Attachment A

Technology Readiness Levels

Level	Description
1	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.
5	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.
6	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.
7	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft.
8	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Attachment B
Water Performance Demonstration Plan

All references to Significant Wave Height (SWH) are defined by the Pierson-Moskowitz spectral density.

All references to a heading are defined as a range of vehicle headings relative to the oncoming waves. Head seas are vehicle headings within a range of 45 degrees toward the oncoming waves. Following seas are vehicle headings within a range of 45 degrees away from the oncoming waves. Beam seas are vehicle headings within a range of 45 degrees perpendicular to the oncoming waves.

Hull Water Intrusion

The objective of the Hull Water Intrusion demonstration is to determine the locations of all leak paths into the vehicle through the hull and determine the corresponding total leak rate. The vehicle shall be configured in Load Conditions 1 and 3 (LC1/LC3).

All bilge pumps are required to be functional. The total bilge pump capacity and capacity of each individual bilge pump shall be measured. For all trim orientations, the ability of the vehicle to manage damage stability shall be observed (e.g. location of bilge pumps, emergency cross connects between the engine, and troop compartment bilge pumps).

All floor deck plates and sea chest covers will be removed so that a visual inspection of any leaks can be observed by test personnel inside the vehicle. The vehicle will be slowly driven into the basin in 1-foot depth increments holding the vehicle in position for internal inspections. The vehicle shall be incrementally submerged thereafter until the vehicle is afloat.

Over the time span of one (1) hour, the vehicle shall be sprayed with an indirect water stream from a fire hose. Observations will be recorded regarding the watertight integrity of all external components, including, enclosures, cases, storage areas, dry boxes, electrical devices, and electrical connectors.

Speed and Power

The objective of the Speed and Power demonstration is to characterize power and trim data for a range of speeds up to maximum engine Revolutions Per Minute (RPM) in the forward and reverse directions. The vehicle shall demonstrate operation at a minimum average forward speed at LC3. The vehicle shall be controllable and directionally stable at all speeds.

The vehicle shall be configured in LC3 and shall be operated over a three (3) mile straight water course in head and following seas. A sea state two (2) is preferable; however, lesser sea states are acceptable given prevailing conditions. An instrumented wave buoy will record the sea conditions during the demonstration. Vehicle position, speed, track angle, pitch, roll, and yaw, will be measured using installed Government instrumentation.

Runs at engine speeds shall start at idle then incrementally increase until maximum RPM are achieved. The vehicle shall reach a steady condition, maintain a steady heading, and collect data for 30-45 seconds during each RPM setting until full throttle has been reached. The Government shall construct a time history plot of vehicle motion relative to sea conditions for each steady run and review video of the event.

Surf Transit

The objective of the Surf Transit demonstration is to assess the capability of the vehicle to transit the surf zone, to include vehicle preparation, to and from the shore in LC1/LC3. The demonstration course shall be a selected beach landing zone.

Surf Transit seaward: The vehicle shall accelerate to the Contractor specified speed for effective surf zone transit. The vehicle shall maintain heading directly into the waves and upon crossing the surf zone proceed further outside the surf zone and come to a stop.

Surf Transit beachward: The vehicle shall be positioned on seaward side of the surf zone with bow facing shore. The vehicle shall be a sufficient distance away from the surf zone to allow the vehicle to accelerate to the Contractor specified speed for effective surf zone transit. The operator will steer to maintain heading when crossing the surf zone and proceed onto the shore. Contractor shall perform functional checks after each beachward surf transit to assess any vehicle damage.

The following areas shall be assessed and recorded during surf operations:

- Shore to water entry speed
- Ability to maintain approach speed as waves impact outbound vehicle
- Ability to maintain directional control inbound and outbound
- Water intrusion from engulfing waves
- Adverse effects to vehicle stability or directional control (e.g. broaching, extreme rolling)
- Transit times
- Grounding events during inbound transit
- Phasing interactions with vehicle/wave on inbound transit

The Government will measure the surf and sea conditions using a surf array and a wave buoy. Demonstrations will be conducted in prevailing conditions up to four (4) feet plunging surf. Vehicle position, speed, track angle, pitch, roll, and yaw will be measured using installed Government instrumentation. External video cameras located on the Government provided safety chase boat and on the beach will be employed.

Maneuverability and Control

The objective of the Maneuverability and Control demonstration is to characterize and assess the following capabilities of the vehicle:

1. Determine turning diameters and zigzags for a range of speeds

2. Determine stopping distance from idle speed
3. Ability to pivot turn in calm water
4. Demonstrate reverse speed and reverse steering maneuverability

The vehicle will be configured in LC3 and demonstration will be conducted in prevailing seas not to exceed sea state two (2). The demonstration will be conducted in an area of at least one (1) square mile; zigzags require a linear distance of at least one (1) mile. The vehicle will demonstrate all maneuver and control capabilities in head and following seas at various RPM settings.

- *540-degree turns* to port and starboard
- *Reverse powering runs*
- *Reverse steering runs:* 360-degree turns port and starboard will be executed to observe reverse turning radius
- *Perform reverse acceleration with steering runs:* Engage propulsion in reverse maintaining a straight line course. Once steady vehicle speed has been achieved, execute a 90 degree heading change in full reverse to port and starboard to observe vehicle controllability.
- *360 degree pivot turns* shall be observed
- *Distance required to stop (coast):* Engage propulsion and reach steady vehicle speed. Cut throttle and coast to stop until vehicle speed drops below about 1 knot. The heading during the demonstration and the distance required to stop shall be measured using onboard GPS equipment.
- *Distance required to stop (crash):* Engage propulsion and reach steady vehicle speed. Switch to reverse and maintain throttle setting at idle speed and do not execute steering after reverse is engaged. Wait for vehicle speed to drop below about 1 knot or less. The heading during the demonstration and the distance required to stop shall be measured using onboard GPS equipment.
- *Distance required to stop (crash w/ steering):* Engage propulsion and reach steady vehicle speed. Switch to reverse and maintain throttle setting at idle speed and execute steering. Wait for vehicle speed to drop below about 1 knot or less. The heading during the demonstration and the distance required to stop shall be measured using Government instrumentation.
- *Perform docking maneuvers:* Initiate docking maneuvers (i.e., allowing changes in throttle, shifting, and operation in reverse) at various approach speeds along a course parallel and just along starboard side of dock.
- *Low Speed Controllability:* Maintain a straight line heading to an identified marker buoy. On command, provide no steering inputs for a minimum of ¼ mile. Measure the distance the vehicle deviates from the marker buoy using Government instrumentation.

The Government will measure the sea conditions using a wave buoy. Vehicle position, speed, track angle, pitch, roll, and yaw, will be measured using installed Government instrumentation.

Plow-In

Plow-in is the condition that can occur when the vehicle, while underway, experiences a downward pitching and submergence of the bow or stern into the water. The onset can be abrupt with water coming over the bow and the vehicle going well down into the water and abruptly stopping. It occurs when the self-generated bow wavelength matches the vehicle length. Since the wave trough is forward and the crest is aft along the vehicle, there is loss of buoyancy forward and added buoyant lift aft, thereby enabling this condition. If the vehicle LCG is sufficiently far aft then this condition can be overcome and the vehicle will remain with positive trim angle and stable. Plow-in conditions are also affected by the buoyant geometry of the vehicle, the hydrodynamic surfaces and dynamic lift, wave conditions and heading, transom flap angle, vehicle weight, and mode.

The objective of the Plow-In demonstration is to characterize the conditions where plow-in is imminent for LC1 and LC3 weight conditions.

The demonstration will be conducted at various engine RPMs and in LC1 and LC3. The test course will be conducted on a straight water course to maintain wave heading, up to five (5) miles length desired. The demonstration shall be conducted in prevailing seas not to exceed a sea state characterized by a 0.61 meter (2 feet) SWH in head and following seas. It will be necessary for the Government to verify the LCG and the weight of the LC1 and LC3 configured vehicle prior to operations.

The Government will measure the sea conditions using a wave buoy. Vehicle position, speed, track angle, pitch, roll, and yaw, will be measured using installed Government instrumentation.

Forward Speed and Fuel Consumption Estimate

The primary objectives of this demonstration are: 1) to observe the vehicle's ability to maintain maximum forward achievable speed in prevailing seas not to exceed a sea state characterized by a 0.61 meter (2 feet) SWH in head and following seas following a prescribed uniform route for one (1) hour; 2) to determine the fuel consumption rate during this demonstration. The demonstration shall be conducted in LC3. Prior to operations, fuel levels will be topped off and documented, and the vehicle weight will be recorded. At the completion of this demonstration, the vehicle will be weighed again, the fuel system will be topped off, and the required fuel will be recorded. The bilge will be inspected for water accumulation before each weight measurement. As required, accumulated bilge fluids will be removed prior to each weight measurement. Two methods will be used to determine estimated fuel consumption; 1) amount of fuel burned during operations; 2) weight differential before and after the demonstration.

The Government will measure the sea conditions using a wave buoy. Vehicle position, speed, track angle, pitch, roll, and yaw, will be measured using installed Government instrumentation.

Attachment C
Definitions

1. Combat Weight – for the purposes of this SOW "Vehicle Combat Weight" is defined as vehicle weight, fuel, ammunition, crew with existence loads, embarked personnel with existence loads and X additional days of supply (see Attachment H).

2. Curb Weight – Weight of a ground vehicle including fuel, lubricants, coolant, and on-vehicle materiel, excluding cargo and operating personnel.

3. Gross Vehicle Weight – Combined weight of vehicle and total load

4. Load Condition 1 – Vehicle plus crew with existence loads, ammunition and fuel

5. Load Condition 2 - Vehicle plus crew with existence loads, fuel, embarked personnel with existence loads, and one (1) day of supply.

6. Load Condition 3 – Vehicle plus crew with existence loads, fuel, embarked personnel with existence loads, and two (2) days of supply.

7. Non-developmental Item (NDI) – An NDI is any previously developed item of supply used exclusively for government purposes by a federal agency, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement. 2.) Any item described in item 1 that requires only minor modifications or modifications of the type customarily available in the commercial marketplace in order to meet the requirements of the procuring department or agency. 3.) Any item of supply being produced that does not meet the requirements of items 1 or 2 solely because the item is not yet in use. **(FAR 2.101)**

8. November Flag – Nautical flag meaning 1.) No or negative 2.) abandonment

9. Technology Readiness Levels – Nine defined levels used to determine the readiness state for technology. Used for technology assessments and risk determination. See Attachment C.

Attachment D
Survivability Demonstration Plan

The purposes of the Government conducted survivability demonstration are to: (1) determine the capability of the candidate vehicle to defeat specified threat(s) as per the classified annex of the Capabilities Development Document (CDD) dated 6 May 2011; and (2) determine the level of occupant survivability of the candidate vehicle to the specified threat(s).

Planned Survivability Demonstrations

Secure storage of each Contractor's supplied demonstrators and materials will be provided. Only one (1) Contractor team and associated demonstrators will be present at each specific test site for a given event.

Prior to survivability demonstration, the weight and Center of Gravity (CG) of the demonstrators will be verified. If the Contractor supplies certification that the demonstrators have the correct weight and CG then this verification may be waived at the Government's discretion.

The survivability demonstration will be conducted in accordance with NATO Allied Engineering Procedure (AEP)-55 Vol. 1 (Edition 1) and International Test Operations Procedure (ITOP) 4-2-508.

The following ballistic test events are planned:

Direct Fire – 20 each - AP (threshold)
Indirect Fire – 10 each - 20mm FSP
IED-Indirect Blast (Roadside Configuration) - 2 each (threshold), one per side
IED-Direct Blast (Under Belly) - 1 each (threshold), 1 each (objective), 1 each (fragmentation)
IED-Direct Blast (Under Wheel) - 1 each (threshold), 1 each (objective)

Both the direct fire and the indirect fire simulants will impact the side of the demonstrators at various locations. These impact locations may or may not be the same location on all demonstrators. All impact locations will be equivalent in nature (i.e. seams, fasteners, pivot points, center of armor panel, and edges).

The IED (Roadside Configuration) will consist of a fragmenting-type IED positioned two (2) meters from the side of the demonstrator such that a majority of the fragments impact the demonstrator. The test will be repeated on the opposite side of the same demonstrator.

Under Belly IEDs will be positioned under the centerline of the demonstrator with 50mm of earth placed over the surface. Beginning with the threshold level, the IED will be placed under the front of the demonstrator. The second demonstration will consist of the fragmentation IED placed under the rear of the demonstrator in the troop compartment area. The last demonstration will be the objective level threat placed near the center of the demonstrator. The execution of the last demonstration is dependent on the condition of the demonstrator.

Under Wheel IEDs will be positioned under the wheel of the demonstrator with 50mm of earth placed over the surface. Beginning with the threshold level, IED will be placed under the rear right wheel. The second demonstration will consist of the fragmentation IED placed under the rear left wheel. The last demonstration will be the objective level threat placed under the front wheel on the driver's side.

Demonstration Events Associated with Demonstrators

Demonstrator 1:
All direct and indirect fire shots
IED (Under Belly) - 1 each (threshold), 1 each (fragmentation)
IED (Under Wheel) - 1 each (threshold), 1 each (objective)

Demonstrator 2:
Two (2) IED (Roadside Configuration), 1 per side
IED (Under Belly) - 1 each (objective)

Planned Demonstrator Instrumentation

The following is a list of planned instrumentation that will be provided by the Government:

- Anthropomorphic Test Devices (ATD) Hybrid III where threat of perforation of the demonstrator is at a minimum
- Wooden mannequins to ascertain the effect of perforation of the demonstrator
- Accelerometers to measure the acceleration of the demonstrator and to occupants
- High speed and real time video to record the event
- Photographs, measurements, etc. of the pre and post demonstration events
- Witness panels where applicable

The data collected will be provided to the Contractor in the form of a report issued by the Government. The report will be provided to the Contractor 60 calendar days after the demonstration events are concluded.

Attachment E

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
1333 ISAAC HULL AVE SE
WASHINGTON NAVY YARD DC 20376-0001

IN REPLY TO:
5090
Ser 04R/138
26 Nov 2008

From: Commander, Naval Sea Systems Command

Subj: NAVSEA Prohibited and Controlled Chemical List (PCCL)

Ref: (a) Executive Order (EO) 13423 Strengthening Federal Environmental, Energy, and Transportation Management of 24 January 2007
(b) Environmental Requirements and Goals for Navy Systems Acquisition, CNO (N4) Memorandum 5090 Ser N4/5U890259 of 20 April 2005
(c) OPNAVINST 5090.1 Environmental and Natural Resource Program Manual
(d) Environmental Protection Agency (EPA) List of Lists, Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112(r) of the Clean Air Act, EPA 550-B-01-003 of October 2001
(e) OPNAVINST 5100.23 Navy Occupational Safety and Health Program Manual
(f) NAVSEA Letter 5090 Ser 04R/029 of 03 April 2003

Encl: (1) NAVSEA Prohibited and Controlled Chemical List (PCCL) Control and Management Plan
(2) NAVSEA Prohibited and Controlled Chemical List (PCCL)

1. Purpose: This letter approves the methodology for developing the NAVSEA Prohibited and Controlled Chemical List (PCCL), enclosure (1), and promulgates the first issue of the PCCL, enclosure (2).

2. Discussion: This letter provides guidance for PCCL use in planning and executing Environmental, Safety and Occupational Health (ESOH) Programs, Hazardous Material (HM) Management, and Pollution Prevention (P2) efforts in NAVSEA Weapons System Acquisition, In-Service Programs, and at NAVSEA Field Activities. The PCCL is not intended to supersede any other chemical avoidance lists currently being used by a weapons

system acquisition program or field activity. Rather, it should be used as a tool by engineers and managers for developing chemical lists for all future NAVSEA weapons system acquisition programs and as a guide for future routine revisions of field activity chemical use lists. This letter does not apply to the laboratory use of analytical chemicals.

3. Goals: Reducing or eliminating the use of PCCL chemicals will reduce environmental and human health risks, reduce weapon system life cycle costs associated with hazardous materials, and help the Navy meet reference (a) goals to reduce the use of toxic chemicals, hazardous substances, and pollutants. In addition, the PCCL supports reference (b), which established CNO ESOH goals for weapon system acquisition programs including guidance on avoiding materials that meet CNO defined ESOH criteria. Lastly, the PCCL will assist weapons system acquisition programs, and afloat and field activities, in meeting the Navy environmental policy requirements contained in reference (c).

4. Methodology: NAVSEA 04R, Office of Maintenance, Modernization, Environment and Safety, through the NAVSEA Pollution Prevention Program, developed the PCCL as a list of chemicals that should be controlled and managed to eliminate or reduce their use. The foundation of the list is reference (d). The chemicals from reference (d) were ranked using weighted ESOH factors and reference (e) to create the NAVSEA PCCL. The NAVSEA PCCL consists of two tiers based on hazard severity and potential life cycle cost impact. These tiers are Prohibited Chemicals and Controlled Chemicals. The tiering of the chemicals allows the establishment of varying levels of control and management by weapons system acquisition program managers and field activity managers. The NAVSEA control and management plan for each PCCL tier is described in enclosure (1).

5. Action: NAVSEA approves the methodology for developing the PCCL as identified in enclosure (1) and the initial PCCL in enclosure (2). NAVSEA 04R will use the PCCL to update the Target Chemical List (TCL), reference (f). Weapons system acquisition programs should use the PCCL for screening and preventing the use of hazardous materials containing PCCL chemicals during the design phase. Naval Technical Authority and Warrant Holders should use the PCCL for screening and preventing the use of hazardous materials containing PCCL chemicals during the total life of the systems under their

authority. Field activities should use the PCCL to manage Hazardous Material Authorized Use Lists screening of new hazardous materials and pollution prevention of existing hazardous materials.

6. Access: The PCCL is maintained by NAVSEA Surface Warfare Center, Carderock Division (NSWCCD)and can be found at https://navyseic.dt.navy.mil. The PCCL, will be updated whenever there is a significant change to regulations, Navy Policy, or significant Environmental or Human Health and Safety impacts materialize that require immediate action, but not to exceed three years. Updates to the PCCL will be posted on the website above. Users will be notified of any updates with a link to the website.

7. NAVSEA will continue to identify and evaluate alternative products and processes to reduce critical human health risks, ensure environmental compliance, and decrease costs associated with the use of hazardous materials and products. The PCCL will be an integral part of these efforts to support the Navy.

8. The point of contact for this matter is Mr. Samuel R. Johnson, SEA 04RE, at (202)781-2216, email Samuel.R.Johnson@navy.mil.

J. F. Brice
By Direction

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NSWC CORONA DIV Corona CA (CO, TD, CM013)
NSWC CRANE DIV Crane IN (CO, TD, PRCR4)
NSWC DAHLGREN DIV Dahlgren VA (CO, TD, XDC8)

Subj: NAVSEA Prohibited and Controlled Chemical List (PCCL)

NSWC COASTSYSSTA Panama City FL (CO, TD, XPO1FE)
NSWCCD Ft Lauderdale (CO, TD, 7540)
CBTDIRSYSACT Dam Neck VA (CO)
NSWC INDIAN HEAD DIV Indian Head MD (CO, TD, 041TR)
NSWC PORT HUENEME DIV Port Hueneme CA (CO, TD, 208)
NUWC KEYPORT DIV Keyport WA (CO, TD, 172)
NUWC NEWPORT DIV Newport RI (CO, TD, 1151)
NAVSHIPYD Portsmouth NH (Code 100, 106)
NAVSHIPYD Norfolk VA (Code 100, 106)
NAVSHIPYD & IMF Puget Sound WA (Code 100, 106, IMF Code 00)
NAVSHIPYD & IMF Pearl Harbor HI (Code 100, 100B, 106)
NAVSEALOGCEN Mechanicsburg PA (Code 100)
NAVXDIVINGU Panama City FL (CO)
NAVEODTECHDIV Indian Head MD (CO, ED)
NOSSA Indian Head MD (CO, 02, 09)
SUBMEPP Portsmouth NH (Code 100, 1853)
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Subj: NAVSEA Prohibited and Controlled Chemical List (PCCL)

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NAVSEA Prohibited and Controlled Chemical List (PCCL)
Control and Management Plan

1. Purpose To standardize the management of the Prohibited, Controlled Chemical List (PCCL) and to formally establish processes, procedures and the methods for maintaining it.

1. References

a) Executive Order (EO) 13423 Strengthening Federal Environmental, Energy, and Transportation Management of 24 January 2007
b) Environmental Requirements and Goals for Navy Systems Acquisition, CNO (N4) Memorandum 5090 Ser N4/5U890259 of 20 April 2005
c) NAVSEA Letter 5090 Ser 04R/029 of 03 April 2003
d) Pollution Prevention Act of 1990
e) OPNAVINST 5090.1 Environmental and Natural Resource Program Manual
f) Environmental Protection Agency (EPA) List of Lists, Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112(r) of the Clean Air Act, EPA 550-B-01-003 of October 2001
g) OPNAVINST 5100.23 Navy Occupational Safety and Health Program Manual
h) Patty's Industrial Hygiene, 5th Edition
i) Navy Environmental Health Center Technical Manual NEHC-TM-OEM 6260.01A, of April 2006, Reproductive and Developmental Hazards: A Guide for Occupational Health Professionals

2. Appendices

Appendix (1) - PCCL Selection Methodology
Appendix (2) - Initial Chemical Screening Criteria

3. Background

a) Reference (a), Section 2, sets goals for Federal agencies. Paragraph (e) of the section identifies that the head of each agency shall: " ensure that the agency (i) reduces the quantity of toxic and hazardous chemicals and materials acquired, used, or disposed of by the agency, (ii) increases diversion of solid waste as appropriate, and (iii) maintains cost-effective waste prevention and recycling programs in its facilities." NAVSEA acquisition programs and field activities have expended significant resources to develop HM avoidance lists aimed at reducing their overall acquisition, usage and disposal of toxic and hazardous chemicals and materials.

NAVSEA Prohibited and Controlled Chemical List (PCCL)
Control and Management Plan

b) Reference (b) forwarded CNO (N4) environmental requirements and goals for weapon system acquisition programs as follows: "Design systems that avoid and/or minimize, to the maximum extent feasible, requirements for the use of materials that pose environmental risks throughout the system's life cycle."

c) NAVSEA published a Target Chemical List, reference ©, to support efforts of references (b) and (d), to reduce or eliminate specific chemicals by all NAVSEA field activities and programs. The goals were to: (1) "focus NAVSEA attention for pollution prevention (P2)" and, (2) "the use and specification of products containing such chemicals…. Be eliminated or reduced to the maximum extent possible."

d) The NAVSEA 04R, Office of Maintenance, Modernization, Environment and Safety, through the Target Chemical List (TCL) Committee of the NAVSEA Pollution Prevention Working Group, developed a scientific scheme for evaluating chemicals to support establishing policy for managing and controlling use of chemicals. The chemical basis for the scheme was the EPA List of Lists (reference (f)). The scheme evaluated and ranked chemicals by weighted Environmental, Safety, and Occupational Health factors and cost impacts that were gathered from a variety of sources including references (g), (h) and (i). Break points were established to segment the chemicals into relative risk classes and to allow varying levels of control and management by acquisition programs and field activities. Three lists were created; the Prohibited Chemical List, the Controlled Chemical List and the List of Chemicals of Concern. The first two lists were utilized to make the NAVSEA Prohibited and Controlled Chemical List (PCCL).

e) The following definitions apply:

i) Prohibited Chemicals

(1) The chemicals in this category have been determined to pose the highest level of risk to human health and the environment.

(2) Use of chemicals in this category shall be limited to the maximum extent practicable based on the performance of risk assessments and cost analyses. Procurement or use of any system, component or product that contains a prohibited chemical, or the specification of any process or procedure that uses a prohibited chemical, shall be approved by the applicable Program Manager and Technical Authority.

ii) Controlled Chemicals:

(1) The chemicals in this category have been determined to pose a moderate level of risk to human health and the environment.

(2) Use of chemicals in this category shall be reduced based on the performance of risk assessments and cost analyses.

iii) Chemicals of Concern:

(1) The chemicals in this category have been determined to pose the lowest level of risk to human health and the environment and therefore are not included in the PCCL.

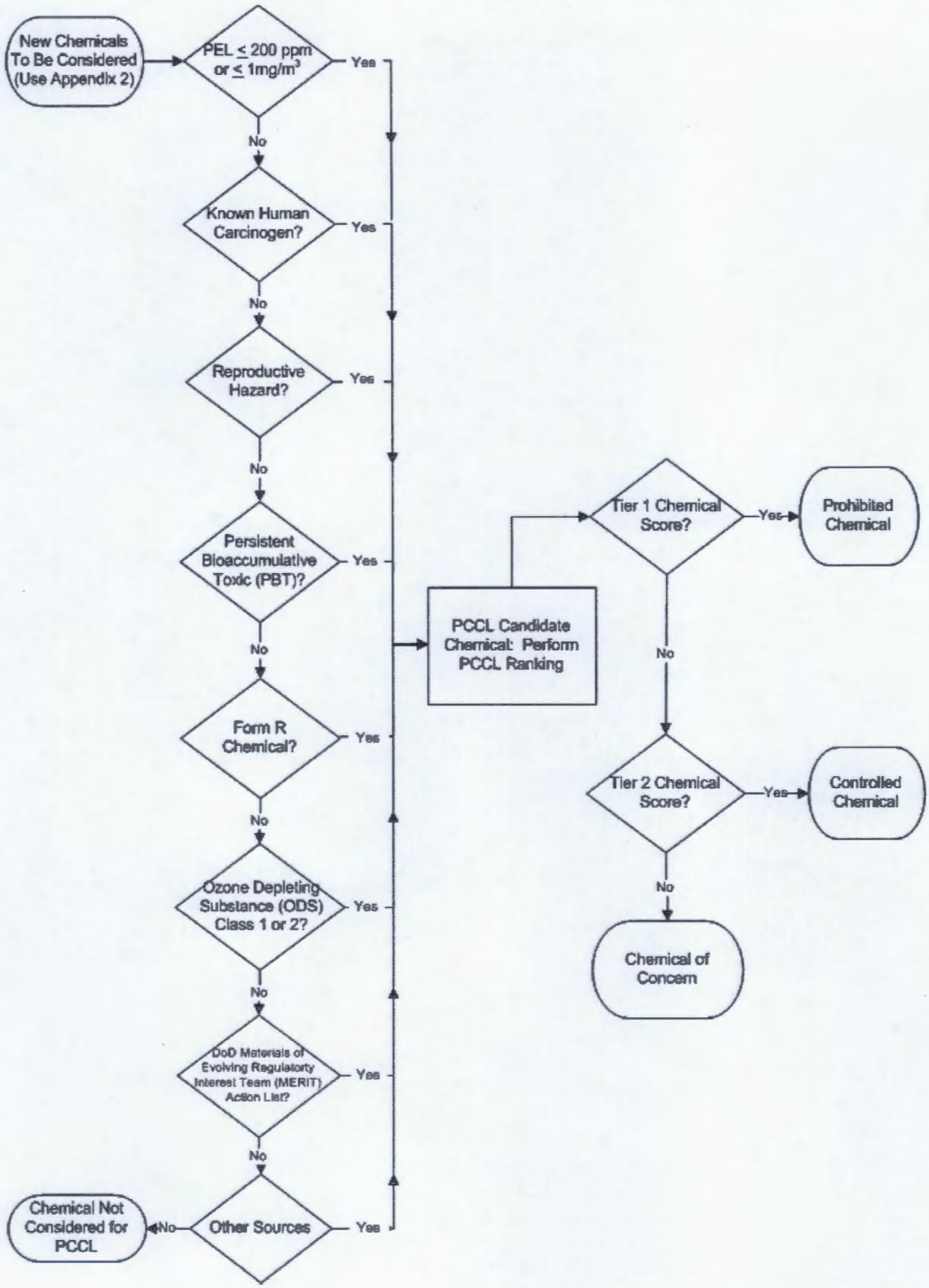
(2) Use of chemicals in this category shall be managed in accordance with references (e) and (g).

4. Implementation

a) Management processes for the approval of the use of systems, components, products, processes and procedures containing a PCCL Prohibited or controlled Chemicals shall be defined in writing by Program Managers, Technical Authority Warrant Holders, and field activity managers.

b) All PCCL Prohibited, Controlled Chemicals used by weapon system acquisition programs, Technical Authority Warrant Holders, or field activities shall be documented and tracked for the life cycle of the system or application.

NAVSEA Prohibited and Controlled Chemical List (PCCL)
Control and Management Plan
Appendix (1) PCCL Selection Methodology



NAVSEA Prohibited and Controlled Chemical List (PCCL)
Control and Management Plan
Appendix (2) Initial Chemical Screening Criteria

Chemicals that are newly identified, or whose status has changed due to changes in national and international regulatory requirements or changes in Navy policy, and meet any of the following criteria may be added to the PCCL at the discretion of NAVSEA:

Have an Occupational Safety and Health Administration (OSHA) Permissible Exposure Level (PEL) of < 1 milligrams per cubic meter (mg/m3) or < 200 parts per million (ppm). The PELs are listed in 29 CFR 1910.1000 TABLES Z-1, Z-2, Z-3 and can be found at:
http://www.osha.gov/SLTC/etools/respiratory/advisor_genius_nrdl/z_tables.html

Are classified as a known human carcinogen by either the International Agency for Research on Cancer (IARC) or the National Institutes of Health, National Toxicology Program (NTP), when present in concentrations ≥ 0.1% by weight. The IARC list of carcinogens can be found at:
http://www.iarc.fr/ENG/Databases/index.php

Are listed as a human reproductive hazard as defined by OPNAVINST 5100.23, Chapter 29 - Occupational Reproductive Hazards, when present in concentrations ≥ 0.1% by weight. Reproductive hazards can be found at:
http://www-nehc.med.navy.mil/downloads/occmed/Reprodev2006.pdf

Are identified by the US Environmental Protection Agency (EPA) as Priority Persistent Bioaccumulative and Toxic (PBT) Chemicals. This list can be found at:
http://www.epa.gov/ebtpages/polltoxicpersistentbioaccumulativetox.html

Are identified as toxic by the EPA for purposes of Form R reporting at 40 CFR 372.65. These can be found at:
http://www.epa.gov/tri/chemical/index.htm

Are Class 1 or 2 Ozone Depleting Substances (ODS) as determined by 40 CFR 82 Appendix A or Appendix B. This list can be found at:
http://www.access.gpo.gov/nara/cfr/waisidx_04/40cfr82_04.html

Are listed on the DoD Materials of Evolving Regulatory Interest Team (MERIT) Action List. These include but are not limited to nano-scale and micro-mediation substances. This list can be found at:

https://www.denix.osd.mil/denix/Public/Library/MERIT/action_list.html

Other Sources - For other sources not addressed above.

NAVSEA Prohibited and Controlled Chemical List (PCCL)

Prohibited Chemical List	
Chemical Name	CAS
1,1,1-Trichloroethane	71-55-6
1,1,2,2-Tetrachloroethane	79-34-5
1,1,2-Trichloroethane	79-00-5
1,1-Dichloroethane	75-34-3
1,1-Dichloroethylene	75-35-4
1,1-Dimethyl hydrazine	57-14-7
1,2,4-Trichlorobenzene	120-82-1
1,2-Dibromo-3-chloropropane	96-12-8
1,2-Dibromoethane	106-93-4
1,2-Dichlorobenzene	95-50-1
1,2-Dichloroethane	107-06-2
1,2-Dichloropropane	78-87-5
1,2-Diphenylhydrazine	122-66-7
1,3-Butadiene	106-99-0
1,3-Dichlorobenzene	541-73-1
1,3-Dichloropropene	542-75-6
1,4-Dichlorobenzene	106-46-7
1-Naphthalenol, methylcarbamate	63-25-2
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
2,4-D	94-75-7
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6-Dinitrotoluene	606-20-2
2-Nitropropane	79-46-9
2-Propenal	107-02-8
2-Propenenitrile	107-13-1
3,3'-Dichlorobenzidine	91-94-1
4,6-Dinitro-o-cresol	534-52-1
4-aminobiphenyl	92-67-1
Acetaldehyde	75-07-0
Acrylamide	79-06-1
Aldicarb	116-06-3
Aldrin	309-00-2
Aniline	62-53-3
Antimony and Antimony Compounds	Multiple CAS
Arsenic and Arsenic Compounds	Multiple CAS
Asbestos (friable)	1332-21-4
Aziridine	151-56-4
Aziridine, 2-methyl	75-55-8
Benzene	71-43-2

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Benzidine	92-87-5
Benzo(a)phenanthrene	218-01-9
Benzo[a]pyrene	50-32-8
Benzoic trichloride	98-07-7
Benzyl chloride	100-44-7
Beryllium and Beryllium Compounds	Multiple CAS
beta-Naphthylamine	91-59-8
Bis(2-chloroethyl) ether	111-44-4
Bis(chloromethyl) ether	542-88-1
Bromoform	75-25-2
Bromomethane	74-83-9
Cadmium and Cadmium Compounds	Multiple CAS
Camphechlor	8001-35-2
Carbamic acid, ethyl ester	51-79-6
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorambucil	305-03-3
Chlordane	57-74-9
Chlorine	7782-50-5
Chlornaphazine	494-03-1
Chlorobenzene	108-90-7
Chloroform	67-66-3
Chloromethane	74-87-3
Chloromethyl methyl ether	107-30-2
Chromium and Chromium Compounds	Multiple CAS
Copper and Copper Compounds	Multiple CAS
Cyclophosphamide	50-18-0
DDT	50-29-3
Dichloromethane	75-09-2
Dichlorvos	62-73-7
Dieldrin	60-57-1
Diethylstilbestrol	56-53-1
Dimethoxy DDT	72-43-5
Dimethyl sulfate	77-78-1
Dinitrobutyl phenol	88-85-7
Dioxanes	Multiple CAS
Dioxins	Multiple CAS
Endrin	72-20-8
Epichlorohydrin	106-89-8
Ethane, 1,1'-thiobis[2-chloro-	505-60-2
Ethene, chloro-	75-01-4
Ethyl acrylate	140-88-5
Ethylbenzene	100-41-4

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NAVSEA Prohibited and Controlled Chemical List (PCCL)

Ethylene oxide	75-21-8
Ethylene thiourea	96-45-7
Fluoranthene	206-44-0
Formaldehyde	50-00-0
Heptachlor	76-44-8
Heptachlor epoxide	1024-57-3
Hexachloro-1,3-butadiene	87-68-3
Hexachlorobenzene	118-74-1
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
Hydrazine	302-01-2
Hydrocyanic acid and Cyanide Compounds	Multiple CAS
Kepone	143-50-0
Lead and Lead Compounds	Multiple CAS
Lindane	58-89-9
Melphalan	148-82-3
Mercury and Mercury Compounds	Multiple CAS
Methanamine, N-methyl-N-nitroso-	62-75-9
Methanethiol	74-93-1
Naphthalene	91-20-3
Nickel and Nickel Compounds	Multiple CAS
Nicotine	54-11-5
Nitrobenzene	98-95-3
o-Cresol	95-48-7
o-Toluidine	95-53-4
Ozone Depleting Substances - Classes I and II	Multiple CAS
Parathion	56-38-2
PCBs	1336-36-3
Pentachlorophenol	87-86-5
Perchloroethylene	127-18-4
Phenol	108-95-2
Phthalates	Multiple CAS
Selenium and Selenium Compounds	Multiple CAS
Styrene	100-42-5
TEPP	107-49-3
Toluene	108-88-3
Trichloroethylene	79-01-6
Warfarin	81-81-2
Xylenes (mixed isomers)	1330-20-7

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NAVSEA Prohibited and Controlled Chemical List (PCCL)

Controlled Chemical List	
Chemical Name	CAS
1,2,3,-Trichloropropane	96-18-4
1,2,4,5-Tetrachlorobenzene	95-94-3
1,2-Dichloroethylene	156-60-5
1,3-Propane sultone	1120-71-4
1,4-Dichloro-2-butene	764-41-0
2,2'-Bioxirane	1464-53-5
2,4-Diaminotoluene	95-80-7
2,4-Dichlorophenol	120-83-2
2-Acetylaminofluorene	53-96-3
2-Chlorophenol	95-57-8
2-Ethoxyethanol	110-80-5
2-Methoxyethanol	109-86-4
2-Methyllactonitrile	75-86-5
2-Propen-1-ol	107-18-6
3,3'-Dimethoxybenzidine	119-90-4
3,3'-Dimethylbenzidine	119-93-7
4,4'-Methylenebis(2-chloroaniline)	101-14-4
4,4'-Methylenedianiline	101-77-9
4-Bromophenyl phenyl ether	101-55-3
4-Dimethylaminoazobenzene	60-11-7
4-Nitrophenol	100-02-7
7,12-Dimethylbenz[a]anthracene	57-97-6
Acenaphthene	83-32-9
Acetonitrile	75-05-8
alpha-Naphthylamine	134-32-7
Anthracene	120-12-7
Barium and (soluble) Barium Compounds	Multiple CAS
Benomyl	17804-35-2
Benz[a]anthracene	56-55-3
Benzene, m-dimethyl-	108-38-3
beta-Propiolactone	57-57-8
Biphenyl	92-52-4
Cacodylic acid	75-60-5
Carbofuran	1563-66-2
Carbonic dichloride	75-44-5
Chloroacetic acid	79-11-8
Chlorobenzilate	510-15-6
Chloroethane	75-00-3
Chloroprene	126-99-8
Cresol (mixed isomers)	1319-77-3

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NAVSEA Prohibited and Controlled Chemical List (PCCL)

Cumene	98-82-8
DDD	72-54-8
Dibenz[a,h]anthracene	53-70-3
Dichlorobromomethane	75-27-4
Dimethoate	60-51-5
Dimethylamine	124-40-3
Dimethylcarbamyl chloride	79-44-7
Di-n-propylnitrosamine	621-64-7
Disulfoton	298-04-4
Endosulfan	115-29-7
Ethylene glycol	107-21-1
Fluorine	7782-41-4
Fluoroacetic acid, sodium salt	62-74-8
Formic acid	64-18-6
Furan	110-00-9
Hexamethylphosphoramide	680-31-9
HFCs (Hydrofluorocarbons)	Multiple CAS
Hydrazine, 1,2-dimethyl-	540-73-8
Hydrazine, methyl-	60-34-4
Hydrofluoric acid	7664-39-3
Hydroquinone	123-31-9
Indeno(1,2,3-cd)pyrene	193-39-5
Lithium	1310-65-2
Maleic anhydride	108-31-6
m-Cresol	108-39-4
m-Dinitrobenzene	99-65-0
Methane, tetranitro-	509-14-8
Methanesulfenyl chloride, trichloro-	594-42-3
Methanol	67-56-1
Methyl ethyl ketone	78-93-3
Methyl iodide	74-88-4
Methyl isobutyl ketone	108-10-1
Methyl methacrylate	80-62-6
Mevinphos	7786-34-7
Mexacarbate	315-18-4
Microbiological Remediation Agents*	Multiple CAS
Mitomycin C	50-07-7
n-Butyl alcohol	71-36-3
Nano-scaled Substances**	Multiple CAS
Nitrogen dioxide	10102-44-0
N-Nitrosodiethylamine	55-18-5
N-Nitroso-N-ethylurea	759-73-9
N-Nitroso-N-methylurea	684-93-5

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NAVSEA Prohibited and Controlled Chemical List (PCCL)

o-Anisidine	90-04-0
o-Dinitrobenzene	528-29-0
Osmium oxide OsO4 (T-4)-	20816-12-0
Oxamyl	23135-22-0
Oxirane, methyl-	75-56-9
p-Benzoquinone	106-51-4
p-Chloroaniline	106-47-8
PCNB	82-68-8
p-Cresol	106-44-5
p-Dinitrobenzene	100-25-4
Pentachlorobenzene	608-93-5
Perchlorates	Multiple CAS
PFCs (Perfluorocarbons)	Multiple CAS
Phenanthrene	85-01-8
Phosphine	7803-51-2
Phosphorus	7723-14-0
Pyrene	129-00-0
Pyridine	110-86-1
Streptozotocin	18883-66-4
Strychnine	57-24-9
Sulfotep	3689-24-5
Thallium and Thallium Compounds	Multiple CAS
Triethylamine	121-44-8
Uracil mustard	66-75-1
Vanadium pentoxide	1314-62-1

* Microbiological Remediation Agents are to be considered on a case by case basis, as not all microbiological organisms have been assigned CAS numbers. In cases where CAS numbers have been assigned, these CAS numbers typically do not discriminate between pathogenic and non-pathogenic strains of the same organism.

** Nano-scaled Substances are to be considered on a case by case basis, as such substances are chemically and physically dissimilar to the macro-scaled parent substance, imposing unknown environmental and human health risks associated with their use.

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Attachment F
Human Factors/Stowage Capacity Demonstration Plan

The human factors/stowage capacity demonstration will consist of three (3) separate demonstrations as detailed below. All demonstrations will be conducted statically on land at AVTB.

Capacity Demonstration

The objective of the capacity demonstration is to demonstrate that two (2) vehicles will be capable of carrying a crew of three (3) Marines per vehicle, a reinforced Marine rifle squad consisting of 17 combat equipped Marines with existence load, and two (2) days of supply. The demonstration will consist of the following:

- Vehicle will be loaded with nine (9) members of a reinforced Marine rifle squad and vehicle crew. Loading of the vehicle will be done in accordance with the Contractor's recommended load plan.
- Vehicle will be unloaded
- Vehicle will be loaded with the remaining eight (8) members of the reinforced Marine rifle squad and vehicle crew. Loading of the vehicle will be done in accordance with the Contractor's recommended load plan.

Emergency Egress Demonstration

The objectives of the emergency egress demonstration are to (1) demonstrate that the 5th – 95th percentile combat equipped Marine is capable of operating and exiting each hatch on the vehicle and (2) determine the time required for all Marines in a fully loaded vehicle to exit the vehicle.

The test director will select a representative 5th percentile Marine. The selected Marine will open and exit from each hatch.

The test director will select a representative 95th percentile Marine. The selected Marine will open and exit from each hatch.

The vehicle will be loaded with nine (9) members of a reinforced Marine rifle squad, three (3) crew, existence loads, and two (2) days of supply. All 12 Marines will exit the vehicle through topside hatches to simulate evacuation of the vehicle while the vehicle is in the water. Time from opening the first hatch to the last Marine having exited the vehicle will be recorded.

The vehicle will be loaded with the remaining eight (8) members of the reinforced Marine rifle squad, three (3) crew, existence loads, and two (2) days of supply. All 11 Marines will exit the vehicle through topside hatches to simulate evacuation of the vehicle while the vehicle is in the water. Time from opening the first hatch to the last Marine having exited the vehicle will be recorded.

Tactical Egress Demonstration

The vehicle will be loaded with nine (9) members of a reinforced Marine rifle squad, three (3) crew, existence loads, and two (2) days of supply. All nine (9) combat equipped Marines will exit the rear of the vehicle to simulate combat deployment while the vehicle is on land. Time from opening the rear of the vehicle to the last Marine having exited the vehicle will be recorded.

The vehicle will be loaded with the remaining eight (8) members of the reinforced Marine rifle squad, three (3) crew, existence loads, and two (2) days of supply. All eight (8) combat-equipped Marines will exit the rear of the vehicle to simulate combat deployment while the vehicle is on land. Time from opening the rear of the vehicle to the last Marine having exited the vehicle will be recorded.