modification and Advisory Committee

For projects which involve genetic manipulation or research on genetically modified organisms (GMOs), the guidelines - "The Singapore Biosafety Guidelines for Research on Genetically Modified Organisms (GMOs)" from the Genetic Modification and Advisory Committee (GMAC) are to be adhered to. The Guidelines cover experiments that involve the construction and/or propagation of all biological entities (cells, organisms, prions, viroids or viruses, plants and animals) which have been made by genetic manipulation and are of a novel genotype and which are unlikely to occur naturally or which could cause public health or environmental hazards. The Guidelines also have provisions for the importation of GMOs and/or GMO-derived products for research purposes.

Please refer to Singapore Biosafety Guidelines for Research on GMOs for full set of guidelines. http://www.gmac.gov.sg/Index_Singapore_Biosafety_Guidelines_for_Research_on_GMOs.html

Please inform the Lab Manager if your research is likely to involve the use of GMOs. GMOs for use in research should not be transported to SJINML without prior permission.

Infectious Disease Act

The Infectious Disease Act (IDA) is the principle legislation for the control of outbreaks and prevention of infectious diseases in Singapore. The IDA and Infectious Disease (Notification of Infectious Disease) Regulations stipulate requirements for person(s) who know, or has reason to suspect, the existence of an infectious disease to notify the authority and take measures to prevent the exposure of other persons to the risk of infection.

IATA Dangerous Goods Regulations

The International Air Transportation Association (IATA) Dangerous Goods Regulations specify requirements for classification, marking, packing, labelling and documenting dangerous goods for air shipments.

E) Fire Safety

The National University of Singapore is committed to a high standard of fire safety and will make all reasonable efforts to adopt best practices and compliance with the Fire Safety Act, Codes of Practice and all other current fire safety legislation and standards.

Research Users must comply with instructions given to them in regards to fire safety and any other fire procedures;

- a. Know what to do in the event of a fire, including leaving equipment in a safe position
- b. Familiarize yourself with the escape routes
- c. Consider the risk of fire from your activities; reduce or control that risk
- d. Not to interfere or abuse any equipment provided for fire safety.
- e. Report any observed shortcoming in fire precautions to the Admin Manager

All Supervisors with responsibility for other staff, students, contractors or visitors have a particular role in ensuring that work is carried out safely to minimize the risk of fire.

- a. Ensure those under your charge have the appropriate information, instruction and training to work safely and take the correct action in the event of a fire.
- b. Include the risk of fire in risk assessment of their activities, and training needs are identified and provided for
- c. Ensure control measures are implemented; Check compliances for different procedures
- d. Ensure information and instruction is provided about risks and controls
- e. Ensure personnel under your charge know how to respond in the event of a fire.

Fire Detection and Protection Equipment

Emergency Exits

All fire exits and escape routes shall be kept clear of obstructions. A minimum 3m clearance is to be maintained from fire exit staircases.

The floor plan is available at the fire alarm panel board (Admin Block) to facilitate the work of emergency services in case of fire outbreak.

Good Housekeeping

Good housekeeping or maintenance of orderly cleanliness is a basic factor in fire safety. Good housekeeping practices, both indoors and outdoors, by disposal of unwanted combustibles, limitation or segregation of combustibles reduce the danger of fire.

Fire Fighting Equipment

Fire extinguishers are available in every block and level in SJINML. Please refer to the chart below on the Class Type and the extinguishing agents.

FIRE SAFETY GUIDELINES

- a. Do not use cardboard boxes, wooden crates or other receptacles that are made of combustible material as makeshift rubbish bins at your workplace. Use proper rubbish bins, preferably those made of non-combustible material, like metal. Conduct frequent rubbish and waste disposal.

- b. Do not accumulate unwanted items at your workplace. Dispose of unwanted items at regular intervals to ensure good house-keeping at your workplace. All packing materials should be neatly stacked in a separate storage area and not in passageways or aisles. In storage areas, aisles shall be maintained for unobstructed access and egress. These aisles should correspond as much as possible to the width of the room's entry/exit points.
- c. Keep corridors, walkways and passageways free of obstructions. Do not use corridors, walkways or passageways that form part of the emergency route at your workplace for storage. Do not use staircases as rest areas or storage areas. Keep staircases free of obstructions at all times.
- d. Do not remove ceiling boards or use ceiling void (i.e. space above suspended ceiling) for storage. Ensure that all ceiling boards are in place, not missing, or damaged
- e. Do not paint over smoke/heat detectors and sprinkler heads or hang objects on them. Ensure that the detectors and sprinkler heads are not painted over or obstructed with objects.
- f. There shall be a minimum clearance of 0.5m between the top of storage piles and sprinkler heads or the ceiling. Do not stack up items to a height less than 0.5m from sprinkler heads. This clearance space shall be 1.0m in workshops.
- g. Do not use fragile containers to store flammable liquids or keep flammable substances in places where large amounts of heat will build up or near an ignition source. Store flammable liquids in proper, unbreakable containers and keep flammable substances in well-ventilated places and away from any ignition source. See also CHEMICAL SAFETY
- h. Do not seal up ventilation openings or leave a non-working/inoperable ventilation fan unrepaired. Ensure ventilation openings are not sealed up and have defective ventilation fans repaired quickly.
- i. Do not use candles or other naked flame for lighting purposes, especially during a power failure. Use battery operated portable torchlights as a back-up.
- j. Do not smoke anywhere on campus building. Observe "No-smoking" rule strictly in your premises.
- k. Do not leave electrical appliances or equipment continued to be energized when they are not in use, especially after office/working hours. Switch off at the mains all electrical appliances or equipment that are not in use, especially after office/working hours.
- l. Do not put any liquid or thing that is flammable or combustible near an electrical socket, switchboard or an enclosure containing electrical components. Ensure that electrical socket, electrical switchboards and the enclosures of electrical components are kept clear of flammable or combustibles substances and liquids. All electrical boxes should be closed to prevent the possibility of contact with combustible materials.
- m. All fixtures, switches and sockets should be well maintained. Do not use electrical equipment that has poor wiring such as frayed cables and loose conditions. Ensure that the wiring is in good condition and for any defect, get a licensed electrician to check and rectify it immediately. Connections between electrical wires and plugs should not be loose.
- n. Do not overload the electrical circuit by drawing current from one power outlet to multiple electrical appliances or equipment simultaneously. Use one power outlet for one electrical equipment or appliance, whenever possible. The use of multiple plugs drawing power from one socket is not recommended.
- o. Do not use electrical closets or compartments that house dry riser inlets/outlets, hose-reel, telecom riser ducts etc for storage. Ensure that the closets and compartments are clean and free of obstructions at all times.

- p. Do not burn joss sticks, oil, incense fragrance sticks, incense paper and other offerings used in religious ceremonies in the premises. Use joss sticks, lamps and candles that are electrical or battery operated.
- q. Do not wedge open any fire door or exit staircase. Ensure fire doors are kept closed but unlocked at all times.
- r. Do not obstruct the access to a fire hose-reel or fire extinguisher.
- s. Hot works, welding: please seek assistance from Facility Management for any hot works or welding.
- t. Do not tamper with gas cylinders. Seek assistance from Laboratory Managers.
- u. Based on safety considerations, activities which require the use of open flame, explosive, flammable liquids, gases or substances are not allowed in all buildings of NUS.
- v. Attend Fire Safety Training and ensure your certificates are updated regularly.

F) LABORATORY SAFETY

There is an increasing trend of research laboratories being designed in an “open” concept, instead of individual laboratory suites. This layout provides greater opportunities for collaboration and for monitoring of safety practices. As there might be different research groups in these laboratories, there is a need for each group to communicate their hazards and risks to the other research groups.

All staff and research personnel must comply with policies laid out in this Manual, as well as other university, faculty and departmental level manual, directive, standard operating procedures (SOPs), standards and guidance documents that are applicable to their area of work. All staff and students are responsible to carry out their work safely.

All research users working in the laboratory are responsible to read and understand his/her role and responsibilities in the emergency response plans, as well as the expected actions to be carried out in the event of emergency. Everyone is required to participate in drills to familiarize themselves with the emergency response procedures.

1. RISK MANAGEMENT & ASSESSMENTS

The principle of risk management is to identify the safety and health hazards associated with works carried out in a laboratory, assessing the risk level, prioritizing and implement measures to control the hazards and reduce the risk to acceptable level. These include:

- a. Physical hazards (electrical, mechanical, noise, ergonomics, trip and fall, and etc)
- b. Chemical hazards (flammable substances, compressed gas and etc)
- c. Biological hazards (animals, infectious substances, biological agent and etc)
- d. Radiation hazards (ionizing and non-ionizing)

Research Users must conduct of risk assessment prior to the commencement of research projects, and only commence work after their risk assessment has been approved. The risk assessment should cover both routine and non-routine activities in the laboratories. Discuss with the relevant Lab Managers to ensure adequate and effective control measures are in place to control the hazards identified and reduce the risks to acceptable level. The risk assessment should be endorsed by the Principal Investigator of your project and relevant Lab Manager at SJINML. A signed copy of the Risk Assessment must be filed with your host institution and one copy filed with the relevant Lab Manager at SJINML, *before you start work.*

2. SAFETY TRAINING

Research users are expected to have received adequate instruction and proper training in managing the hazards specific to his/her laboratory and the safe conduct of the experimental procedure to be used. At the minimum, all personnel working in the laboratory should be trained in the following areas prior to the start of their experiment:

- a. Understanding of the NUS Laboratory General Safety Manual and other relevant laboratory manuals
- b. Experimental procedures to be carried out
- c. Understanding of the hazards in the laboratory
- d. Proper operation of tools and equipment
- e. Safety precautionary measures to be taken
- f. Usage and maintenance of PPE

- g. Emergency response procedures (e.g. chemical spill, gas leak, fire)
- h. Accident/ incident reporting procedures

Research users must complete appropriate safety trainings stipulated by the Lab Managers before they commence work.

3. SAFETY CONTROL

a) ELIMINATION & SUBSTITUTION

Eliminate the hazard or task where it is practicable to do so. For example, use ready-mixed solutions. This eliminates the need to weigh and mix, and the associated hazards that comes with such tasks.

If elimination is not feasible, consider using substitution method. For example, substitute toxic chemicals with something less hazardous, substitute glassware with plastic ware, substitute syringes with pipettes, etc.

b) ENGINEERING CONTROL

Engineering controls can be implemented in the form of:

- Automation of the process,
- Isolating the hazard from the target(s) (including both the user and persons in the vicinity) by means of: - distance, physical barriers (e.g. guarding, shield, chemical storage cabinet), or containment equipment (e.g. secondary containment, fume hood, biological safety cabinet, exhaust ventilation system).

c) ADMINISTRATIVE CONTROL

Administrative controls are work procedures such as safety policies, rules, supervision, and standard operating procedures (SOP). The administrative controls commonly implemented in the University laboratories are: restricting access to laboratory and other hazardous areas, posting of signs and labelling to indicate the hazards present in the laboratory, development of SOPs on the safe handling of materials, equipment and machines, display of informative posters and guidelines and etc.

Research users must observe all SOP and access controls posted by Lab Management.

d) PERSONAL PROTECTIVE EQUIPMENT (PPE)

The use of PPE is necessary when feasible engineering and administrative controls are unavailable or where there is a need to supplement those controls. PPE should NEVER be considered as a first priority in minimizing exposure to hazardous substances.

Research Users are expected to have available appropriate personal protective equipment (PPE) for his/her work. He/she must have been trained on the proper use, care and maintenance of the PPE. All users bear the ultimate responsibility to learn and to use the PPE correctly. This is to ensure the PPE provides the intended and effective protection to the user. Otherwise, the PPE can give a false sense of security and in fact be a danger to the user. It is the Research Users responsibility to ensure the PPEs are kept clean and properly maintained, and the faulty ones are replaced.

SJINML Laboratory Managers reserve the right to expel any researchers from the laboratory if they fail to use PPE appropriately.

***Eye and Face Protection**

Suitable protectors shall be used when employees are exposed to hazards from flying particles, molten metal, acids or caustic liquids, chemical liquids, gases, vapors, bio-aerosols, or potentially injurious light radiation. Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. For employees who wear prescription lenses, eye protectors shall either incorporate the prescription in the design, or fit properly over the prescription lenses.

Note that use of safety glasses is now compulsory for all NUS laboratories

***Respiratory Protection**

Note that under NUS policy, research users must undergo fit test and medical examination prior to using a respirator. They must also be trained in donning and maintaining the respirator properly to ensure effective protection to the users.

4. WASTE DISPOSAL

Definitions

- a. General waste -paper/ plastic packaging; items not contaminated with chemicals nor biological materials.
- b. Broken Glass – Laboratory glassware and should not contain any hazardous material.
- c. Sharps – Objects or devices capable of cutting or penetrating the skin e.g. hypodermic needles, scalpel blades and glass contaminated with chemicals, toxic or infectious materials.
- d. Chemical waste – Spent chemicals and all materials/consumables tainted with chemicals.
- e. Biological Waste - Biological materials of animal, plant or microbial origin. This can include infectious material, contaminated agar plates, live cultures and disposables that have been in contact with the aforementioned.
- f. Cytotoxic Waste – Any materials/ consumables contaminated with any residue or preparations that contain materials that are toxic, carcinogenic, toxic for reproduction or mutagenic.
- g. Disposal method for mixed waste can be found under: https://www.wshc.sg/files/wshc/upload/cms/file/2014/WSH_Guidelines_on_Laboratories_Handling_Chemicals.pdf

Solid waste	Hazard	Example Waste type	Additional disposal	Action prior to	Waste container
	Biological	Agar (both molten or solidified)		Allow it to solidify	Biohazard bag and bin
		Contaminated plastic tubes / vials (non-glass)		Ensure cap is secured	Biohazard bag and bin
		Contaminated, reusable glassware		If material inside the bottle is autoclaveable, autoclave followed by washing	
				If material is not autoclavable, and is contaminated with chemical: discard liquid into chemical waste container and disinfect bottle before washing.	Chemical waste container for liquid

		Contaminated pipette tips, gloves, paper towels	N/A				Biohazard bag and bin
	Cytotoxic	Contaminated pipette tips, gloves, paper towels	N/A				Cytotoxic bag and bin
		Contaminated agarose (molten / solidified)	Allow it to solidify				Cytotoxic bag and bin
	Chemical	Emptied bottle from supplier	Ensure all labels are intact				Dedicated collection corner
		Reuseable bottles tainted with chemicals	Ensure all labels are intact				Dedicated collection corner
		Any solids / consumables contaminated with chemical (e.g. pipette tips, paper towels)	Place in separate plastic bag and seal				Laboratory waste bag and bin
		Expired chemicals	Contact lab manager				
		Unwanted chemicals	Contact lab manager				
	Broken laboratory glassware	Broken laboratory glassware					Broken glass bin
	Sharps	Glass slides, needles (see definition)					Sharps bin
	General waste	paper, plastic packaging (see definition)					General waste bin
Liquid waste	Hazard	Example Waste type	Additional disposal	Action	prior to	Waste container	
	Biological (with no hazardous chemical)	Spent media, seawater, live culture	Decontaminate				Sewage drain
	Biological (with hazardous chemical)	Spent media, seawater, live culture	Depending on compatibility decontamination procedure	on chemical with			Appropriate chemical waste bottle (see lab manager)
	Cytotoxic	Contaminated buffer / liquid					Appropriate chemical waste bottle (see

		lab manager)
Chemical	Liquid contaminated with chemical	Appropriate chemical waste bottle (see lab manager)
	Expired chemicals	Contact lab manager
	Unwanted chemicals	Contact lab manager

5. SHARED BENCH SPACES

As there might be different research groups in these laboratories, there is a greater need for each group to communicate their hazards and risks to the other research groups.

- Ensure you have communicated to the Lab Manager the nature of your research activities especially if there is any changes to the scope, *before you begin work*
- Practice diligent housekeeping. Clean up your workspace as soon as possible and at the end of every workday.
- Ensure all contents all labelled and any hazards are clearly marked so other users are aware.
- Exercise mutual respect – do not tamper with research of other users in the laboratory
- Refer to Lab Manager if you have any concerns, requirements or unsure how to operate equipment or proceed with your experiment.
- Do not block emergency escape pathways, exit doors and emergency windows. Do not block the access to emergency response equipment (e.g. fire extinguisher, hose-reel, spill kit) and first aid kits.

6. SHARED EQUIPMENT

All users of the shared equipment must:

- Review the risk assessment associated with this equipment.
- Follow the safe operating procedures, training, competencies and/or other requirements for the use of this equipment.
- Perform a risk assessment if they intent to use the equipment beyond its normal operating and performance limits and seek approval from the Lab Manager before you begin work
- Be responsible in the use of the equipment.
- Promptly remove samples after the use of the equipment and clean up any residual contamination from the equipment.
- Notify the equipment owner of any spillage and/or damage to the equipment.
- Participate in the clean-up of material from the equipment.

7. ELECTRICAL APPLIANCES

Seawater is a very good conductor of electricity and as such, it is very important to observe good practice in handling electrical devices in a marine laboratory.

Dos:

- a. Use electrical equipment and apparatus that complies with local safety standards and regulations. Certified electrical equipment usually bears a 'Safety Mark'.
- b. Consider the electrical loading of equipment prior to purchasing and installation.
- c. Use electrical equipment and apparatus in accordance with the manufacturer's operating instructions.
- d. Ensure grounding is carried out for any electrical equipment that needs to be grounded.
- e. Switch off appliances when not in use. With the exception of those indicated by a notice that read "Do not switch off – equipment needs to be switched on all the time", all electrical equipment and apparatus are to be switched off when not in use.
- f. Post warning signs whenever there is a need to alert personnel working in the laboratory about electrical hazards that may be present.

Don't ever - never handle electrical equipment with wet hands!

Electrical Plugs

- a. Do not use any plug that has not been approved/ certified. Certified electrical equipment usually bears a 'Safety Mark'.
- b. When inserted into a socket, make sure that it is fully inserted.
- c. Remove all broken or damaged plugs immediately.
- d. Always switch off the electricity supply before taking out the plug from the socket.

Electrical Sockets

- a. All sockets should be firmly mounted onto the wall or mounting location.
- b. Broken sockets are to be replaced immediately.
- c. Do not overload any electrical socket by connecting several appliances using multiple socket accessories.

Electrical cords

- a. Electrical cords should be maintained in good condition.
- b. Remove all frayed cords immediately. They could cause fire to start or even cause electrocution of personnel who happened to get into direct contact with the exposed wires.
- c. Do not allow any cord to be laid along the floor where people need to walk across.
- d. When connected to a plug, the electrical cord is to be firmly held by the cord gripper.
- e. Do not use extension cord for heavy duty equipment and where permanent wiring should be installed.
- f. Only 4-way extension cord with 'Safety Mark' is allowed.
- g. Do not plug another extension cord onto an extension cord.

Electrical wiring and fuses

- a. Take note of the colour code used for electrical wiring: Live wire – brown; Neutral – blue; Earth - green / yellow
- b. Do not use any undersized or oversized wire.
- c. Joining of wires using adhesive tapes is not permitted – use proper connectors.
- d. Select the right size fuse. Do not use a wire as an improvised fuse.

Electrical Switchboards, Distribution Panels and Faulty Equipment

- a. Do not open up the cover of the main electrical panels. Please refer to SJINML Facility Management for assistance
- b. Do not place any item that can obstruct accessibility to the front opening of the electrical panel.
- c. No one other than a licensed electrical worker is allowed to carry out any electrical installation and maintenance where there is a possibility of getting into contact with live wiring or terminal.
- d. Report any faulty electrical equipment or apparatus to the Lab Manager immediately. Do not attempt to use any equipment labelled as “FAULTY - DO NOT USE”

8. ERGONOMIC RISK

Many laboratory activities involve awkward and static postures, high repetition, excessive force, contact stresses, vibration, and pinch grip among others. These activities include pipetting, microscopy, cell counting, using forceps, using a cryostat and working in a glove box, biosafety cabinet or fume hood. Those who work in a laboratory are at an increased risk of repetitive stress injuries. Alternate work processes should be considered. Where significant task variation is not possible, then work pauses or breaks should be taken.

Lifting Heavy Objects

- a. Plan the Lift - Before lifting or moving an object, plan out the movements. Make sure there is enough room to perform the task properly and ensure that any travel path is clear of obstacles. If lifting or moving an object as a team, make sure that all in agreement with how the lift and/or move will take place.
- b. Close and Centered - Whenever lifting an object, start with and keep the object close to the body. A good way to do this is to have a diagonal footing when lifting an object off the floor (one foot to the side of the object, the other foot behind the object). If lifting straight up with this footing, the object will remain close to the body. The further the person lifts and/or holds an object away from the body, the more strain it places on the back muscles and bones. Keep the object centered in relation to the body. Keeping the object centered will help to discourage from twisting or contorting the back while lifting or holding the object. Twisting, even while lifting or carry little or no weight, can cause back injuries.
- c. Use “Core Strength” - Having a strong “core” essentially means having strong upper, middle, and lower abdominal muscles. By tightening up the core muscles when lifting and moving objects, it will place the back muscles in a good position for lifting/moving and will help to prevent excessive force on the spine. Doing sit-ups and leg lifts will strengthen the abdominal muscles and will do a lot to protect from a back injury.
- d. Bend the Knees, Lift with the Legs - When lifting objects from down low, bend the knees and keep the back straight when setting up the lift. While lifting the object, use the large, powerful muscles of the legs to straighten the body up (rather than the smaller, weaker, and more vulnerable muscles of the back and arms). Keep the abdominal muscles tight when lifting.
- e. Look Ahead - Keep eyes looking in front of and slightly upward when lifting and moving objects – this will keep the upper back and neck in the best position for lifting. Avoid bending the head or neck downwards when lifting.
- f. Don’t Lift It Alone - If an object is too heavy, large, or awkward to lift or move for one person, get some help.

Helpful tips for microscopy work:

- a. Do not work with elbows winged. Keep elbows close to sides, below 45-degree angle.
- b. Objects that must be accessed frequently should be kept close enough to avoid having to stretch and strain, usually within a distance of 20-65 cm.
- c. Make sure to work with wrists in neutral (straight) position. Avoid forearm and wrist contact pressure.
- d. Ensure that feet are flat on floor or supported by footrest.
- e. Avoid raising shoulders and bending neck while looking through microscope's eyepiece.
- f. Ensure the microscope eyepieces have been adjusted correctly for your use
- g. Prevent repetition, and alter prolonged awkward posture. Take adequate small breaks, or perform other job tasks that require less repetition, rest the eyes, neck, and shoulders.
- h. Reduce fatigue by taking micro-breaks, 20-180 seconds at 10 to 15 minute work. Use this time to stand and/or stretch, and allow the eyes to focus at a distance
- i. Use a fully adjustable chair or stool with built-in solid footrest.
- j. Use lifters and angled microscope arm supports to relieve fatigue and strain.
- k. Ensure that sufficient knee and leg space is available.

9. ACCIDENT/ INCIDENT REPORTING AND INVESTIGATION

An "incident" refers to any undesired safety & health-related event that resulted or could have resulted in any harm to human, property or environment. This includes:

- a. Accident: Any event which has resulted to injury, ill-health or fatality.
- b. Near Miss: Any event where no injury, ill-health or fatality occurs but had the potential to do so

When an incident occurs:

- a. Where it is safe to do so, take appropriate immediate actions to minimize further injury/damage
- b. Inform SJINML Lab Manager/Admin staff immediately
- c. Ensure injured person(s) has received first aid treatment
- d. Injured person(s) receive seek further medical attention at the nearest hospital if necessary
- e. Ensure that the incident site is not disturbed until investigation is completed
- f. Do not release any information to anyone (except SJINML staff) until investigation is completed

All safety and health-related incidents are required to be reported to NUS Office for Safety Health and Environment (OSHE) within 24 hours, including those reportable to government regulators.

Incidents Reportable to Government Regulators are:

- a. Ministry of Manpower (MOM): Fatality, > 24hrs hospitalization, > 3 days of MC (consecutive or otherwise), Occupational Disease, Dangerous Occurrences
- b. Ministry of Health: Laboratory Acquired Infections resulting from working with Biological Agents Toxic Act (BATA) agents
- c. National Environment Agency: Radiation exposure as described under Radiation Protection Act

G) Chemical Safety

All users should work with lab managers to ensure that reasonably practicable control measures are implemented, measures are effective in eliminating or minimizing the risk, and assist to inform any chemical hazards to other users in the laboratory.

Legislations

There are several legislations that are applicable to chemicals which govern specific requirements for procurement, inventory record, storage, disposal and medical surveillance. These include:

- a. Workplace Safety and Health Act, including WSH (General Provisions) Regulations, WSH (Incident Reporting) Regulations, WSH (First Aid) Regulations, WSH (Risk Management) Regulations and WSH (Confined Space) Regulations.
- b. WSH (General Provisions) Regulations
- c. Chemical weapons (Prohibition) Act
- d. Fire safety (Petroleum & Flammable Materials) regulations
- e. Poisons Act
- f. Environmental Protection and Management Act (EPMA)

Licensed chemicals (i.e. CWC chemicals, poisons, explosive precursors and controlled drugs) shall be kept under lock and key with proper inventory record. The cabinet key shall be kept by designated lab managers. Only authorized users are allowed to access these licensed chemicals.

Responsibilities

- a. PIs should ensure that all his/her staffs and students actively avoid or minimise the generation of hazardous waste.
- b. PIs are required to establish local procedures that are consistent with these guidelines and ensure that his/her staffs and students are familiar with and follow the procedures.

Administrative Requirements

- a. **All research users handling chemicals are expected to hold a valid Chemical Safety Training certificate at all times.** This is to ensure that you are equipped with the necessary knowledge, skills and techniques to handle chemicals in such a manner so as not to threaten the safety and health of yourself and others in the vicinity. PIs should ensure their students and staff received adequate instructions on the safe handling of chemicals, undergone the required training, and received the necessary medical examination. SJINML reserves the right to suspend any research user that we feel does not have adequate training and knowledge in chemical safety, from conducting laboratory activities.
- b. Any person wishing to work with hazardous chemicals shall first obtain permission from the lab managers. Please allow 4 – 6 weeks of processing time. The application submitted to the lab manager shall contain the following information:
 - a. Name of the university/institute & faculty who will be responsible for the safe use of the hazardous substances;
 - b. List of hazardous substances to be used, including physical form and maximum amount in possession at any one time;
 - c. A description of how the hazardous substances are to be used;
 - d. Procedures for safe removal of contaminated wastes;

- e. Decontamination procedures.
- c. All research users must conduct risk assessment for all activities involving chemicals in the laboratory. Your risk assessment must be reviewed once every three years and approved by the Lab manager before you begin work. The risk assessment must address:
- a. Risks associated with the use of the hazardous substances
 - b. Potential spillage or leakage
 - c. Impact of an incident to the surrounding people and on the surrounding area
 - d. Medical or first aid requirements in the event of an exposure
 - e. Incompatible goods
 - f. Effective containment and clean up
 - g. Appropriate disposal of waste material

General guide to chemical hazards

It is important to exercise caution in the usage of chemicals as they may exist in different forms: solid, liquid and gas. They may be chemically reactive with each other and result in disastrous effect. Some are harmful to our health and some can even cause severe injury and fatality.

In general, chemical hazards are differentiated into three building blocks:

- a. Physical hazard building block
- b. Health hazard building block
- c. Environmental hazard building block

To identify the hazard class or hazard category of a chemical, always refer to the label affixed to the packaging/container or the Safety Data Sheet. The label should include the following information to aid users in understanding the hazards and safety and health risks involved:

- a. Product identifier, i.e. identify of the chemical
- b. Pictogram
- c. Signal words such as 'Danger' or 'Warning', indicating the relative hazard severity and alert readers to a potential hazard
- d. Hazard statement(s), describing the nature as well as the degree of hazard of a chemical
- e. Precautionary statement(s), describing the recommended measures that should be taken to minimise or prevent adverse effects resulting from exposure or improper storage or handling of a hazardous chemical
- f. Supplier information
- g. Supplementary information

Physical Hazards

There are 16 hazard classes under the physical hazard building blocks, i.e.:

1. Explosives
2. Flammable gases
3. Flammable aerosols
4. Oxidising gases
5. Gases under pressure*
6. Flammable liquids
7. Flammable solids

8. Self-reactive substances and mixtures
9. Pyrophoric liquids
10. Pyrophoric solids
11. Self-heating substances and mixtures
12. Substances and mixtures which, in contact with water, emits flammable gases
13. Oxidising liquids
14. Oxidising solids
15. Organic peroxides
16. Corrosive to metals

* The hazard categories under this hazard class include compressed gas, liquefied gas, refrigerated liquefied gas and dissolved gas.

Health Hazards

There are 10 hazard classes under the health hazard building blocks, i.e.:










1. Acute toxicity
2. Skin corrosion/ irritation
3. Serious eye damage/ eye irritation
4. Respiratory or skin sensitization
5. Germ cell mutagenicity
6. Carcinogenicity
7. Reproductive toxicity
8. Specific target organ toxicity (single exposure)
9. Specific target organ toxicity (repeated exposure)
10. Aspiration hazard

Environmental Hazards

There are two hazard classes under the environmental hazard building blocks, i.e.:

1. Hazardous to the aquatic environment – acute toxicity
2. Hazardous to the aquatic environment – chronic toxicity

Pictograms convey physical, health or environmental hazard that is assigned to a GHS hazard class and category. Please refer to the table below.

<p align="center">Flame</p>  <ul style="list-style-type: none"> • Emits flammable gas • Flammables • Self-heating • Self-reactives • Organic peroxide • Pyrophorics 	<p align="center">Flame over circle</p>  <ul style="list-style-type: none"> • Oxidisers 	<p align="center">Exploding bomb</p>  <ul style="list-style-type: none"> • Explosives • Organic peroxide • Self-reactives
<p align="center">Corrosion</p>  <ul style="list-style-type: none"> • Corrosives 	<p align="center">Skull and crossbones</p>  <ul style="list-style-type: none"> • Acute toxicity (severe) 	<p align="center">Gas cylinder</p>  <ul style="list-style-type: none"> • Gases under pressure
<p align="center">Health</p>  <ul style="list-style-type: none"> • Aspiration toxicity • Carcinogenicity • Germ cell mutagenicity • Target organ toxicity • Respiratory sensitiser • Reproductive toxicity 	<p align="center">Environment</p>  <ul style="list-style-type: none"> • Environmental toxicity 	<p align="center">Exclamation mark</p>  <ul style="list-style-type: none"> • Acute toxicity (harmful) • Irritant • Narcotic effects • Respiratory tract irritation • Skin sensitiser

Transportation into, out of and within SJINML

Improper transportation and transferring of chemicals can result in spills and, in some instances, chemical exposures and fire hazards. The following preventive measures shall be put in place when the chemicals are expected to be transported from one location to another via common areas such as corridors.

- Inform lab manager at least 4-6 weeks in advance. Admin charges will apply if additional license is required for its transport and storage in SJINML.
- Read SDS to make sure that one has understood the chemical hazards.
- Do NOT transport incompatible chemicals together.
- Carry the relevant spill response materials.
- Look for any signs of leakage before handling the package.
- Check that the container is sealed and in good condition. Do NOT transport the chemical if the packaging is damaged.
- Use unbreakable secondary containment when transporting chemicals in public areas or within SJINML, particularly liquids and or the primary container is made of glass. Ensure that the secondary containment is able to hold the contents of the largest individual chemical container. Do not hold acid or solvent containers by the neck alone.
- Use appropriate cart or trolley when necessary.
- Do not leave chemicals unattended during transport.
- Choose a time to minimise interaction with the public, i.e. use the mid-day boat whenever possible.

Be cautious when transporting/ transferring shock- or impact-sensitive chemicals. Consult the SDS for special precautions to be taken. When transporting and transferring cryogenic liquids, the following precautions must be observed:

- e. Transportation of cryogenic liquids via ferry and buggy should be carried out in a safe manner with a buddy system.
- f. Transfers or pouring of cryogenic liquids should be done very slowly to minimize boiling and splashing.
- g. Transfer of liquid nitrogen should be done in a well ventilated area and to ensure that the flasks are not completely sealed during transfer as they will result in pressure build up. .
- h. Liquid hydrogen should NOT be transferred in an air atmosphere because oxygen from the air can condense in the liquid hydrogen, presenting a possible explosion risk.

Chemical Storage

Proper chemical storage prevents flammables from ignition, minimize the potential of exposure to hazardous materials and segregation of incompatible substances prevent the accidental mixing due to spillage or human error.

The following are the general Dos and Don'ts for chemical storage:

Dos:

- a. All containers, packaging and cylinders containing chemicals (solid, liquid or gas) shall be labelled. The label must be in good condition, clear, legible and written in English. It must be affixed firmly on the container at all times, and be able to withstand the expected environment it is exposed to. As a minimum, the label must contain the following information whenever available:
 - Name of User and Supervisor
 - Name of hazardous substances
 - Chemical formula/ composition
 - Chemical concentration
 - Chemical hazard pictograms/ symbol
 - Product identifier
 - Name of supplier
 - Date of purchase
 - Date of first opening (especially important for peroxide-forming chemicals)
 - Date of preparation (e.g. for solutions)
- b. A valid Safety Data Sheet (SDS) shall be supplied to the lab manager.
- c. Users have to work with relevant lab manager to ensure that the chemical register is updated accordingly.
- d. Ensure storage areas are provided with adequate lighting and ventilation.
- e. Segregate chemicals according to their physical and chemical properties. Store chemicals according to their chemical compatibility.
- f. Licenced chemicals must be kept under lock and key with proper inventory record. The cabinet key shall be kept by laboratory manager. Only authorized users are allowed to access these licensed chemicals.
- g. The chemicals shall be stored in a durable, leak-proof container of compatible material to the chemicals, if it is not in its original containment.

- h. Ensure that liquid chemicals are provided with a secondary containment to contain leaks and spills. Capacity of the secondary containment should be at least 20% of the total volume of chemicals stored within the containment tray. The material of the secondary containment should be compatible to the chemicals.
- i. Store highly toxic chemicals (e.g. hydrofluoric acid (HF)) in compatible secondary containers prominently labelled with a description of the content.
- j. Avoid using round bottom flasks for storage of chemicals. If not possible, use cork rings to secure/support round bottom flasks.
- k. Evaluate the chemicals for safe use periodically (recommended every 6 months). Chemical that is found to be safe shall be permitted to be re-dated and retained for an additional 6-month period.
- l. Date peroxide formers and other chemicals that degrade over time when received and when opened. Review the label or product information for recommended shelf life and put disposal date on the container as well.
- m. Store chemicals on shelves that have a raised lip along the outer edge, preferably behind glass door.
- n. Always consult SDS for compatibility and reactivity information.
- o. Storage of hazardous chemicals on laboratory benches should be minimized.
- p. Exposure of chemicals to heat and sunlight should be avoided.
- q. Periodic inventories shall be conducted, with unneeded items being discarded.

Don'ts:

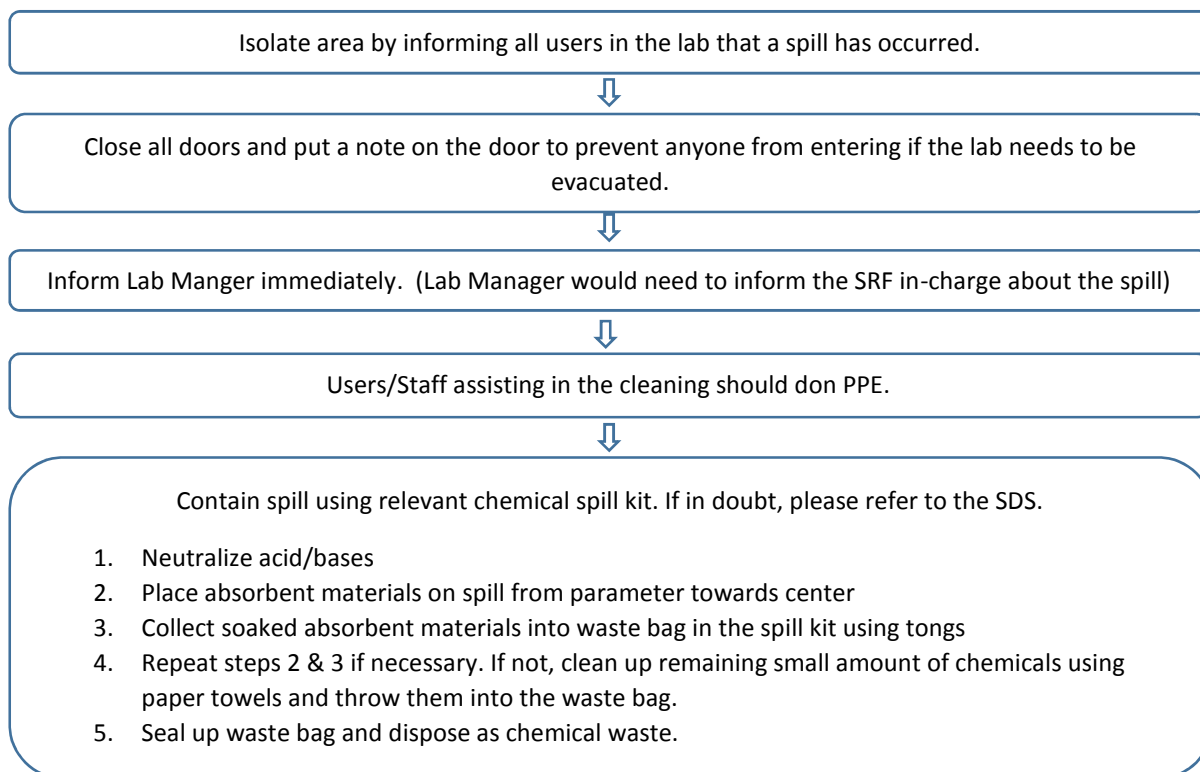
- a. Do not store chemical in alphabetical order except within "compatible storage group".
- b. Do not store chemicals, in particular flammable substances, near heat sources (e.g. oven, direct sunlight).
- c. As far as reasonably practicable, do not store chemicals on shelves above eye level, especially for liquids and corrosive chemicals.
- d. Incompatible chemicals shall not be stored together. In general:
 - o Store acid separately from bases.
 - o Store organic acid separately from inorganic acids (eg. nitric acid).
 - o Store solvents separately from acids.
 - o Store oxidizers, including oxidizing acids (e.g. nitric acid and perchloric acids) separately from oxidizable compounds (e.g. acetic acid).
 - o Store perchloric acid such that it cannot come into contact with organic material.
 - o Store pyrophoric substances separately in a dry inert atmosphere (e.g. a nitrogen filled desiccator). Pyrophoric substances are chemicals that will ignite spontaneously, i.e. its auto ignition temperature is below room temperature.
 - o Chemicals that possess two or more hazardous chemical properties (e.g. acetic acid – corrosive and flammable) shall be stored based on the highest potential threat pose to the personnel working in the lab. In the case of acetic acid, it shall be stored in a flammable safety cabinet, in a separate containment tray or an enclosed secondary container.

General Safety Rules for the Use of Chemicals

- a. Do not smell or taste chemicals.
- b. Appropriate gloves shall be worn. Inspect gloves before use. Replace them when necessary.
- c. Wash hand thoroughly before leaving the laboratory.
- d. Do not use mouth suction for pipetting.
- e. Confine long hair or loose clothing.
- f. Keep work area clean and uncluttered with chemicals

- g. Appropriate eye protection shall be worn by all persons in the laboratory.
- h. Use a fume-hood for operations for chemicals which might result in release of chemical vapours or dust. Keep materials stored in hoods to a minimum and do not allow them to block vents or airflow.

Chemical Accidents and/or Spillage Procedures



Users using hazardous chemical must be familiar with appropriate spill response procedures prior to commencing work. The SDS for a chemical should be checked for specific advice; clean-up and disposal procedures; and compatibility information.

Users should be trained in spill procedures so that rapid and accurate response for a minor or major spill can be undertaken. Spilled chemicals shall be cleaned up immediately and disposed of properly. Users should seek assistance in the event of a major spill.

Please use the spill kit to contain any spilled chemicals and treat the victims who are involved in chemical accident.

Splashes on the skin

Remove contaminated clothing and flush with water for at least 10 minutes. Seek medical help.

Splashes in eyes

Flush the eyes with water for several minutes. Seek medical treatment immediately.

Inhalation of gases or vapours

Remove casualty to a safe area. Apply cardiac pulmonary resuscitation (CPR) if breathing has stopped. Send for medical aid immediately.

Ingestion

Wash the mouth with water. Do not induce vomiting. Seek medical treatment immediately. Be sure to inform the medical staff of the substances ingested.

All spills which are hazardous with potential to cause injury or have caused an injury must be reported.

Contact with cryogenic liquid

Warm the affected area of the body rapidly by immersion in water not to exceed 40°C, with body heat, or by exposure to warm air. In the event of massive exposure, the emergency shower should be used to warm the body. All clothing must be removed prior to showering. Maintain the affected area of the victim at normal body temperature until medical help arrives.

Calm the victim and prevent aggravation of the injury. People with frostbitten feet should not walk on them. Do not rub or massage the affected parts of the body. Prevent infection; use a mild soap to clean the affected area. Dressings need to be applied if the skin is intact. Flush eyes, if affected, with warm water for 15 minutes.

Chemical Waste Disposal

Chemical bottles should not be re-used for waste storage. Chemical waste containers are available upon request. Plastic containers should be used when appropriate. Please refer to chemical compatibility chart (https://share.nus.edu.sg/corporate/procedures/safety_and_health/Chemical-Safety-Procedures/EPACChemicalCompatibilityChart.pdf) for determining the compatibility of chemical mixtures. Incompatible wastes shall NOT be stored in the same container.

Containers of hazardous waste should be clearly identified, classified and labelled accordingly. Waste container shall be labelled legibly. The waste label should indicate the following information:

- I. chemical name or formula of the content in container,
- II. generator's name,
- III. date of waste generated/collected,
- IV. approximate quantity/volume, and
- V. affixed with the appropriate caution labels indicating the hazard classification and class of waste.

Blue hazardous waste labels (see below) can be obtained from laboratory managers.



HAZARDOUS WASTE LABEL

Name of PI:	Contact Number:
Department/School:	Date of Waste Generated:
Container Serial No:	Total volume/weight in waste container:
Chemical (include all constituents) Total should = 100%, No Abbreviations)	Approximate Concentration (%/ kg)

Please "✓" type of waste

- Poison
- Flammable Solvent
- Flammable Solid
- Carcinogen
- Oxidizer

- Acid
- Alkali
- Irritant
- Reactive
- Others, please specify:

HANDLE WITH CARE! CONTAINS HAZARDOUS OR TOXIC WASTES.

- a. Wastes shall be deposited in appropriate receptacles.
- b. Chemicals that are no longer required should not be stored in the laboratory.
- c. Take special care to ensure that incompatible chemical wastes are segregated to prevent risk of hazardous reactions.
- d. Containers and labels for chemical waste can be obtained from lab manager. The labels are to be completed and affixed to each container.
- e. Chemically contaminated consumables must be collected in strong leak proof bags and labelled as above. Chemically contaminated plastic tips must be disposed of in rigid containers and labelled as above.

Handover Procedures for Unused or Unwanted Chemicals

- a. User is responsible for disposal of unwanted chemicals and waste generated from his/her project.
- b. At the completion of any research projects, all chemicals must be properly disposed. In event that the PI has decided to give the chemical to another researcher, inform Lab Manager and ensure that ownership records are amended accordingly.

H) BIOLOGICAL SAFETY

NOTE: As there are no Biological Safety Level 2 containment facilities available as of 26 September 2016, Work involving biological agents and toxins under BATA and GMOs is **prohibited** until further notice.

Limited handling of environmental samples may be allowed with BSL 2-practice. Please discuss your proposal and seek permission from Lab Manager (Biosafety).

Legislations

There are several legislations that are applicable, which govern specific requirements for procurement, inventory record, storage, disposal and medical surveillance. These include:

- Workplace Safety & Health Act
- Environment Protection and Management Act
- Environmental Public Health Act
- Biological Agents and Toxins Act
- WHO Laboratory Biosafety Manual
- Singapore Genetic Modification and Advisory Committee
- Infectious Disease Act
- IATA Dangerous Goods Regulations

REQUIREMENTS FOR WORK INVOLVING BIOLOGICAL MATERIALS

The use of biohazardous agents, genetically modified organisms (GMOs), animals and transgenic animals are not allowed at SJINML until further notice, unless the project is already approved by NUS-IBC for NUS users. All other principle investigators intending to use the abovementioned biological materials are required to submit their request to the laboratory manager before any new research project is implemented; or when there are changes that may affect the safety and health aspects of the project.

Details of Project Risk Assessment submission are available upon request.

All risk assessment submissions for projects requiring grant funding are to be submitted to the respective Heads of Departments (HODs) / Deans for endorsement prior to their submissions to the IBC. For projects that do not require any grant funding (e.g. teaching activities, dissertation projects) risk assessments are approved by the HOD or his designate and do not need to be submitted to the IBC for approval. PIs can only commence work after their risk assessments have been approved.

It is mandatory for PIs to notify IBC / OSHE (for NUS users), or notify SJINML laboratory management (for non-NUS IHLs) if a certified PI wishes to start any of the following work:

- Use of a regulated biological agent / material by MOH, AVA, NEA, etc.
- Use of a genetically modified agent / material that falls under Category A or B of GMAC guidelines.

Administrative Requirements

- d. **All research users handling regulated biological agents are expected to hold a valid Biological Safety Training certificate at all times.** This is to ensure that you are equipped with the necessary knowledge, skills and techniques to handle biological agents in such a manner so as not to threaten the safety and health of yourself and others in the vicinity. Pls should ensure their students and staff received adequate instructions on the safe handling of biological agents, undergone the required training, and received the necessary medical examination. SJINML reserves the right to suspend any research user that we feel does not have adequate training and knowledge in biological safety, from conducting laboratory activities.
- e. Any person wishing to work with hazardous biological agents shall first obtain permission from the lab managers. Please allow 4 – 6 weeks of processing time. The application submitted to the lab manager shall contain the following information:
 - a. Name of the university/institute & faculty who will be responsible for the safe use of the hazardous substances;
 - b. List of hazardous substances to be used, including physical form and maximum amount in possession at any one time;
 - c. A description of how the hazardous substances are to be used;
 - d. Procedures for safe removal of contaminated wastes;
 - e. Decontamination procedures.
- f. All research users must conduct risk assessment for all activities involving biological agent in the laboratory. Your risk assessment must be reviewed once every three years, and whenever there is alteration to the approved risk assessments, and approved by the Lab manager before you begin work. The risk assessment must address:
 - a. Risks associated with the use of the hazardous substances
 - b. Potential spillage or leakage
 - c. Impact of an incident to the surrounding people and on the surrounding area
 - d. Medical or first aid requirements in the event of an exposure
 - e. Incompatible goods
 - f. Effective containment and clean up
 - g. Appropriate disposal of waste material

USE OF BIOLOGICAL MATERIALS AT SJINML

Research and teaching activities in SJINML may involve use of various biological materials. Anyone working with biological materials must be aware of the potential health risks and take the necessary precautions to prevent undue exposure to these agents, resulting in consequences such as laboratory-acquired infections. In addition, users dealing with cultivation / propagation of unknown environmental microbial agents should also be prepared to conduct proper decontamination procedures to minimize potential environmental impact. Where necessary, BSL2 practices will need to be in place. Please refer to Laboratory manager for details.

All researchers who plan to use the following are required to inform the laboratory managers of SJINML during the application of the facility request form:

- a. Biohazardous agents,
- b. Genetically modified organisms (GMOs),

- c. Animals and transgenic animals.
- d. Cultivating (propagation) unknown environmental microbial agents

All users working in the laboratories should know how to identify hazards, minimize risks and carry out their laboratory work safely.

Users must complete and submit a project risk assessment before any new research project is implemented or when there are changes that may affect the safety and health aspects of the project or as and when required by the University.

It is mandatory for all users performing research work in laboratories to undergo institutional safety trainings that are applicable to them. Without the proper training and certification, Users will not be able to perform their research in SJINML.

RISK ASSESSMENTS

Evaluate the risks associated with all materials to be handled. Consider:

- a. the species of the source cells, the tissue or cell type origin
- b. the culture type and volume
- c. the intrinsic properties of the cell culture
- d. subsequent properties acquired as a result of any genetic modification
- e. the possibility that the cell culture may inadvertently or deliberately become contaminated
- f. appropriate use, storage, decontamination, disposal, and emergency response procedures

GUIDELINES FOR DETERMINING BIOSAFETY LEVEL

The appropriate Biosafety Level (BSL) must be assigned for each research project and the associated biological agent(s). The following flowchart shows how the biosafety level can be determined for the most widely used biological agents and toxins. If animals are involved in the research, the corresponding animal biosafety levels apply.

Risk group is known. First, identify the risk group of the biological agent (if available) and determine the BSL or ABSL assigned for the biological agent. Refer to BATA Schedule, under https://www.moh.gov.sg/content/moh_web/biosafety/about-bata.html

Well-characterized harmless agents, knowingly not causing any harm to humans, animals and plants can be used in a BSL1 setting.

If no viable cells are used. For work with biological toxins, certain nucleic acids and their products, it makes a difference if these substances are used in vectors or viable cells as shown in the flowchart above. The risk assessment has to provide the necessary information for the decision making. Work involving the use of biological toxins fall under the Fifth Schedule is not allowed at SJINML. Please refer to the website for the current List of Biological Agents and Toxins under the BATA.

Activities with increased risks. The BSLs assigned to a particular agent assumes activities typically associated with the routine growth and manipulations of infectious agents at quantities and concentrations to accomplish identification or typing. However, if the activity involves higher agent concentrations, larger agent volumes, or practices likely to endanger personnel or the environment (public, wildlife, plants, habitats), additional precautions may be required and the BSL assignment may have to be increased.

Risk group is not known. If the BSL assignments of a biological agent is not known or there is insufficient information e.g. unknown agent that may be present in a diagnostic specimen, make a

preliminary determination of the biosafety level that best correlates with the initial risk assessment based on the identification and evaluation of the agent hazards. It would be prudent to assume the specimen contains an agent presenting the hazardous classification that correlates with BSL2 unless additional information suggests the presence of an agent of higher risk. Consider routes of agent transmission, means of transmission and the infective potential of the agent. The strategy shown below could be adopted. At each stage, assess the best available information to make an evaluation.

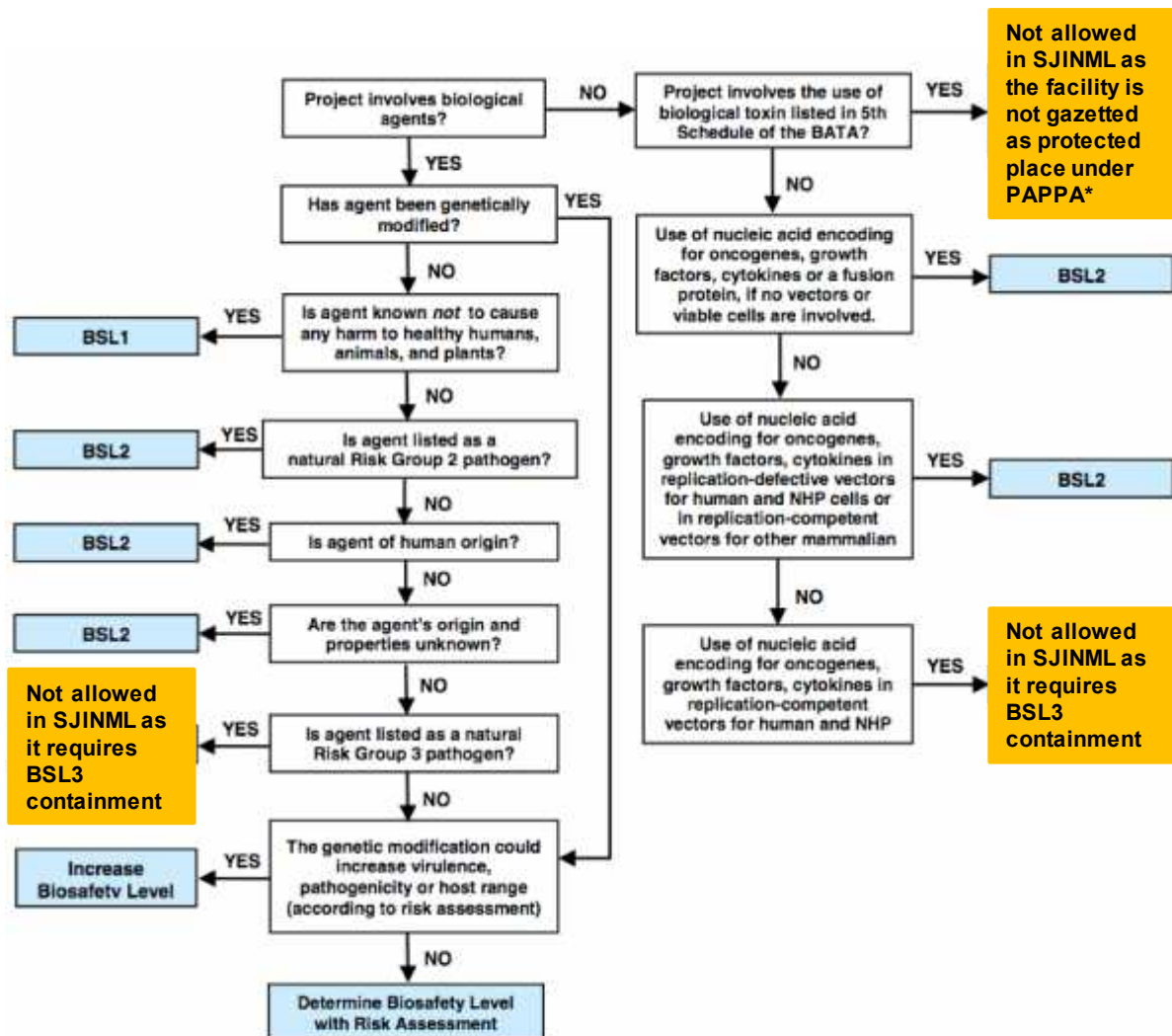


Figure 4.1 Flowchart on determination of biosafety levels

Biosafety Level 1 (BSL1)

Biosafety Level 1 is suitable for work done with well-characterized agents not known to consistently cause disease in healthy adult humans, and is of minimal potential hazard to laboratory personnel and the environment.

BSL1 represents a basic level of containment. Work is generally conducted on open bench tops using standard microbiological practices. These include wearing laboratory coats and safety goggles at all

times and use of appropriate gloves for all procedures that may involve direct contact with biological materials in the laboratory.

Biosafety Level 2 (BSL2)

Biosafety Level 2 (BSL2) is applicable to work done with agents associated with human disease but is of moderate potential hazard to personnel and the environment. It is also applicable to work involving materials of human origin from both commercial and non-commercial sources and other work with biological hazards classified by the PI or IBC as Risk Group 2.

Table: BSL requirements for working with agents of various risk groups (extracted from NUS Bio-risk Management manual)

Table 4.2 BSL requirements for working with agents of various risk groups

Risk Group	Biosafety Level	Laboratory Type	Laboratory Practices	Safety Equipment
1	BSL 1	Basic teaching, Research	General Microbiological Techniques	None; open bench work.
2	BSL 2	Primary health services; diagnostic services, research	General Microbiological Techniques plus protective clothing, biohazard sign	Open bench plus BSC for potential aerosol.
3	BSL 3	Special diagnostic services, research	As level 2 plus special clothing, controlled access	BSC and/or other primary containment devices for all activities. Directional airflow, negative room pressure, exhaust air is HEPA-filtered.
4	BSL 4	Dangerous pathogen units	As level 3 plus airlock entry, shower exit, special waste disposal	Class III BSC, or positive pressure suits in conjunction with Class II BSCs, double-ended autoclave (through the wall). Directional airflow, negative room pressure, supply air is HEPA-filtered, exhaust air is double-HEPA-filtered.

Table: Summary of controls of the five Schedules in BATA (extracted from NUS-OSHE's Bio-risk Management manual, Table 3.2)

Table 3.2 Summary of controls of the five Schedules in BATA

Requirement	First Schedule		Second Schedule	Third Schedule	Fourth Schedule	Fifth Schedule	Inactivated Agents	
	Part I	Part II					First Schedule	Second Schedule
Import Permit	√	√	√	√	√	√	√	√
Transshipment Permit	√	√	√	NA	NA	√	NA	NA
Approval to Possess	√	√	√	NA	NA	√	NA	NA
Approval to Produce	√	√	X	√	NA	NA	NA	NA
Special Approval to Handle	NA	NA	√	NA	NA	NA	NA	NA
Transfer Notification	NA	√	√	NA	NA	√	NA	NA
Certified Facility	√	√	√	NA	NA	NA	NA	NA
Protected Place	NA	√	√	NA	NA	√	NA	NA

√ - Required

X - Prohibited

NA - Not required

STORAGE

All biological materials to be stored must be clearly labelled with the scientific name, and/or descriptions, date of storage and name of person who stored them to facilitate identification. Autoclave and discard all unlabelled and obsolete items. Expired and other unwanted material must be decontaminated properly.

Storage containers must be robust and leak-proof. Visually inspect to ensure that no material remains on the outside of the container.

Hazard warning signs, indicating the biosafety level of the biological material being used, must be posted on laboratory doors, cold rooms, refrigerator / freezer doors and cryogenic tanks.

General Safety Procedures for Handling of Biological Materials

All appropriate measures must be taken to protect laboratory personnel and the environment. Safety measures to take include the use of engineering and administrative controls, and personal protective equipment.

Proper use and disposal of sharps is essential for protecting all users from being injured by discarded sharps. Never discard sharps into regular trash bins or biological waste. Dispose of all sharps into puncture resistant containers.

In the event of a sharps or needle stick injury, encourage bleeding, wash the punctured wound with soap and water and apply an appropriate skin disinfectant. Inform the principal investigator or laboratory manager of the incident.

DECONTAMINATION OF BIOLOGICAL MATERIAL AND DISPOSAL

Depending on the category, wastes containing biological agents is either sterilized and disposed off as regular wastes, or collected by licensed biowaste collectors.

Waste from laboratories may include infectious wastes, pathological wastes, contaminated sharps, routine clinical wastes, cytotoxic wastes, radioactive wastes, pharmaceutical wastes, chemical wastes and general wastes. Wastewater generated from biological /food analysis labs can be discharged directly into the sewer after dilution.

Biowaste Classification

- a. Bio-waste shall be classified based on their treatment or disposal methods
- b. The waste container/bottle shall have caution labels indicating the hazard classification and class of waste.
- c. Except for sharps and liquid wastes for disposal into sewer, all biohazard wastes are to be placed in yellow plastic bag with biohazard sign printed on it. Sharps shall be placed in appropriate sharps containers.
- d. If the biological waste is contaminated with chemical agents, the waste shall be treated as chemical waste.

DECONTAMINATION

HEAT STERILIZATION

The application of heat, either moist or dry, is recommended as the most effective method of sterilization. Disinfection as a physical or chemical means of killing microorganisms, but not necessarily spores. This is to distinguish it from sterilization which is defined as a process that kills and/or removes all classes of microorganisms and spores. Although many items can be easily autoclaved, there are

situations where autoclaving is not an option, for example when dealing with biological spills, surface decontamination and materials that cannot withstand the steam autoclaving conditions.

- a. Steam autoclaving is the preferred method for all decontamination processes.
- b. Autoclaves can sterilize all items that are heat stable. Proper autoclave treatment will inactivate all fungi, bacteria, viruses and also bacterial spores, which can be quite resistant.
- c. Solid surfaces are effectively sterilized when heated to 121 °C, at 15 psi for at least 15 minutes. Liquids and instruments packed in layers of cloth require a much longer time to reach a sterilizing temperature.
- d. Laboratory personnel should be aware of the safe and proper operation of autoclaves.

LIQUID DECONTAMINANTS

Hypochlorites (bleach and Presept) are broad-spectrum disinfectants used in many laboratories here. It is active against bacteria, fungi and viruses. At higher concentrations and extended contact times, bleach can inactivate bacteria spores as well. Domestic household bleach is typically made of 5.25% (52,500 ppm). Sodium hypochlorite but can range from 3-6%. Industrial bleach solutions have a higher concentration (10-15% sodium hypochlorite). They have to be diluted accordingly to obtain the working concentration. Please consult the product sheet of commercial solid chlorine-releasing disinfectants (e.g. Presept) for the equivalent availability of chlorine to add per volume of liquid.

Guidelines for use:

Liquid wastes can be decontaminated with 1:10 final dilution of household bleach (i.e. one part bleach to 9 parts liquid) for 30 minutes.

- a. A lower dilution (higher concentration) should be considered if there is much organic matter in the liquid (i.e. tissue culture waste).

After decontamination, liquid waste can be disposed of in the public sewer with copious amount of water provided no other hazardous materials are present (e.g. chemicals and/or radioactive materials).

Effective working concentrations of hypochlorite for disinfection are:

“Dirty” conditions (e.g. presence of large amounts of organic matter) - Sodium hypochlorite solution containing 0.5% available chlorine (equivalent to 5 grams per litre or 5000 parts per million)

Clean” conditions (e.g. for disinfecting surfaces, rinsing protective clothing) - Sodium hypochlorite solution containing 0.1% available chlorine (equivalent to 1 gram per litre or 1000 parts per million)

Other notes when using chlorine:

Many by-products of chlorine can be harmful to humans. Avoid indiscriminate use of chlorine- based disinfectants and follow safety precautions when using bleach:

- a. Chlorine gas is highly toxic. Store and use bleach in a well-ventilated area.
- b. Household bleach containing 5% sodium hypochlorite is considered to be an irritant. More concentrated bleaches containing 10-15% sodium hypochlorite are considered corrosive. Avoid direct contact with skin and eyes. Contact with skin can produce caustic irritation or burns. Splash goggles/face shield and protective gloves are recommended PPE when handling, diluting, etc.

- c. Hypochlorite and other chlorine-releasing disinfectants may cause corrosion of metals and this must be taken into account when decontaminating equipment. It is good practice to wipe down with water to remove residual hypochlorite on metal surfaces.
- d. Products containing chlorine dioxide or other forms of chlorine can successfully and safely be used in BSCs constructed with a high quality (grade 16 or higher) of stainless steel if the chlorine residue is rinsed off with sterile water or 70% alcohol after the effective contact time.
- e. Do not mix hypochlorites with other chemicals. For example, bleach mixed with acids or ammonium-containing materials rapidly generates the toxic chlorine and chloramine gas respectively. Check the incompatibility chart of bleach.
- f. Do not autoclave solutions containing bleach as toxic and corrosive chlorine gas can be liberated.

LIQUID CHEMICAL DISINFECTANTS

General Considerations for Selecting Chemical Disinfectants

Microorganisms exhibit a wide range of resistance to inactivating agents. Most vegetative bacteria, fungi and lipid-containing viruses are relatively susceptible to chemical decontamination whereas non-lipid containing viruses and bacteria with a waxy coating e.g. tubercle bacillus have mid-range resistance. Spores are most resistant to inactivation

No single chemical disinfectant or method is effective for decontamination in all situations. The choice of chemical disinfectants should be made after consideration of the following factors:

- a. Target organism(s)
 - b. Highest concentration of organisms
 - c. Amount of extraneous organic material present
 - d. The material & area to be decontaminated
 - e. Application method, contact time possible
 - f. Potential toxicity of disinfectant
 - g. Activity of disinfectant
 - h. Stability, storage conditions
- Contact times for disinfectants are specific to each biological agent, buffer or culture media constituents and the class of disinfectants.

Most chemical disinfectants are not sterilizers and should not be relied upon to destroy all organisms on a surface or piece of equipment. Simple wiping of the surface to be decontaminated with a liquid disinfectant does not kill all the organisms present.

Managing Accident / Incident

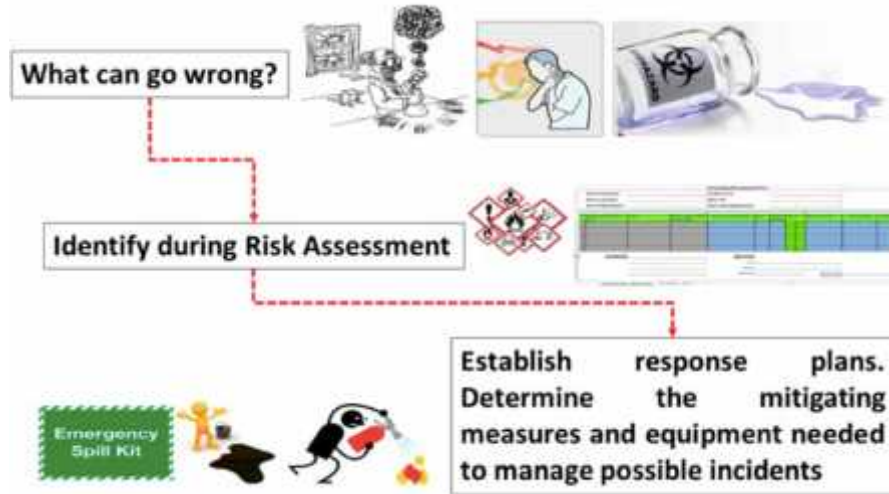


Image courtesy from OSHE

Biohazard Spill

Principal investigator should work with laboratory managers to ensure written spill clean up procedures are available in the lab

Spill kit contents and procedures should be based on **risk assessment**

Things to consider:

- 1) Biological agent used
- 2) Volume of possible spill
- 3) Likely location of spill
- 4) Potential of release to the environment
- 5) Effective disinfectant
- 6) PPE requirements

Recommended items in biological spill kit:

- Spill clean up procedures
- Warning Signage
- Effective disinfectant
- Biological waste bags
- Absorbent material
- Tongs/forceps/brush & dustpan / sharps bin
- PPE: Disposable gown, appropriate gloves, goggles, shoe covers, N95 respirator

Biohazard Spill Response

A: Raise Alarm

1. Warn others
2. Inform laboratory manager
3. Warning signage to restrict access



B: Contain and Disinfect I

1. Leave aerosol to settle for 30 mins
 2. Get spill kit
 3. Wear PPE
4. Prepare disinfectant



C: Contain and Disinfect II

1. Place absorbent sheet
2. Apply disinfectant
3. Pour from outer rim towards the center



D: Dispose & Notify

1. Discard as biohazard waste
2. Notify facility management of the incident

Ensure that researchers in the lab have been trained and are familiar with the spill clean-up procedures before attempting a clean-up.

You should only clean up a spill if you are aware of the biological hazards and procedures.

Biological Spills in a BSL1 Laboratory

- a. Notify others in the area, to prevent contamination of additional personnel and environment
- b. Users should inform the Lab Manager immediately and Lab Managers should inform the SRF in-charge.
- c. Put on gloves and a lab coat
- d. Cover spill with paper towels and gently apply disinfectant
- e. Leave in place for at least 30 minutes
- f. Wipe down any contaminated area
- g. Pick up the towels and discard into a biohazard container
- h. Re-wipe the spill area with disinfectant
- i. Remove gloves and thoroughly wash hands
- j. Decontaminate reusable items or equipment.
- k. Inform laboratory manager once the clean-up is over.

Biological Spills in BSL2 Laboratory

- a. Hold your breath and leave the room immediately
- b. Users should inform the Lab Manager immediately and Lab Managers should inform the SRF in-charge.
- c. Warn others to stay out of the spill area to prevent spread of contamination
- d. Post a sign on the door warning others of the spill
- e. Remove any contaminated clothing and put it into a biohazard bag for autoclaving
- f. Wash hands and exposed skin and inform your PI or Lab Manger about the spill
- g. Put on protective clothing (lab coat / disposable gowns, double gloves, N95 respirator, eye protection / goggles, shoe covers) and assemble clean-up materials
- h. Wait 30 minutes before re-entering the contaminated area to allow dissipation / settling of aerosols
- i. Cover the spill with paper towels and gently apply disinfectant
- j. Leave in place for at least 30 minutes
- k. Use forceps, tongs, broom and dustpan to pick up any broken glass and place in a sharps container
- l. Re-wipe the spill area with disinfectant
- m. Remove PPE in the correct order (i.e. safety glasses first and gloves last) and dispose as biohazard waste
- n. Dispose biohazardous wastes according to procedures determined after adequate risk assessment

Bio waste Disposal

- a. All wastes containing biohazardous material should be handled with gloves. Contaminated lab coats, dirty gloves and other contaminated materials must be autoclaved. To assure adequacy of sterilization, autoclaves must be tested routinely with spore strips and other methods as recommended by the manufacturer.
- b. Free flowing liquid waste e.g. cultures of microorganisms, tissue culture wastes, shall not be disposed off with solid waste nor discarded down the drainage system. The waste shall be contained in leak proof, rigid durable containers labeled with the biohazard symbol and the word "biohazard". Liquid wastes shall be decontaminated by autoclaving or with the use of an appropriate chemical disinfectant in accordance with the manufacturer's recommendations. The treated waste can then be disposed off in the sewer system.
- c. Sharps shall be placed in appropriate sharps containers that are labelled "biohazard".

- d. Used materials must be decontaminated prior to reuse or disposal. The aim of decontamination is to reduce or eliminate the potential of infectious agents to cause disease. Depending on the category, wastes containing biological agents is either sterilized and disposed off as regular wastes, or collected by licensed bio-waste collectors.

Sharp-Waste Disposal

- a. Sharps pose a physical-injury hazard as well as an infection hazard and a high degree of precaution should be taken. These include blood-drawing equipment, needles, syringes, slides, Pasteur pipettes, capillary tubes, broken glass and scalpel blades.
- b. Biologically contaminated sharps wastes are to be handled separately and differently from the ordinary trash. All contaminated sharps are to be treated as infectious and disposed of only through licensed biohazardous waste collectors.
- c. Contaminated needles should not be broken or clipped unless the clipping device can effectively control the aerosol generation. Needles shall not be recapped or separated from syringes prior to disposal.
- d. Containers for sharps (sharps containers) should be impervious, rigid and puncture proof. Sharps containers shall not be filled beyond the recommended fill line.
- e. Sharps containers shall remain closed at all times, except when being deposited into the container. Sharps containers shall not be placed on the floor in the lab at all times.
- f. Filled sharps containers should be sealed, labelled as 'SHARPS' and the biohazard symbol before disposal by licensed biohazardous waste collectors.

Autoclavable Material

- a. All laboratory specimens or materials consisting of, containing, or contaminated with blood, plasma, serum, urine, faeces or other human or animal tissues or fluids, as well as inoculated media, cultures, and other potentially infectious materials, may be sterilized by autoclaving. If autoclaving is not performed, the waste must be sent to NEA-licensed bio-hazardous waste collectors for incineration.
- b. Contaminated solid wastes such as cloth, plastic and paper items e.g. wrappers and paper towels must be put into autoclavable biohazard bags and may be autoclaved.
- c. Sterilization of biological wastes by autoclaving should be monitored using a biological indicator (such as 3MTM ESPE Attest™ Biological Monitoring System, code 1262P) to ensure quality assurance, and must be performed periodically if the autoclaved waste is disposed of as general waste at least once a month.
- d. *Autoclaved waste is no longer considered hazardous and can be disposed of as general waste.*
 - o Solid wastes shall be disposed of ONLY in black or blue trash bags.
 - o Autoclaved liquid wastes can be discharged into the sewer with copious amount of water.
- e. Dry hypochlorite or other strong oxidizers should not be autoclaved with organics such as paper and oil. **This may lead to explosion.**

Wastes for Incineration or Cremation

- a. Animal carcasses, human tissues, organs and sharps wastes are to be disposed of by incineration or cremation through licensed waste contractors.
- b. Waste generated from the use of scheduled agents listed under the Biological Agents and Toxins Act must be sent for incineration by an authorized waste collector / disposal company.

Chemical Decontaminated Wastes

- a. Waste which cannot be autoclaved should be chemically decontaminated.
- b. Swabs and other disposables soaked in a disinfectant may be double-bagged and treated routinely as general garbage. When using a disinfectant, precautions should be taken in accordance with the MSDS to prevent splashing and other harmful exposure.
- c. Chemically decontaminated wastes should be disposed through licensed toxic industrial waste collectors if the chemicals found in the waste pose a hazard to handlers.

Non-Infectious and Environmentally Benign Wastes

- Materials that can be directly discarded into the sewer include uninoculated liquid medium, tissue culture medium, and nutrient fluids, provided *these materials do not contain any infectious agent*.

Segregation and Storage

- All infectious waste containers should be properly sealed and marked with the biohazard label. The Principal Investigator or his designate shall ensure that all wastes are segregated and stored at the designated storage areas. The PI and staff shall ensure good housekeeping for all biological wastes stored in the common area under their jurisdiction.

VERTEBRATE ANIMAL BIOSAFETY LEVELS

No work involving with vertebrate animals (e.g. fish) is allowed at SJINML until further notice.

Animal Biosafety Level 1 (ABSL-1) is suitable for work involving little or no known potential hazard to animal handling personnel and the environment.

Animal Biosafety Level 2 (ABSL2) is suitable for animal work involving inoculation of agents of moderate potential hazard to personnel and the environment and it is also applicable to work with animals inoculated with materials of human origin (human cell lines, tissues, body fluids, etc.) from both commercial and non-commercial sources.

HOUSEKEEPING AND PERSONAL HYGIENE

Housekeeping procedures are essential in reducing the risks associated with working with pathogenic agents and contribute to safe research programme.

Injuries and exposures are more likely to occur in poorly maintained, disorderly work areas than in neat, well-kept spaces. In shared spaces, consideration for others and cleaning up after oneself is essential for maintaining a safe working environment.

Proper storage is important to prevent infection and contamination. Improper storage, handling or transport of biological materials in the laboratory poses a risk of infection to the personnel involved and others who may come in contact with the personnel or a contaminated environment.

I) Field Work Safety

A field trip is defined as any activity that occurs taking place in the outdoor environment. With respect to SJINML, this fieldwork safety policy shall be limited to activities undertaken on R/V Galaxea and fieldwork on coastal shore of St John's Island and Lazarus Island by SJINML research users.

GENERAL POLICY

Planning and preparation before embarking on the field trip is important. The organizer of the trip should plan the activities and communicate this plan to all participants. This plan should also be communicated to colleagues in the department for use in case of emergencies. The plan where applicable should include the following:

- a. General description of the activities to be conducted in the field trip
- b. Expected transportation routes and modes
- c. Feedback/records/risk assessment of previous field trips/similar activities, etc.
- d. The Planned itinerary – Locations, dates of arrival and departure, lodging details, type of transportation.
- e. Environmental conditions of the location – altitude, temperature, humidity, etc.
- f. Applicable/relevant regulations and standards
- g. List of participating personnel – organizer may need to capture information such as participant's addresses, phone numbers, passport details, blood type, medical condition and next-of-kin emergency contacts. Participants should provide relevant information about their medical background to the organizer, e.g. drug allergies. In cases of accidents, this information may be useful to emergency or rescue personnel. Designate a primary point of contact in the field who will be the person in charge (principal investigator or other on-site personnel if PI does not travel) of the field trip personnel.

Hazard and Risks Identification

General risks inherent to field trip include risk of the physical nature, posed by climatic and geographic conditions, and biological risks (for example, those arising from the presence of poisonous animals or pathogenic microorganisms). Other risk factors, such as chemical exposure, vehicular traffic, slips, trips and falls, etc should not be neglected.

Once the hazards have been defined, the next step is to qualify and quantify the risks. This is done through a procedure of risk assessment, based on:

- a. Location of the field trip conducted locally (and the necessary research permit/entry permit required/or any special training required)
- b. Nature of the activities conducted during the field trip (climbing, diving, handling of animals, carrying of tools/equipment)
- c. Number of personnel involved in the field trip
- d. Transportation arrangements (mode of transportation, hired drivers/boatmen, licenses and permits)

Once the risks are identified, the next step is to determine the appropriate type of risk controls. When determining the type of control measures, one should always consider the Hierarchy of Control:

- a. Elimination,
- b. Substitution/Reduction,

- c. Engineering control,
- d. Administrative control (including standard operating procedures) and
- e. Personal Protective Equipment (PPE)

In most instances, combinations of controls are required to manage the risk effectively. In field trips, risk controls should also be considered for emergencies or scenarios.

Elimination of potential hazards will be given the first priority while PPE will be the last resort in all control measures implemented in laboratories.

The following specifically describes main areas of fieldwork hazards/risks and possible measures/controls to take:

1. Weather/Climate
2. Animal Handling
3. Transportation Means

1. Weather/Climate related Hazards and Risk Controls

Hazard	Location	Cause	Symptoms	First Aid	Prevention
Dehydrating environment	Worldwide	Inadequate water intake	Dark urine Lethargy Constipation Light-headedness	Drink Plenty of fluids. Take frequent rest breaks. Minimize intake of beverages containing caffeine.	Drink plenty of water (at least 2 liters of water per day). Drink more if working strenuously or in a warm climate.
Sunburn	Worldwide	Excessive exposure to the sun	Irritated skin, pink to red in color, blistering in extreme cases	Apply cool water, aloe, or other cooling lotion to affected area.	Wear long sleeved clothing and a hat. Apply sun block with sun protection factor (SPF) of 30 or greater. Avoid activities during peak heat times of day.
Heat Exhaustion	Worldwide: Hot climate	Prolonged physical exertion in a hot environment	Fatigue Excessive thirst Heavy sweating Cool and clammy skin	Cool the victim, treat for shock, and slowly give water or electrolyte replacer	Acclimate to heat gradually. Drink plenty of liquids. Take plenty rest breaks. Avoid activities during peak heat times of the day.

Heat Stroke	Worldwide: Hot climate	Prolonged physical exertion in a hot environment	Exhaustion Light-headedness Change in behavior Loss of consciousness	Cool the victim at once by shower/bath/ice, replenish fluids, and seek medical attention immediately	Acclimate to heat gradually. Drink plenty of liquids. Take frequent rest breaks. Avoid activities during peak heat times of the day.
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2. Animal handling related hazards and risks controls

All field trip activities which involve trapping or handling vertebrate wild animals must be reviewed and approved by the NUS Institutional Animal Care and Use Committee (IACUC) prior to commencing the project.

Packing and Transporting of vertebrate animals

For animals caught in the field, transportation may occur between the capture site and field holding facilities or even the institutional animal holding facilities. Careful planning for all types of transportation should occur to ensure animal safety and wellbeing. The process of transportation should provide an appropriate level of animal biosecurity, while minimizing zoonotic risks, protecting against environmental extremes, avoiding overcrowding, providing for the animals' physical, physiologic, or behavioural needs and comfort, and protecting the animals and personnel from physical trauma.

3. Transportation related hazards and risk controls

Field trip activities may involve transportation across water bodies such as river channels, sea, etc. PI/Laboratory Supervisor should assess the appropriate transportation requirements and ensure that the students/ staff have received appropriate training to carry out the activity, informed about the risks involved and the safety requirements.

Improper transportation and transferring of chemicals in the field can result in spills, chemical exposures, and even fire hazards. The following guidelines can be useful while transporting chemicals in the field

- a. The Risk Assessment must be conducted for activities involving transport or transfer of chemicals.
- b. Loose chemical bottles or containers shall be placed in a secured and enclosed secondary containment container before it is transported from one location to another location.
- c. The chemicals should be packaged in durable, leak-proof container made of compatible material. It should be protected from external forces and secured in an appropriate cart or trolley, when necessary.
- d. Carry along an emergency spill kit and the appropriate PPE, if necessary.

- e. Be cautious when transporting/ transferring shock- or impact-sensitive chemicals. Consult the SDS for special precautions to be taken.
- f. Special measures must be undertaken when transporting and transferring cryogenic liquids. For e.g.: transport in a well-ventilated area, transport in an unmanned lift, avoid splashing, etc.
- g. Chemical compatibility must be taken into consideration when transporting chemicals of diverse reactivity, together at the same time.

USE OF RESEARCH VESSEL

- a. The Research Vessel *Galaxea* (SR 3049Z) is a 12m work boat, installed with an “A-Frame” and winch along with 600m of steel cable. The vessel is capable of carrying a maximum of 12 Pax onboard inclusive of the 3 crew members namely the steersman, engine driver and deckhand/safety diver. The boat is installed with navigational aid (Raymarine E120 and depth sounder). Cruising speed is about 15 knots. The vessel is equipped with an A-frame and hydraulic winch that can lift loads up to 400 kg. The vessel is manned by a steersman, an engine driver and a deckhand. Between the three crew, they have over 20 years’ experience navigating and working in Singapore waters and supporting marine science research.
- b. R/V *Galaxea* is reserved solely for research and educational work activities, and **STRICTLY NOT** to be used for any recreational or personal activities.
- c. All persons who will board R/V *Galaxea* for work must be registered with St John’s Island National Marine Lab (SJINML) as a Research User, including volunteers and any visiting scientists. This step is intended to ensure safety and insurance compliances are in order for all staff, researchers and facilities.
- d. Given the limitations for rapid emergency medical evacuation at sea, if you have any medical conditions which may place you at higher risk either during the field trip or during an emergency evacuation at sea, you are strongly advised to re-consider participating in the trip. Individuals are responsible for discussing any known medical conditions with their supervisor and Field Support Officer (FSO), bearing in mind the liability they pose to themselves and others in the research mission. For safety reasons, all researchers working onboard R/V *Galaxea* are expected to be able to swim.
- e. All researchers must have appropriate safety training required to complete the field work planned onboard, with safety risk assessments duly completed and approved by your Project PI. Risk assessment should include the use of life jacket for work on the boat. Note that any research activities involving vertebrates and cephalopods require approval from your institutional IACUC. Please ensure you have completed the relevant training and obtained the approvals for your research before commencing work.
- f. All researchers are expected to observe good work practices that minimize any harmful impact to the environment. This includes appropriate discretion in the design of your research and competent conduct of research activities at sea. Do not litter. No refuse shall be thrown overboard.
- g. Research Permits: Please ensure you have all the necessary research permits for collection of marine samples. Information on research permits for collection of marine life may be found on the National Parks Board website: <https://www.nparks.gov.sg/biodiversity/resources-and-research-permits>. Note that Research Permit Applications may take up to 3 months for approval.

- h. Entry into Restricted Areas: Users are also expected to apply for permits (including names of crew) for entry into restricted areas and provide the Vessel Steersman a copy of the permit one day before the field trip. Users are also to refrain from sampling at sites very close to the Port Limit.
- i. Dive Policy: As of 1 January 2017, NUS registered divers may use R/V *Galaxea* for research diving on condition that they provide copy of approval from NUS Office for Safety Health & Environment. Researchers from other institutions who wish to conduct research diving off R/V *Galaxea* should contact SJINML Administration and advise us of your institutional dive policy. This step is to ensure researchers have the appropriate training and are adequately insured.
- j. Safety First Policy. Working on a vessel at sea is inherently dangerous. As such, every member onboard must be safety conscious at all times.
- k. Insofar as safety is concerned, the Vessel Steersman has been assigned authority to suspend any activities which he deems unsafe. Research users are expected to take heed of all safety instruction from the crew. For diving activities, the dive supervisor reserves right to cancel the dive if sea conditions are unsafe.
- l. In the case of serious injury or medical emergency, scientific work will be terminated. The vessel will proceed immediately to evacuate the patient to the nearest ferry point for transfer to hospital.
- m. SJINML management reserves the right to suspend any researchers from conducting work on R/V *Galaxea* with immediate effect if their activities are deemed unsafe or inappropriate.

BOOKING PROCEDURE:

- n. Step 1: All users must register with SJINML Admin as a Research User by filling up the Facility Use Request form. For safety compliance, only registered users may board the vessel.
- o. Only one person needs to fill up a Boat Request Form for each trip but he/she must declare all the personnel participating in the field trip. All personnel must be registered SJINML Research Users.
- p. The Work Request Form must be submitted to FSO at least 1 week before the field trip.
- q. The booking calendar will be opened for bookings in 3 month blocks. Bookings are accepted as early as 3 months in advance and at least 3 days before the intended use. This allows the crew to plan for maintenance activities.
- r. Block booking is discouraged. As SJINML facilities are shared resources, in general, we will only grant a block booking if the booking does not obstruct other users from completing their work. If you require consecutive booking for more than 3 days in a week, please email Admin Manager with justification.
- s. Cancellations: Once you have made a booking, you will be charged the full fee of \$700/day whether or not you actually use the vessel on that day. As such, users are advised to cancel bookings (email FSO) as soon as possible if, for any reason your field trip cannot proceed. Booking cancellation made more than 7 days before the booking date will not incur charges. Any booking cancellation between 3 to 7 days before the booking date will incur a 50% charge. No refund will be provided for cancellations less than 3 days prior to the booking date. No penalty will be imposed if you are able to transfer your booking to another user.
- t. Multiple Users requesting the Same Date: SJINML has only limited resources to be shared. As such, we seek all users' cooperation to facilitate different activities of our marine science community. In event that multiple users require the same date for work, the FSO will inform the relevant parties. We encourage users to collaborate and agree on a mutually acceptable alternative plan. If no resolution is reached within 10 days of the booking date, a ballot will be taken. The results of the ballot will be final.

BOAT USE CHARGES:

- u. Per day rate for weekdays is S\$700 inclusive of 300L fuel (equivalent to 2–3 hrs cruising) and three (3) crew comprising the steersman, engine driver, and deckhand.
- v. Per day rate for weekends is S\$1,400 inclusive of 300L fuel (equivalent to 2–3 hrs cruising) and three (3) crew comprising the steersman, engine driver, and deckhand.
- w. A surcharge of \$1.00 per litre will be imposed for fuel consumption exceeding 300 litres per trip. For example, a return trip from Raffles Lighthouse to Republic of Singapore Yacht Club (RSYC) consumes about 300L of diesel.
- x. 60% additional charge will be levied for non-academic users.
- y. Operation Hours are from 0900 hrs – 1700 hrs on weekdays. Please ensure you arrive at the marina early and are ready to **set off by 9am**. Ensure you complete your work in a timely manner so that the vessel is able to return to RSYC and **disembark by 5pm**. These timings are to ensure the crew have sufficient time to prepare the vessel before/after a trip, and get off work on time every day.
- z. Overtime charges for weekdays will apply to any service after 1700 hrs or before 0900 hrs, while overtime charges for weekends will apply to any service after 1600 hrs or before 0900 hrs. In due respect to the crew who have families, please ensure you plan for and complete your work on time. Note that there are strict rules regarding employment of non-academic staff after hours. As such, if you require use of R/V *Galaxea* after operation hours, please apply to FSO at least 2 weeks in advance, so appropriate staff arrangements can be made. SJINML management reserves the right to suspend any users who persistently incur overtime without prior arrangement.
- aa. Disembarking at an alternative location: In event that you require the vessel to be berthed at a different location overnight, please ensure that you have made all the arrangements with the marina to host our vessel, as well as appropriate transport provisions for the crew. All expenses are to be borne by the project. The staff's travel to an alternate marina will be chargeable to the user. If you choose to embark/disembark from an alternative location, note that the start/end time for your trip will still be based on the time of departure/arrival of R/V *Galaxea* at RSYC. Overtime charges will apply if the crew have to work outside operation hours in order to reach the alternate pickup point.
- bb. Bookings on weekends and public holidays are possible but strongly discouraged, given strict NUS guidelines for employment of non-academic staff outside office hours. Overtime charges will apply. If you must use the vessel after operation hours, please apply at least 2 weeks in advance so that suitable arrangements can be made.

SAFETY:

- cc. Under Workplace Safety & Health Act, a risk assessment must be conducted for all research activities including field work. Please submit a copy of your risk assessment to the FSO prior to commencement of work. Please ensure that you have all PPE required for use of equipment onboard (eg. safety shoes, gloves, helmet, etc) as specified in the Risk Assessment submitted.
- dd. The crew onboard *Galaxea* will not be responsible for equipment loss or damage, or loss of personal valuables. Research users are expected to take appropriate measures to safeguard equipment and personal belongings, including taking appropriate insurance for sensitive and high value equipment.
- ee. As Singapore waters are heavily patrolled by the coast guard, all Singaporean and Permanent Residents are advised to carry their personal identity card and non-citizens should bring their passport/FIN card when conducting field work at sea.
- ff. Users are strongly encouraged to check their field equipment and materials prior to the start of the field trip (before 9am) so that the field trip can commence on time. No waiver of charges will

be provided if the trip is called off due to problems with the researcher's equipment on the day of the booking.

- gg. For safety reasons, the winch onboard R/V *Galaxea* should ONLY be operated by the crew of R/V *Galaxea*. If you have special requirements, please inform FSO at least 1-2 weeks in advance of your booking date.
- hh. If you will be using any chemicals or hazardous materials for your research and will be carrying these onboard R/V *Galaxea*, please seek permission from FSO at least 2 weeks before your trip. Please provide a copy of the MSDS, relevant permits and safety risk assessment. Work closely with FSO to ensure that appropriate safety controls and emergency procedures are in place before commencing trip. Research users are responsible for supplying all the required chemical spill kits and PPE.
- ii. Any accidents, injuries or illnesses are to be immediately brought to the attention of the Vessel Steersman.

IMPORTANT CONTACT INFORMATION:

Boat Bookings and Enquiries: Field Support Office (FSO): Mr Sebastian Yeo

Emergency contacts:

R/V *Galaxea* Captain - Mr Wong Ann Kwang: 9795 6179 (HP)

Police Coast Guard: 1800-375-0000

Maritime Port Authority: 6375 1600

DIVE SAFETY REGULATIONS

As of 1 September 2016, only research personnel from NUS are approved to use R/V *Galaxea* for research diving, on condition that they provide evidence (such as copies of risk assessment, approved dive plan and medical certificate, latest dive logged no. and date) that they have conformed to the Dive Safety Policy and requirements set by NUS safety office. Access for other organisations will only commence after the dive code covering scientific research is approved by MOM.

NUS divers must register with appropriate departmental dive safety officer, and provide SJINML evidence of (a) dive qualification, (b) approval from OSHE to undertake dive activities as a NUS registered diver.

All other institutions shall apply to SJINML administration for permission. Applications will be considered on case-by-case basis depending on the researcher's experience, host institution's dive safety policy and appropriate insurance coverage for the personnel's field work.

Compliance is required for all personnel (staff, students, attached personnel and volunteers). For NUS staff and students, the NUS Dive Policy and practice as defined in the NUS Research Diving Manual shall apply to ensure:

- a. Appropriate dive standards and practices
- b. Appropriate levels of dive competencies
- c. Submission of a Dive Operations Plan including risk assessment for all research projects prior to diving phase of project
- d. Medical fitness to dive. All research divers will require a dive medical to ensure they are fit to participate as a research diver.
- e. Surveillance, reporting and diving incident investigations.

f. Medical response plan for medical emergencies

The following activities are NOT permitted:

- a. Diving to depths greater than 20 m
- b. Diving with gases other than air (21% O₂)
- c. Diving with pure oxygen
- d. Decompression diving
- e. Cave diving

Diving Activity	Minimum Certification	Minimum Experience # dives
No-decompression diving to depths < 10m	Adult Open Water Scuba Diver	20
No-decompression diving to depths 10-18m	Advanced Scuba Diver	30
No-decompression diving to depths 18-30m	Rescue Diver	50
No decompression diving to depths 30-40m	Divemaster	100

Basic guidelines:

Risk assessment and management for any dive project is similar to that of any research project undertaken within NUS. All dive projects must be registered with NUS Safety Office by the completion of the Dive Project Registration Form.

Divers are expected to keep and maintain a permanent record of all dives undertaken for the duration of the diver's research. All permanent records and Equipment Logbook are to be kept for 5 years for legal and audit purposes.

All dive teams must have a Dive Supervisor who will not be participating in the actual dive. Dive teams that are not able to assign a Dive Supervisor would be required to inform the Dive Control Officer (DCO) and provide additional dive safety measures prior to dive trips. A copy of approval must be provided to FSO before the trip may commence. A dive may also be refused by the Dive Supervisor if deemed dangerous and unsuitable. Divers must take into Dive Supervisor's recommendation before executing the dive.

Buddy System shall be practiced. Buddy diving offers a greater margin of safety, being able to provide any assistance to one another in the shortest given time and allows for better accountability for the divers working underwater.

The diving pair must have a dive computer, an underwater time keeping device, a depth indicator, and a submersible tank pressure gauge. The divers must have a laminated dive table during the dive to be used as a backup when a dive computer is not available or malfunctioned during the dive. Each diver is required to carry a writing slate, tank banger, a surface marker buoy and a dive whistle on each work dive. Each diver shall conduct a functional check of his diving equipment in the presence of the diving buddy. Each diver is to perform all checks as required by their training protocol – BCD, Weights, Air, Release mechanisms, Final check (BWARF).

Dives must be planned carefully and followed to ensure the number of ascents during a dive is kept to a minimum. For shallow dives, there should not be more than 2 ascents (excluding final ascent) per shallow dive. A shallow dive is defined as a maximum dive depth of 3 - 10 m.

Divers performing successive multi-day repetitive dives must use the dive tables/dive computer for calculating their no decompression limits on each dive even if all dives are shallow.

The Dive Supervisor will implement head-count procedures which must be reflected in the dive plan and communicated to all divers. There should not be more than 6 divers to 1 Dive Supervisor.

The likely quantities of gases needed for diving operations, including emergency oxygen, must be calculated when planning a diving activity. Allowances should be made for contingencies. The diving operation must cease if the quantity of gas available falls below the minimum planned for and specified in the dive plan. Gas cylinders must be clearly labelled.

Bad weather can affect diving operations in the following ways:

- a. Wind speed and direction can make supervising drift divers difficult for the vessel master.
- b. Rain and haze will cause a reduction in surface visibility, making it difficult to navigate the dive vessel.
- c. Bad weather can make working on deck extremely hazardous for the dive team.
- d. Extreme heat or cold can affect divers. Arrangements should be made to keep divers sheltered and well hydrated.
- e. Electrical storms or lightning is a hazard to exposed personnel or equipment. Underwater recall procedures and drills to take cover from lightning must be in the plan.

Underwater currents can inhibit the diver's ability to dive comfortably and safely. Tide tables for shores around Singapore provide accurate information useful for predicting the flow of prevailing currents. They should be used to assess diving conditions. The sea state can affect each stage of a diving operation as the risk of accidents are increased and recovery of divers can be difficult.

The boat captain reserves the right to cancel a dive trip in event of bad weather or rough sea condition.

After the completion of a dive, each diver shall report to FSO immediately, any physical problems, symptoms of decompression sickness, or equipment malfunctions. He should also not undertake any activities that will increase the risk of decompression sickness such as strenuous exercise and heavy alcoholic intake within 24 hours after a dive, and that includes between dives.

Appendix A: FACILITIES USE REQUEST

This form will be used by SJINML staff to review your requests for facilities use. Please be as descriptive and thorough as possible in completing this form, so we may assist in making your use of the SJINML as productive as possible.

If you have any questions about the available facilities, equipment, boats, sampling areas, required permits and safety trainings etc., please do not hesitate to contact us at Email: sjimlbooking@nus.edu.sg

Please forward the completed form to Email: sjimlbooking@nus.edu.sg. An officer will be assigned to assist you within 7 days of the date we receive your application. He/she will assist you to complete registration.

NAME _____

ADDRESS _____

PHONE NO. _____

E-MAIL ADDRESS _____

Staff of Singapore-based organisation

Student – project/ 4-6 months

Student – Postgraduate studies

Overseas Visiting Scientist

Volunteer

PROPOSED PERIOD OF RESEARCH: From _____ to _____

BRIEF DESCRIPTION OF PROJECT:

Please attach a short proposal describing broadly the objective of the research. Describe your research approach focusing on facility requirements and highlighting any safety and health risks. Please enclosed relevant Safety Risk Assessments as necessary. Please also include a short biography indicating your previous research experience relevant to the proposed research.

FUNDING: Project Grant/Organisation/Individual _____

REQUIREMENTS:

1. How often do you expect to come to SJINML?

Daily rate (User is charged by per day usage based on days booked by the User)

Annual rate (User is charged an annual fee irrespective of the number of days in the year User access the facility)

2. Would you require accommodation? Yes/No

3. Research requirements

Lab – bench space only

Lab and equipment _____

Cold Storage space: Refrigerator/Freezer 20°C/Deep Freezer -80°C _____ m³

Research Vessel “Galaxea”

Scuba Use

Aquaria space – holding tanks only: _____ m³

Aquaria space – experimental use

Special Equipment needs: _____

My research may involve the use of Hazardous chemicals and controlled substances:

I will be bringing in animals and plants for my research:

- Any pathogens? Type: _____ Biosafety Level _____
- Any organisms governed by legal requirement (eg. CITES)? _____
- Other information: _____

My research may require infrastructure modification to SJINML facilities:

Additional Information:

Please note:

All publications of any materials (via media releases, media interviews, speeches or videos etc.) by any User of the Facility that are related to work fully or partially undertaken at the Facility must include an acknowledgement of the National Research Foundation’s support of SJINML substantially in the form as follows:

“[The authors] would like to acknowledge the St. John’s Island National Marine Laboratory for providing the facility necessary for conducting the research. The Laboratory is a National Research Infrastructure under the National Research Foundation Singapore.”

Date of Request _____ Signature _____

FOR OFFICIAL USE:

This Request is – Approved – Not Approved

Signature: _____

Safety Training Requirements to be tracked:

SJINML Safety Briefing

Fire Safety Training Certificate

Basic Laboratory Safety Training certificate

Chemical Safety Training certificate

Biological Safety Training Certificate

Others: _____

Safety Trainings completed (Date of expiry):

SJINML Safety Briefing (_____)

Fire Safety Training Certificate (_____)

Basic Laboratory Safety Training certificate (_____)

Chemical Safety Training certificate (_____)

Biological Safety Training Certificate (_____)

Others: _____

Laboratory access granted:

- **Biodiversity Cluster, except/only** _____
- **Water-Plankton Cluster, except/only** _____
- **Microbial-Molecular Cluster, except/only** _____
- **Culture Facilities, except/only** _____
- **Biome Lab, except** _____
- **Aquarium A, except** _____
- **Aquarium B except** _____
- **Open Area, except** _____

Laboratory access - after hours : – Yes – No – Limited Access _____

Other resources:

Dive facilities

Use of Research Vessel

Use of Seminar Room

Use of Teaching Lab/Classroom

Use of Living quarters

Other Information: _____

Facility Charges (Updated 17 February 2017)

*Note that the amount indicated below do not include GST.

Bench Fees:

USER TYPE	Cost (SGD)*
Short term/Daily Rate user	
Student (hot desking; Open Plan Office)	12.00
Researcher Type A (general user; Open Plan Office)	60.00
Researcher Type B (senior staff; Private Office)	70.00
Visiting Scientist (non-resident; Open Plan Office)	80.00
Visiting Scientist (Resident; no office, with Dormitory)	100.00
Non-academic/commercial user (Open Plan Office)	100.00
Use of Aquarium only (no personnel on site; basic use of aquaria)	20.00
Long term user	
Project student (4-6 months; <80 days)	960.00
Postgraduate Student (per annum)	3,600.00
Researcher Type A (per annum)	18,000.00
Researcher Type B (per annum)	21,000.00
Aquaria only (1m ³) (per annum)	6,000.00
Add-ons	
Bench space (Daily, per m ²)	5.00
Aquarium usage (Daily per m ³)	5.00
*excluding GST	

The basic bench fee includes:

- Daily ferry transport to/from St John's Island
- Desk space
- Shared use of research laboratories with basic equipment, aquaria (<1m³ in 2 m²) and bench space (<1 m²)
- Use of kitchen and dining facilities

Bench fees excludes:

- Laboratory consumables
- Meals
- Basic safety Personal Protective Equipment (PPE). Researchers are expected to bring their own PPE as required for their research.
- Disposal of hazardous waste (e.g. chemical, biological, bulky refuse)

Notes

- Open Plan Office refers to offices where there are several staff and students in each room. Some may be long term, some hot desking.
- Private Office refers to offices with <3 senior staff sharing an office.
- Long term user refers to staff/students that are based full time in SJINML. They will be given a fixed desk and bench space, as well as space to keep things on site.

- Short term/daily rate users are expected to make bookings for each day they come to use the lab. They are expected to remove their belongings from the desk and lab bench at the end of each day.
- Government agency staff enjoy the same bench fee rates as for academic users.
- For projects requiring >5m² laboratory bench and/or >5m³ aquaria facilities, the researcher is advised to approach Admin Manager with a proposal describing the intended usage and expected outcomes of the research for senior management approval (see Pg. 7).

Waiver of Bench Fees

- Volunteers shall refer to persons assisting on projects and not receiving any kind of payment for their work, nor is the work contributing directly to his/her studies (eg. project work). Volunteers are not entitled to priority booking of facilities and boat seats. Volunteers require permission for access and as such must apply as for all research personnel, but will be exempt from payment of bench fees.
- Casual day visitors to the Education Centre are also exempt from bench fees
- All other requests for waiver or exemption must be raised to Facility Director/Governing Board for approval.

Additional Facilities:

Facilities	Cost (SGD)*
Research Vessel (R/V) Galaxea	
<i>Academic users</i>	
Daily rate for weekdays	700.00
Daily rate for weekends or public holidays	1,400.00
Additional fuel usage (per litre)	1.00
Marine Park Outreach & Education Centre (MPOEC)	
Dormitory (per bed)	30.00
Seminar Room (per day) <i>Max 70 pax</i>	250.00
Classroom (per day) <i>Max 20 pax</i>	250.00
*excluding GST	

Use of R/V Galaxea:

Research users may use the Galaxea for all dive and field work. The vessel has the capacity to hold 9 pax and 3 crews (steersman, engine driver and deckhand) for its trip, with a maximum speed of 24 knots. Overtime penalty applies for any trip extending before/ after operation hours (0900 hrs to 1700 hrs) for weekdays and for weekends, before 0900hrs and after 1600 hrs. Overtime charges would apply on an hourly basis at \$100/hr for weekday and weekend. Additional fuel usage incurred will be charged at \$1 per L. For Non-academic user, additional 60% overhead charge will be applied.

Request for field trips after office hours (>3 hours) and weekends must be submitted at least 2 weeks before the trip date. Overtime charges apply.

*As of 1 September 2016, only research personnel from NUS are allowed to use R/V Galaxea for research diving, on condition that they provide evidence (such as copies of risk assessment, approved dive plan and medical certificate) that they have conformed to the Dive Safety Policy and requirements set by the respective institutional safety office. Access for other organisations will only commence after the dive code covering scientific research is approved by MOM.

Transport of chemicals and hazardous substances into SJINML: Apply at least 4-6 weeks in advance. Admin charges will apply if additional license is required for its transport and storage in SJINML.

Appendix B: Template for Facilities Use Agreement between NUS and external organisations

The following document provides a draft legal template for Facilities Use Agreement for non-NUS researchers. The Facilities Use Agreement seeks to ensure that employers and host institutions continue to exercise appropriate responsibility for the safety of their researchers when they are working on our premises, to ensure a safe work environment for everyone. After initial registration, the Admin Manager will follow up with researcher's host organisation to ensure appropriate legal agreement is in place.

ST JOHN'S ISLAND NATIONAL MARINE LABORATORY NATIONAL UNIVERSITY OF SINGAPORE RESEARCH FACILITIES USE AGREEMENT

This RESEARCH FACILITIES USE AGREEMENT (the "Agreement"), effective as of _____ (the "Effective Date"), is executed by and between _____ (the "User"), having a principal place of business at _____, and the National University of Singapore, having its registered office at 21 Lower Kent Ridge Road, Singapore 119077 ("NUS"), acting through its Tropical Marine Science Institute ("TMSI").

This Agreement sets out the Parties' mutual understanding regarding the use of the facilities and/or equipment (collectively the "Facility") by the User at St John's Island Marine Laboratory ("SJINML"), which is a Facility owned by NUS.

(NUS and the User may hereinafter be individually referred to as "Party" and collectively as "Parties" in this Agreement.)

1. TERM OF USE

The User's use of the Facility shall commence on _____ (the "Commencement Date") and continue through _____ (the "End Date"), unless otherwise extended or terminated as provided in Clause 15, provided the User has complied with User obligations as set forth in this Agreement.

2. PURPOSE, LICENCE AND RESTRICTIONS ON USE

a. The User's access and use of the Facility shall be for the specific purposes as set out in Appendix A only. The Facility shall not be used for any other purpose(s). The use of the Facility shall not result in the generation of hazardous materials or hazardous waste, unless a written request with necessary details has been made to NUS and expressly permitted by NUS, subject to additional terms and conditions as prescribed by NUS.

b. NUS shall allocate the designated space for the User (the "Allocated Space"). Any requirement for more space at SJINML shall be subject to availability and written approval by NUS.

c. This Agreement shall not be construed as giving the User exclusive right to the occupation of the Allocated Space. The legal right to possession and control over the Allocated Space remains vested in NUS throughout the term of this Agreement. NUS retains the right to grant permission to other parties to use the Facility or any part thereof at its sole discretion.

d. The User's use of the equipment furnished by NUS is limited to the equipment and uses set out in the Equipment Standard Operating Protocols, which will be made available on-site.

e. The User's access to and use of the Facility is subject to guidelines defined in the SJINML Research User Handbook (Appendix B), and such guidelines will be monitored by the respective laboratory managers overseeing research facilities.

3. FEES AND COSTS

The monthly fee charged to the User for use of the Facility shall be:

a. The daily/annual fee shall be \$_____*.

b. For daily rate, user shall pay NUS as indicated above, on a monthly basis. NUS shall submit an invoice to User once a month (or within two (2) weeks of last date of use), and the User shall pay such invoice within thirty (30) days of the invoice date.

c. For annual fee, the User shall pay NUS in advance, within thirty (30) days of the Commencement Date.

d. Separate charges apply for use of special equipment, services and accommodation at SJINML. The User will be informed of fees payable by the relevant manager in charge. NUS shall submit an invoice to User once a month (or within two (2) weeks of last date of use), and User shall pay such invoice within thirty (30) days of invoice date.

e. All fee payments by User shall be made payable to the "National University of Singapore".

f. For effective notice of payment, all invoices shall be sent to:

[User to insert details]

Payments shall be sent to: [insert details]

*NUS reserves the right to adjust bench fees, with new rates taking into effect at the beginning of each financial year. User will be notified by 1 February of each year, of changes expected from 1 April of the new financial year.

4. CARE & MAINTENANCE

The User shall at all times ensure proper care of the Facility and keep it in good condition and good working order. The User shall also maintain the Facility in a clean and safe condition over the period of use, and upon termination of the Agreement, surrender the Facility in as good a condition as received, normal wear and tear accepted.

5. DAMAGE TO FACILITY AND INDEMNITY

a. The User where permitted to bring in hazardous material, shall be responsible for any damage to the Facility and shall be liable for all costs and expenses in rectifying the damage, or for the clean-up or waste-related expenses incurred by NUS, including without limitation, costs pertaining to disposal,

shipping, damages, equipment repair and/or replacement and/or other costs or penalties incurred by NUS as a result of the use of the Facility by the User.

b. The User is fully responsible for his/her own equipment and shall maintain such equipment in safe working order.

c. The User shall indemnify and keep NUS indemnified against all losses, claims, demands, actions, proceedings, damages, costs or expenses (including all legal fees) and any other liability arising in any manner whatsoever (the "Consequences") from (i) the User's employees, agents, or students access and use of the Facility; (ii) the installation, operation or use of any of the User's equipment or material in the Facility; (iii) any animal or plant brought into the Facility by the User; (iv) any breach of the Agreement by the User and/or breach of undertakings by the User's employees, agents or students; (v) breach of law, save where the Consequences arise from and/or have arisen as a result of negligence or wilful default of NUS.

d. The User shall submit a separate damage deposit of \$_____, which shall be applied towards the costs of any NUS expenses beyond reasonable wear and tear that may result from the use of the Facility by User. For the avoidance of doubt, the User's liability for damages shall not be limited or capped to the amount of its damage deposit. Any unused portion of the User's damage deposit shall be returned to User.

6. OWNERSHIP AND INTELLECTUAL PROPERTY RIGHTS

a. Intellectual property developed solely by employees or agents of User in the Facility shall be the exclusive property of User. Intellectual Property jointly developed by employees and/or agents of User and employees, agents and/or students of NUS in the Facility shall be jointly owned by User and NUS. Disposition of such jointly owned intellectual property shall be determined by the terms of a separate agreement between the Parties. Nothing in the foregoing grants any rights to NUS' share of any jointly held intellectual property to User.

b. In the case of intellectual property developed by User which constitutes an improvement or new method of use with respect to equipment within the Facility, User hereby grants to NUS a perpetual, royalty-free right and license to use such intellectual property in combination with such equipment for research purposes.

7. COMPLIANCES

a. The User, its employees, agents and personnel acting on its behalf shall comply with Singapore laws regulations, policy directives and other requirements in Singapore, as amended from time to time, governing the operation and use of the Facility. In addition, the User shall adhere to all applicable NUS policies, rules, guidelines and procedures, pertaining to the use of the Facility. NUS reserves the right, at its sole discretion, to determine and monitor the manner of User's compliance for any matter pertaining to use of the Facility.

b. The User shall permit unannounced access to the Facility by NUS personnel, any National Research Foundation personnel and its authorised representatives and any third party nominated by NUS. User shall promptly comply with all requests by NUS for information related to the use of the Facility as NUS deems necessary for its compliance with any regulatory policies and laws and/or any legal obligations NUS may have to any third party.

- c. For avoidance of doubt. NUS' permission to the User to access and use the Facility shall not be construed as NUS' endorsement of any activities described in Appendix A. Prior to commencing any activities in the Facility that require special permits, licenses or certifications, the User shall obtain the necessary permits, licenses or certification at its own expense and shall consult NUS on procuring such licenses permits or certifications, which may require the Facility owners acknowledgement or approval. The User shall provide NUS with copies of the relevant permits, licenses or certification.
- d. User shall comply with Singapore laws and regulations controlling the export of technical data, computer software, laboratory prototypes, animals and all other export controlled commodities.
- e. User may be required to attend user meeting convened and conducted by NUS to provide feedback in relation to the use of the Facility.

8. AUTHORIZED USERS

- a. The User shall not permit the Facility to be accessed or used by any person who is not an employee, agent or others acting on its behalf without prior written approval by NUS. For the avoidance of doubt, under no circumstances shall the User's use rights in the Facility be extended to unrelated organisations or parties for any purpose.
- b. NUS reserves the right to deny entry to the Facility or to immediately remove from the Facility, at its sole discretion, to any User personnel who NUS believes represents a safety or security risk to NUS.

9. ADDITIONS/MODIFICATIONS TO THE SPACE

- a. NUS shall own all permanent modifications, alterations and additions made to the Facility, whether made by User or NUS. User may furnish non-permanent equipment, tooling, test apparatus or other materials necessary for its use of the Facility, and such items shall remain the property of User. NUS shall not be responsible for any loss or damage to such items however occasioned.
- b. Except as specifically provided in this Agreement, the User shall not use NUS' equipment, tools, personnel or furnishings without permission. The User shall confer with relevant laboratory managers for access to equipment availability to avoid conflicts in the use of the Facility. In the event of an unavoidable conflict, NUS' uses related to research, teaching, and education shall take precedence.

10. NO TENANCY

The Parties agree and acknowledge that the User is not a tenant, and that the Parties' relationship is not a landlord-tenant relationship. As such, the User shall have no right to make any claim upon NUS for abatement of the fee, constructive eviction, rescission, or other claims to which a tenant would be entitled.

11. INSURANCE

The User [and User's parent organisation] shall at all times maintain and keep in force public liability insurance and insurance required under the Work Injury Compensation Act and other applicable legislation and for taking all other actions required as an employer for its employees utilizing the Facility.

12. REPRESENTATIONS AND LIABILITIES

a. The User shall be solely responsible for its activities while using the Facility, and agrees that it does so at its own risk. NUS makes no representations or warranties of any kind, express or implied, concerning the fitness or suitability of the Facility for any purposes.

b. NUS shall not be liable to the User or any other person for:

- (i) accidents, incidents or injuries sustained in the Facility;
- (ii) any loss or damage to property in the Facility; or
- (iii) any interruption, disruption or cessation in the User's use of the Facility by reason of
 - 1) any upgrading, retrofitting, necessary repair or maintenance of the Facility; or
 - 2) any damage or destruction to the Facility;

unless it is shown to be caused by the negligence or default of NUS.

c. To the fullest extent permitted by applicable law, in no event shall NUS be liable for any consequential damages, loss of profits, loss of income, loss of anticipated savings, third party claims or any type of indirect, special, consequential or incidental damages, even if advised of their possibility.

13. PUBLICITY

Neither Party shall use the name of the other, or that of any of its trustees, officers, faculty, students, employees or agents, or any trademark owned by the other in any advertising, or other forms of publicity, without the written permission of the other Party's authorised representative.

14. PUBLICATIONS OF RESEARCH FINDINGS AND ACKNOWLEDGEMENTS

a. All publications of any materials (via media releases, media interviews, speeches or videos etc.) by any User of the Facility that are related to work fully or partially undertaken at the Facility must include an acknowledgement of the National Research Foundation's support of SJINML in such form as may be determined by the National Research Foundation.

We propose you use the following format:

"[The authors] would like to acknowledge the St. John's Island National Marine Laboratory for providing the facility necessary for conducting the research. The Laboratory is a National Research Infrastructure under the National Research Foundation Singapore."

b. Users shall keep NUS informed of the creation of Intellectual Property, patents and publications arising from research that is performed using equipment that is maintained by SJINML. All peer-reviewed publications arising from research that is performed using equipment that is purchased, or maintained under SJINML shall be made publicly available no later than twelve (12) months after the official date of publication.

15. TERMINATION

a. This Agreement shall terminate on the End Date set forth in Clause 1, unless it is extended for an additional period of time by written amendment signed by both Parties, or it is terminated before that date as provided in this Clause 15.

b. Either Party may terminate this Agreement at any time without cause and without further obligation except for return of all borrowed equipment/materials and confidential materials to the appropriate party and payment by User for any use charges incurred prior to the termination date. Such “without cause” termination shall be effected by the terminating Party providing at least thirty (30) days’ prior written notice to the other Party’s authorised representative at the address in Clause 15.

c. NUS may terminate this Agreement immediately for cause if the User:

- (i) fails to make payment to NUS in accordance with the terms stated in Clause 3 above and does not remedy the non-payment within thirty (30) days’ written notice from NUS;
- (ii) fails to materially comply with the terms of this Agreement, provided that, at its sole discretion, NUS may allow a reasonable amount of time for User to remedy such noncompliance; or
- (iii) allows its insurance coverage or safety training certificates to lapse or terminate for any length of time.

d. Upon termination by either Party for any reason, the User shall promptly pay NUS any outstanding fees owed for use of the Facility up to and including the Termination date. If the User has prepaid for use of the Facility beyond the termination date, NUS shall promptly refund any such excess fees to User on a pro-rata basis subtracting any User obligations for clean-up, damage repair and/or replacement and other liabilities under Clause 5. These obligations shall extend beyond the End Date or date of termination under this Clause 15 and shall be extinguished only by written notice from NUS that such obligations have been satisfactorily met.

16. FORCE MAJEURE

a. No Party shall be liable for any failure to perform his obligations under this Agreement if the failure results from a Force Majeure Event (defined below), provided always that whenever possible the affected Party will resume that obligation as soon as the factor or event occasioning the failure ceases or abates. For purposes of this Agreement, a “Force Majeure Event” is an event that is a circumstance or event beyond the reasonable control of a Party which results in the Party being unable to observe or perform on time an obligation under this Agreement. Such circumstance or event shall include, without limitation, industrial action or labour disputes, civil unrest, war or threat of war, criminal or terrorist acts, government action or regulation, telecommunication or utility failures, fire, explosion, natural physical disasters, epidemic, quarantine restrictions, and general failure of public transport.

b. The Party prevented or delayed in the performance of its obligations under this Agreement by a Force Majeure Event, shall give written notice thereof to the other Party specifying the matters constituting the Force Majeure Event, together with such evidence as it reasonably can give and specifying the period for which it is estimated that such prevention or delay will continue.

c. If the Force Majeure Event shall continue for a period exceeding two (2) months from the date of the notice of such Force Majeure Event under Clause 16(b) above, either Party may at any time thereafter terminate this Agreement by written notice to the other Party.

17. CONFIDENTIALITY

a. Each Party agrees to hold in trust and confidence all information disclosed to it by the other Party, including, but not limited to, materials provided to it by the other Party during the course of

collaborating on the Project under this Agreement, AND that is marked with the word “Confidential” or with words of similar import (collectively, the “Confidential Information”).

b. The receiving Party shall not disclose all or any part of such Confidential Information to any third party or make any use of the same (except for the purpose of performing its obligations under this Agreement) without the prior written consent of the disclosing Party. The receiving Party agrees to restrict access to all such information within its institution to only such limited group of authorised employees or contractors who require such information in connection with the receiving Party’s activities pursuant to this Agreement and who are contractually or otherwise obligated to keep such information confidential and are instructed to neither use nor disclose such information in a manner other than as permitted herein. This confidentiality obligation shall survive the expiration or earlier termination of this Agreement for a period of one (1) year.

c. The confidentiality obligation shall not apply to any information which:

- (i) was previously known to the receiving Party without any obligation of confidentiality; or
- (ii) has been properly made available by a third party to the receiving Party under conditions which do not restrict further disclosure or subject to any obligations of confidentiality; or
- (iii) is or becomes part of the public domain through no fault of receiving Party or any of its employees or contractors; or
- (iv) is developed by the receiving Party independently of any Confidential Information of disclosing Party, as evidenced by written records; or
- (v) is required to be disclosed by court rule or governmental law or regulation, provided that the receiving Party gives the disclosing Party prompt notice of any such requirement and cooperated with the disclosing Party in attempting to limit such disclosure; or
- (vi) was disclosed by the receiving Party with the disclosing Party’s prior written approval.

d. The receiving Party shall, upon the request of disclosing Party, return all Confidential Information (including all copies thereof) to the disclosing Party or destroy the same on disclosing Party’s instruction, within thirty (30) days after the termination or expiration of the term of this Agreement, whichever earlier.

18. WAIVERS

Failure of any Party hereto to enforce any of the provisions of this Agreement, or any right with respect therein, shall in no way be considered a waiver of such provision, right or election, or in any way affect the validity of this Agreement, unless expressly waived in writing. The failure of either Party to terminate this Agreement for breach or default shall not be deemed to be a waiver of the right to do so for any concurrent or subsequent breach or default, or for the continuing breach or default of the other Party.

19. TAXES, FEES AND DUTIES

a. Each of the Parties shall be responsible for their own corporate and personal income taxes, customs, fees, duties, fines, levies, assessments and other taxes payable under the laws of Singapore by them or their employees in carrying out their obligations under this Agreement.

b. In the event that either of the Parties is compelled by the tax authorities to pay on behalf of the other Party any of the abovementioned taxes, fees, duties, fines, levies and assessments, the Party compelled to pay shall not do so without first informing the other Party of the compulsion by the tax authorities. Upon such payment being made the other Party shall promptly fully indemnify the other Party for the payment made to the relevant tax authority.

20. ASSIGNMENT

Neither of the Parties shall transfer nor assign the Agreement or any part, share or interest therein without the prior written consent of the other Party.

21. SEVERABILITY

The Parties agree that if for any reason any provision, term or condition contained herein shall be deemed illegal, invalid, unenforceable or defective, then in any such case, that provision, term or condition shall be severable from all the other provisions of this Agreement such that this Agreement is interpreted, construed and applied as though such severed provision, term or condition did not form part thereof.

22. NO PARTNERSHIP

Nothing in this Agreement shall be so construed as to constitute either Party to be the agent of the other or operate so as to create a partnership or joint venture between the Parties.

23. GOVERNING LAW

This Agreement shall be subject to, governed by and interpreted in accordance with the laws of the Republic of Singapore for every purpose and User agrees to submit to the exclusive jurisdiction of the Singapore courts.

24. DISPUTE RESOLUTION

a. Any disputes arising under or in connection with this Agreement shall be referred by the Parties to the Director TMSI and [insert designation for User] jointly or their nominees for amicable resolution.

b. Any dispute which cannot be resolved amicably within a period of sixty (60) days from the time of being referred to each Parties' representative as aforementioned, shall be referred to and finally resolved by arbitration in Singapore in accordance with the Arbitration Rules of the Singapore International Arbitration Centre for the time being in force which rules are deemed to be incorporated by reference to this Clause. The language of the arbitration shall be English and the arbitral tribunal shall consist of one (1) arbitrator. Any award made hereunder shall be final and binding upon the Parties hereto and judgment on such award may be entered into any court or tribunal having jurisdiction thereof.

Research User Declaration: (Please tick boxes with a Blue pen)

I have read the above Agreement and agree to the conditions set out in this document

I have discussed my research plan with the relevant Laboratory Managers and confirm the requirements as described in Appendix A

I have completed the Safety Trainings required to undertake research at SJINML.

IN WITNESS WHEREOF, the authorised representatives of the Parties have executed this Research Facilities Use Agreement, effective as of the date set forth above.

RESEARCH USER

Name:

Organisation:

Address:

Signature:

Date:

Authorised Representative of User's Host Organisation:

Name:

Designation:

Address:

Signature:

Date:

NATIONAL UNIVERSITY OF SINGAPORE

Name of SJINML Officer:

Designation:

Signature:

Date:

Appendix C

Students who are below 21 are required to have their parent/legal guardian complete an indemnity form.

Indemnity Form

Please bring this form duly completed with you when you check in for the Event –

<Name of Event>

I, _____ (Name of student/parent/guardian, as applicable)

_____ (Passport or NRIC No.), *parent/guardian of
_____ (Name of student) _____ (Passport or
NRIC No.), hereby declare that *I/my *child/ward *am/is participating in the **<name of event>**, [including the trip to **<location of event>**,] on **<date of event>** (the “Event”) of *my/his/her own free will and volition, *am/is aware of the risks involved and in consideration of being permitted by **<organizing agency>**, National University of Singapore (“NUS”) to participate in the Event, I, for myself *and my *child/ward, my successors, personal representatives and assigns:

- (a) do hereby absolve, acquit and discharge NUS and its officers, servants, employees, agents or volunteers from all or any responsibility, actions, causes of action, claims, demands and obligations whatsoever arising from any loss or damage (including, without limitation and to the extent permissible by law, physical injury, loss of life or property damage) caused by or sustained as a result of *my/my *child/ward’s participation in the Event; and
- (b) will indemnify and keep indemnified, save and hold harmless NUS and its officers, servants, employees, agents or volunteers against all losses, claims, demands, actions, proceedings, damages, costs or expenses, including legal fees, and any other liability arising in any way from my/my *child/ward’s participation in the Event.

Signature

Date

In the presence of:

Signature of

Witness

Name & Passport/NRIC No. of
Witness

**Please delete accordingly.*

Appendix D: R/V GALAXEA WORK REQUEST FORM

NAME OF PI/GROUP LEADER: _____

ORGANISATION: _____

INSTITUTE/ DEPARTMENT: _____

BRIEF PROJECT TITLE: _____

EMAIL: _____

GENERAL LOCATION(S) OF PROPOSED FIELD WORK:

Expected Duration of Use		
Start Date/Days	Start Time	End Time

S/N	Name of User	Organisation/Dept	Registered with SJINML (Y/N)	SPR/Foreign Passport Holder (Y/N)

*Please list all members: persons not indicated in the above manifest will not be allowed to board R/V Galaxea

Please provide a brief description on your field work (purpose; type of sampling; potential safety issues; any special permits)

- I/we will be collecting marine organisms and have the relevant permits for it
- I/we will be diving/snorkelling
- I/we will require use of the winch for:
- Our research involves the use of chemicals or hazardous materials:
- Any special sampling or safety requirements:

Appendix E: Aquarium Use Request Form

Name: _____

Organization: _____

Proposed Start Date for Use: _____ Estimated Project End Date: _____

Emergency Contact Tel: _____ E-mail: _____

Please tick appropriate box:

Type of aquarium tank: Cylindro-conical fiberglass tank stand alone

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
OA	4.67m x 4.67m x 1.17m	20,000	2	
OA	2.40m x 2.40m x 1.11m	5000	6	
Aqm A/ MA1	2.40m x 2.40m x 1.11m	5000	6	
OA 9	1.14m x 1.14m x 0.70m	714	4	
Aqm A MA2	1.10m x 1.10m x 1.05 m	1000	12	
OA 10	1.10m x 1.10m x 0.50m	475	3	
Aqm A MA6	0.90m x 0.90m x 0.70m	445	3	
Aqm A MA3	0.90m x 0.90m x 0.47m	300	12	
MB11	0.70 m x 0.70 m x 0.80m	300	12	
Aqm B Tank D	0.50m x 0.50m x 0.25m	50	8	
Aqm B MA 8] 0.40m x 0.40m x 0.39m	50	3	

Larval rearing cylinder plastic tank:

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
OA	0.85m x 0.85m x 0.87m	500		
OA	0.63m x 0.63m x 0.94m	300		

Rectangular fiberglass trough stand alone

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
Aqm A MB8	2.50m x 0.80m x 0.30m	600	4	

Rectangular fiberglass trough on stand

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
Aqm B MBB8	2.50m x 0.80m x 0.30m	600	14	

Rectangular fiberglass tank stand alone

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
OA 3	4.80m x 1.84m x 0.56m	5000	1	
Aqua A RT3	2.42m x 1.21m x 0.78m	2280	1	
OA7] 1.80m x 0.90m x 0.53m	860	2	
OA Tank A	1.70m x 0.80m x 0.45m	610	6	
OA 4	1.50m x 1.00m x 0.50m	810	6	
Aqua A RT1	1.50m x 0.95m x 0.44m	620	2	
Aqua A RT2	1.40m x 1.10m x 0.67m	1030	1	
Aqua A Tank C	1.35m x 1.26m x 0.40m	680	2	

Square fiberglass tank stand alone

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
OA Tank B	0.80m x 0.80m x 0.45m	288	7	
Aqua B MBB6	0.80m x 0.80m x 0.39m	250	6	

Square fiberglass tank with flexi glass front stand alone

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
MB13	0.75m x 0.60m x 0.93m	420	6	

Aquarium glass tank stand alone

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
	0.45m x 0.30m x 0.40m	54		
	0.26m x 0.125m x 0.115m	3.73		
Aqua B MBB2A	0.80m x 0.60m x 0.50m	240	6	

Aquarium plastic tank stand alone

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
	0.34m x 0.195m x 0.20m	13.26		

Water table stand alone

Location/Ref No	Size	Volume (L)	No. of Units	No. Required
Indoor Aqua WT	2.20m x 0.93m x 0.09m	184	2	
Aqua B MBB2	2.00m x 0.82m x 0.09m	147	6	
Aqua A WT	2.00m x 0.69m x 0.09m	124	1	
Aqua A WT	2.00m x 0.82m x 0.09m	147	1	

Other Requirement: [] Aquaria - Specification: _____m x _____m x _____m

Aquaria Space – Specification: _____ m x _____

Types of water supply: Filtered seawater

Raw seawater

Freshwater

Types of lighting supply: Sunlight

Fluorescent light

Not required

Numbers of power points: 1

2

Others, please specify: _____

Colour coding tag requirements: Blue – running water (open circulation)

Green – aeration

White - lighting

Other requirements, if any: _____

No modification of infrastructure, aeration, water and electricity supply is allowed. Please seek assistance from the Facility Manager.

Signature and Date: _____

End of Project Clearance Form

€ Tanks clean and dry: _____

€ Storage items: _____

€ Dispose items: _____

€ Remarks: _____

User Name: _____

Signature: _____

Inspected By: _____

Signature: _____

Date: _____

For Official Use

Allocated space: _____ m x _____ m x _____ m **Allocated Area:** _____ m²

Chargeable area: _____ m² – 1m² = _____ m²

Allocated Aquarium: A B Open Indoor Others: _____

Allocated tank: _____

Colour coding tags: [] Blue [] Green [] White

Disposal of unwanted items charges: _____

Other charges, if any: _____

Name: _____ **Signature:** _____

Date: _____

Appendix F: Sample of a Risk Assessment Form and Risk Ranking Guide

Activity-Based Risk Assessment Form

Name of Department _____ Location of Lab _____

Name of Laboratory _____ Name of PI _____

Name of Researcher/LO _____ Name of Activity/Experiment _____

No	Description/Details of Steps in Activity	Hazards	Possible Accident / Ill Health & Persons-at-Risk	Existing Risk Control (Mitigation)	Severity	Likelihood (Probability)	Risk Level	Additional Risk Control	Person Responsible	By (Date)
1							0			
2							0			
3							0			

Conducted By _____ **Approved By** _____
 _____ Name _____
 _____ Signature _____
 _____ Approval date _____

Next Revision date _____
 (Maximum 3 years)

		Likelihood		
		Likely	Possibly	Unlikely
Severity	Low	3	2	1
	Med	6	4	2
	High	9	6	3

Risk = Likelihood x Severity			
RISK	DECISION PROCESS		
< 3	RISK ACCEPTABLE		
3, 4	CONSIDER CONTROL	ADDITIONAL RISK	RISK
> 4	ADDITIONAL RISK REQUIRED	RISK	CONTROL

Likelihood

- | | | |
|---|--------------------|--------------------------------------------------------------------------------------------------|
| 1 | Unlikely | Not likely to occur (has not occurred in the PI's Lab or similar Lab setup.) |
| 2 | Possible | Possible or known to occur (has occurred in the PI's Lab or Similar Lab setup.) |
| 3 | Very Likely | Common or repeating occurrence (has occurred repetitively in the PI's Lab or similar Lab setup.) |

Severity

- | | | |
|---|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Low | (e.g. No injury, injury or ill-health requiring first aid treatment only – includes minor cuts and bruises, irritation, ill-health with temporary discomfort) |
| 2 | Medium | (e.g. Injury requiring medical treatment or ill-health leading to disability – includes lacerations, burns, sprains, minor fractures, dermatitis, deafness, work-related upper limb disorders) |
| 3 | High | (e.g. Fatal, serious injury or life-threatening occupational disease – includes amputations, major fractures, multiple injuries, occupational cancer, acute poisoning and fatal diseases) |

Severity - Consider the magnitude/severity of the consequences of the Risk Factor occurring and then list this as 3 (High), 2 (Moderate) or 1 (Low).
Severity normally will not change unless there is a physical change to the equipment or process.

Likelihood - Team should rely upon their experience and consider realistic scenarios. Listed below are examples of factors that may be considered in determining the likelihood.

- Past experience / incidents
- Complexity of the activity
- Number of personnel involved in the activity (e.g. all personnel, a limited number of trained personnel, etc)
- Frequency of use or execution
- Degree of control (involvement of contractors)
- Strength/completeness of administrative controls
- Sufficiency/formality of training
- Other....