NATURE OF DISCHARGE REPORT

Welldeck Discharges

1.0 INTRODUCTION

The National Defense Authorization Act of 1996 amended Section 312 of the Federal Water Pollution Control Act (also known as the Clean Water Act (CWA)) to require that the Secretary of Defense and the Administrator of the Environmental Protection Agency (EPA) develop uniform national discharge standards (UNDS) for vessels of the Armed Forces for "...discharges, other than sewage, incidental to normal operation of a vessel of the Armed Forces, ..." [Section 312(n)(1)]. UNDS is being developed in three phases. The first phase (which this report supports), will determine which discharges will be required to be controlled by marine pollution control devices (MPCDs)—either equipment or management practices. The second phase will develop MPCD performance standards. The final phase will determine the design, construction, installation, and use of MPCDs.

A nature of discharge (NOD) report has been prepared for each of the discharges that has been identified as a candidate for regulation under UNDS. The NOD reports were developed based on information obtained from the technical community within the Navy and other branches of the Armed Forces with vessels potentially subject to UNDS, from information available in existing technical reports and documentation, and, when required, from data obtained from discharge samples that were collected under the UNDS program.

The purpose of the NOD report is to describe the discharge in detail, including the system that produces the discharge, the equipment involved, the constituents released to the environment, and the current practice, if any, to prevent or minimize environmental effects. Where existing process information is insufficient to characterize the discharge, the NOD report provides the results of additional sampling or other data gathered on the discharge. Based on the above information, the NOD report describes how the estimated constituent concentrations and mass loading to the environment were determined. Finally, the NOD report assesses the potential for environmental effect. The NOD report contains sections on: Discharge Description, Discharge Characteristics, Nature of Discharge Analysis, Conclusions, and Data Sources and References.

2.0 DISCHARGE DESCRIPTION

This section describes the welldeck discharges and includes information on the equipment that is used and its operation (Section 2.1), general description of the constituents of the discharge (Section 2.2), and the vessels that produce this discharge (Section 2.3).

2.1 Equipment Description and Operation

Several Navy ship classes have a welldeck in the aft section of the ship for embarking, storing, and disembarking landing craft. These welldecks range from 50 to 78 feet in width, 168 to 440 feet in length, and 20 to 30 feet in height.[1] During an amphibious operation or beach assault, the ship can be positioned anywhere within proximity of land. However, the operations are more likely to occur near the 12 nautical mile (n.m.) limit so the ship is less susceptible to enemy gunfire from shore. The landing craft carried onboard the ship serve to ferry U. S. Marine Corps (USMC) personnel, vehicles, and equipment to and from shore. Depending on the type of landing craft used, the ship might fill ballast tanks with seawater to lower the ship so that the welldeck floods with water (see Figure 1).

The types of craft that typically operate from these ships are utility landing craft (LCUs), air-cushion landing craft (LCACs), and assault amphibian vehicles (AAVs). LCUs have diesel engines to power the propellers. LCACs are gas-turbine-driven hovercraft. AAVs propel themselves through the water with waterjets, but use tracked running gear on land. Although AAVs can enter and exit the welldeck independently, they are also carried onboard LCUs and LCACs. Mechanized landing craft (LCM), once common to amphibious operations, are no longer carried by amphibious ships.[1,2]

Vehicles and equipment are stored in the vehicle storage areas forward of the welldeck. These areas are located on two levels and are connected by ramps. Vehicles and equipment are also stored onboard the LCUs and LCACs in the welldeck but not in the welldeck itself due to space constraints. Similarly, containers and products are not stored in the welldeck but rather in the vehicle storage areas or elsewhere on the ship. Examples of the vehicles carried onboard include light armored vehicles (LAVs), AAVs, tanks, jeeps, trucks, high mobility multipurpose wheeled vehicles (HMMWVs), and motorcycles. Examples of equipment carried onboard include howitzers and trailers.[2]

The floors of the welldeck are lined with pressure treated lumber. The walls are lined with either pressure treated lumber or synthetic batter boards except near the stern gate where the walls are lined with rubber panels.

Vehicle and equipment maintenance is performed where the vehicles and equipment are stored, which can include on the deck of a host LCU or LCAC. Waste products and spills produced during vehicle maintenance are collected and held in accordance with shipboard procedures for spill containment. Oily patches on the decks are cleaned with a detergent.[2]

There are five primary overboard discharges from a welldeck: (1) washout from the welldeck when the ship ballasts to embark or disembark landing craft; (2) water or detergent and water mixture used for LCAC gas turbine engine washes; (3) graywater and condensate that can be discharged from the LCUs; (4) freshwater wash to remove salt and dirt from vehicles, equipment, and landing craft; and (5) U.S. Department of Agriculture (USDA) washes of the welldeck, vehicle storage areas, and all vehicles, equipment, and landing craft. These discharges can occur almost anywhere within 12 n.m., except for the USDA work which occurs pierside.

2.1.1 Welldeck Washout

Washout occurs when the welldeck is flooded to allow landing craft to enter or exit the ship. However, LCACs and AAVs do not need the welldeck to be flooded to enter or exit, although some water will naturally enter. Therefore, this discussion is primarily applicable to LCU operations. The ship submerges the welldeck by flooding clean ballast tanks with seawater.[3] See Figure 1. When the welldeck is submerged, any debris or fluid in the welldeck is mixed with the seawater and will eventually flow to the open sea.

2.1.2 LCAC Engine Washes

The LCAC engine washes are performed on the four gas turbine engines provided for propulsion and the two auxiliary power units (APUs) provided to supply electrical power. There are two types of LCAC engine washes: thorough preventive-maintenance washes that uses a detergent to remove engine deposits and those performed daily with only distilled water to remove salt deposits. During winter conditions, methanol may be added to the mixture to prevent the wash water from freezing.[4]

Preventive-maintenance washes are scheduled every 25 operating hours for the gas turbines and quarterly for the APUs. Because the purpose of these washes is to prevent engine degradation, any noticeable reduction in engine performance will usually result in a wash. There are currently two separate methods used to perform these washes but both involve flushing distilled water and detergent through the engine while it is being rotated on the starter. One method uses an automated cleaning system, if installed, and a detergent called ZOK-27. The other, a more manual procedure, uses a detergent called B&B 3100 (MIL-C-85704). Following the detergent wash, a separate distilled water wash is performed to flush out the engine. APUs are washed in a similar way except that the detergent is Stoddard Solvent, FedSpec P-D-680, type III.[2,3]

Daily washes are performed when the LCACs have been operating, but not if preventive maintenance washes are scheduled for the same day. This wash consists of a rinse of distilled water through the propulsion gas turbines, but not the APUs. However, if a cleaning system is installed it may also be used for the daily wash as it is for the preventive maintenance wash.

2.1.3 Landing Craft Discharges

LCU crews live aboard their craft in the welldeck. As such, they generate graywater (i.e., water from drains, sinks, and showers) as well as condensate from air conditioning systems. The graywater and condensate produced is drained to the welldeck. LCUs do not create blackwater (sewage) because the crew uses the ship's sanitary facilities.[3] LCACs do not have living spaces, do not produce graywater, and do not discharge condensate into the welldeck.[2] For more information on graywater, see the Graywater NOD Report.

2.1.4 Vehicle, Equipment, and Landing Craft Washes

Dirty vehicles and equipment returning to the ship are washed ashore, if possible. They also will receive a freshwater wash on the ramp leading from the welldeck to the vehicle storage area. The engine compartments are not washed.[2] The wash water flows into the welldeck and is drained overboard or pumped overboard by an eductor. The motive water for the eductors in the welldeck and vehicle storage areas is provided by the firemain.

The aluminum structure of an LCAC is unpainted and susceptible to the corrosive effects of seawater. To prevent this corrosion, the exterior is washed with fresh water at the conclusion of daily operations. If the LCACs are not being used, a biweekly wash is required.[5] No cleaners or detergents are used for these washes. LCUs and AAVs are not washed in the welldeck.

2.1.5 USDA Washes and Inspections

The USDA requires that vehicles, equipment, craft, and internal shipboard areas that have contacted foreign soil be thoroughly washed and inspected to prevent the importation of non-indigenous species. These washes and inspections are performed prior to returning to, or upon return to, the U.S. These washes and inspections fall into three categories; those done on the welldeck and vehicle storage areas, those done on the vehicles and equipment, and those done on the landing craft. These three operations normally occur in foreign ports, but can occur in the U.S. or U.S. territories.[2]

The welldeck and vehicle storage areas are washed when all of the vehicles, equipment, and landing craft that can be off-loaded are removed. Those that remain are too large to fit down the exit ramp on the side of the ship. Their normal path is through the stern gate. One example is the M-9 armored combat earthmover (ACE) which is 10.5 feet wide and 8.75 feet high. During the washes all surfaces (decks, bulkheads, and overheads) are cleaned. The process for the welldeck begins with a seawater wash of all surfaces followed by a freshwater wash. Unlike the welldeck, the vehicle storage areas are only washed with fresh water. Following the washes, the USDA inspects to ensure that no foreign species, soil, or plants are in those areas. All of the water effluent drains overboard or is pumped overboard by an eductor.[2]

The vehicles and equipment are washed pierside, except for those discussed above that cannot be off-loaded. They will be washed and inspected in the welldeck. The process begins with the vehicles and equipment being parked in a designated contaminated area. Each, in turn, is then moved to an area to have the interior cleaned. They are then moved to the wash racks and thoroughly washed (including the engine compartments) with fresh water. The wash racks are long wheel ramps that allow the undersides of the vehicles to be washed and inspected. Following the wash, each vehicle or piece of equipment is inspected by the USDA for foreign organisms, plants, and soil, and then moved to a designated clean area to await reloading on the ship. The effluent from the vehicles and equipment washed in the welldeck drains overboard or is pumped overboard by an eductor.[2]

The landing craft are also washed and inspected. LCACs, however, are not usually given a special wash because enough sea spray is created in their operation that all the exterior surfaces are flushed free of foreign organisms, plants, and soil before the LCAC boards the ship at sea and is inspected. LCUs are washed with fresh water in the welldeck or pierside and then inspected.[2]

2.2 Releases to the Environment

Effluent is discharged to the environment by washout or surge when landing craft are operating in the welldeck. Effluent from the various washes performed in the welldeck are discharged as it drains overboard from the welldeck or is pumped overboard by an eductor.

Welldeck washout and the effluent from the washes can contain fresh water, distilled water, firemain water, graywater, air-conditioning condensate, sea-salt residues, paint chips, wood splinters, dirt, sand, organic debris, oil, grease, fuel, detergents, combustion by-products, and lumber treatment chemicals.

2.3 Vessels Producing the Discharge

Only the Navy has ships with welldecks. Ship classes with welldecks include general purpose amphibious assault ships (LHAs), multipurpose amphibious assault ships (LHDs), amphibious transport docks (LPDs), and dock landing ships (LSDs). While there are differences among welldeck designs, the primary process variance is due to the type and number of landing craft onboard. Applicable data is listed below.[1]

Ship Class	No. of Ships	Welldeck Dimensions	Landing Craft Loading Schemes
LHA 1	5	268’ x 78’	4 LCU, 1 LCAC, or 45 AAV
LHD 1	4	267’ x 50’	3 LCAC or 2 LCU
LPD 4	8	168’ x 50’	1 LCU or 28 AAV
LSD 36	5	430’ x 50’	4 LCAC, 3 LCU, or 52 AAV
LSD 41	8	440’ x 50’	4 LCAC, 3 LCU, or 64 AAV
LSD 49	3	265’ x 50’	2 LCAC or 1 LCU

3.0 DISCHARGE CHARACTERISTICS

This section contains qualitative and quantitative information that characterizes the discharge. Section 3.1 describes where the discharge occurs with respect to harbors and near-shore areas, Section 3.2 describes the rate of the discharge, Section 3.3 lists the constituents in the discharge, and Section 3.4 gives the concentrations of the constituents in the discharge.

3.1 Locality

Welldeck discharges can occur both within and beyond 12 n.m.

3.2 Rate

3.2.1 Welldeck Washouts

The flow from a welldeck washout can be estimated based on the welldeck dimensions listed in Section 2.3. The washout volume was estimated by multiplying the dimensions of the welldeck (length and width in feet) by the approximate height of water needed by an LCU (5' forward, 9' at the stern gate).[2] The numbers shown in parenthesis are estimated values for the amount of water entering the welldeck during LCAC operations (using an assumed depth of 4 inches of water spread uniformly across the welldeck). The water in the welldeck during LCAC operations is the result of the surge created when the LCACs enter the ship and is not the result of ballasting.

Ship Class	Estimated Gallons Per Washout (or Surge)
LHA 1	1,100,000 (52,000)
LHD 1	700,000 (33,000)
LPD 4	440,000 (0, no LCACs)
LSD 36	1,130,000 (54,000)
LSD 41	1,150,000 (55,000)
LSD 49	700,000 (33,000)

On average, an amphibious ship will have one six-month deployment every two years. During such a deployment, ballasting/deballasting will take place approximately 40 times (unless LCACs are deployed in which case the seawater surge will enter the welldeck 40 times).[2] It is variable how many times the ballasting/surge will take place within U.S. waters or how many local exercises will take place during that two year period. This is because the amount of time that a ship spends in U.S. waters varies from ship to ship.

3.2.2 LCAC Gas Turbine Engine Washes

Approximately 12 gallons of distilled water is used for a propulsion gas turbine daily wash. The flow from a detergent wash would be 12.5 gallons of distilled water/detergent mix followed by 12 gallons of distilled water rinse for a total of 24.5 gallons. For each APU, the flow from a detergent wash would be 0.375 gallon of distilled-water-detergent mix followed by a 0.25 gallon distilled water rinse for a total of 0.625 gallon. Thus, each LCAC is capable of producing 48 gallons of effluent from the daily washes of the four propulsion gas turbines and 99.25 gallons of effluent if all of the engines (four propulsion and two APUs) are washed with a water-detergent mix.[2,6]

3.2.3 Graywater and Air Conditioning Condensate

LCUs discharge graywater into the welldeck because they do not have the capability to collect and hold graywater. Air-conditioning condensate is also not collected.

During the transit of an amphibious ship from port to 12 n.m., the LCU would have 4 hours to generate graywater. The rate of graywater generation for Navy personnel is given as 30 gallons per person per day. Thus, an LCU with a typical load of six crew members could generate 180 gallons of graywater per day or 30 gallons of graywater during the 4-hour transit period. However, little or no graywater is produced and discharged within 12 n.m. because the crew of the LCU is occupied with preparations for, or stand down from, welldeck operations.

The generation of graywater on an LCU while the host ship is operating within 12 n.m. has not been estimated since the time that a host ship will be operating within 12 n.m. varies. LCU air-conditioning capacity varies from 5 to 8 tons which, under severe heat and humidity conditions, can produce 30 to 48 gallons of condensate per day.

3.2.4 Vehicle, Equipment, and Landing Craft Washes

When returning to the ship, vehicles and equipment receive a freshwater wash on the ramp leading from the welldeck to the vehicle storage area. This freshwater wash uses a 1.5-inch firehose at a rate of about 95 gallons per minute (gpm).[2] The wash typically takes 30 seconds, so it is estimated that 48 gallons of fresh water is used per wash. A typical ship contains about 100 to 125 vehicles and pieces of equipment, so approximately 4,800 to 6,000 gallons could be discharged if all of the vehicles and equipment are returned to the ship and washed consecutively.

The exterior wash of the LCACs is performed at the end of daily operations. This wash also uses a 1.5-inch firehose at a rate of 95 gpm and lasts for about 10 minutes. Estimates from LCAC personnel indicate that about 1,000 gallons of water are used per LCAC, which is consistent with a 10 minute wash at 95 gpm.[2] Since the number of LCACs carried onboard a ship can vary as shown in Section 2.3, 1,000 to 4,000 gallons of water could be released by these washes. However, if the LCACs are not being used, only a biweekly wash is required.[5]

3.2.5 USDA Washes and Inspections

The welldeck and vehicle storage areas are washed differently. The welldeck is first washed with seawater via the firemain, and then washed with fresh water. The vehicle storage areas are only washed with fresh water. Each wash takes about 45 minutes. The seawater wash of the welldeck uses a 1.5-inch firehose at a rate of about 95 gpm of seawater. Based on the estimated time of 45 minutes, about 4,275 gallons are used. The freshwater wash of the welldeck also uses a 1.5-inch firehose at a rate of about 95 gpm. Again, based on the estimated time of 45 minutes, about 4,275 gallons are used. The upper and lower vehicle storage areas are washed separately with fresh water, each taking about 45 minutes, and using a 1.5-inch firehose at a rate of about 95 gpm. To summarize these estimates, 4,275 gallons of firemain water and 4,275 gallons of fresh water are used to wash the welldeck and 8,550 gallons of fresh water are used to wash both vehicle storage areas.

The vehicles and equipment are washed with a 1.5-inch firehose at a rate of about 95 gpm of fresh water. Each vehicle or piece of equipment takes about 5 minutes to wash. Therefore, about 475 gallons of water are used. If five to ten vehicles or pieces of equipment were unable to be off-loaded, 2,375 to 4,750 gallons of water could be used.

The duration of the landing craft washes for calculation purposes will be estimated at 15 minutes using a 1.5-inch firehose at rate of about 95 gpm of fresh water. Therefore, about 1,425 gallons could be used for each landing craft. The washing of the LCACs in this manner is unlikely however, so the loading of one to four LCUs (from Section 2.3) is used to yield a range of effluent produced which is 1,425 to 5,700 gallons.

3.3 Constituents

The potential constituents of this discharge include:[2,3]

- air-conditioning condensate
- automotive grease
- B&B 3100 detergent (MIL-C-85704)
- bromine (from the wash water)
- chlorine (from the wash water)
- detergent
- gas turbine fuel, JP-5 (MIL-F-5624E)
- graywater
- lumber-treatment chemicals
- methanol
- motor oils
- naval distillate fuel, F-76 (MIL-F-16884)
- nickel, copper, zinc, and other metals
- solvent P-D-680 type III (petroleum distillate)
- vehicle diesel fuel, F-34 (MIL-T-83133)
- ZOK-27 water-soluble detergent

ZOK-27 contains ethanol and 2-butoxyethanol, while B&B 3100 contains solvent-refined heavy naphthenic distillate and petroleum solvents. Marine diesel fuel (F-76) contains petroleum mid-distillates, antisetting agents, and flow improvers.

It is possible that lube oils, greases, and fuel oils can be spilled on welldeck surfaces. However, spills will be quickly wiped up in accordance with shipboard practices, so any oils or greases found on welldeck surfaces will exist as surface films. Such surface films may contain benzene, toluene, ethylbenzene, and xylenes which are the common constituents of lighter petroleum products. These chemicals are also priority pollutants, as are various metals (e.g., copper and nickel) which are in firemain water and could be present in greases, oils, and fuels.[7]

There are no constituents present in welldeck discharges that are bioaccumulators.[8]

3.4 Concentrations

The constituent concentrations have not been estimated. The concentration of metals in the firemain water is discussed in the Firemain Systems NOD Report.

4.0 NATURE OF DISCHARGE ANALYSIS

Based on the discharge characteristics presented in Section 3.0, the nature of the discharge and its potential impact on the environment can be evaluated. A discussion on the mass loadings is presented in Section 4.1. In Section 4.2, the concentrations of discharge constituents after release to the environment are discussed along with the water quality standards. In Section 4.3, the potential for the transfer of non-indigenous species is discussed.

4.1 Mass Loadings

Since numbers that quantify the constituents of the various components of this discharge are unknown and variable, mass loading calculations cannot be performed with any accuracy. However, generalized statements regarding the mass loadings can be made based upon the physical features of the discharge.

4.1.1 Welldeck Washouts

Spills from vehicle and equipment maintenance within the welldeck could potentially result in the discharge of substances such as oil. These spills can leave a residue on the deck. However, spills are controlled by shipboard procedures for spill containment and clean-up. Oily patches on the decks are cleaned with a detergent.[2] The small amounts of constituents remaining as surface films in the welldeck do not support the production of significant mass loadings.

4.1.2 LCAC Engine Washes

The degree to which engine contaminants are removed by the wash water is unknown and the amounts of engine washes within 12 n.m. are unknown. Since there are many LCACs and not all of them are operating each day or are not within U.S. waters, it will be assumed that 1 LCAC is operating each day in U.S waters and requires an engine wash. Since the gas turbine engines are relatively clean, it is assumed that, at most, a few tablespoons of hydrocarbon constituents will be removed by each wash. Using these numbers, only 3-5 gallons of hydrocarbon constituents would be released by the engine washes, per year, in U.S. waters.

4.1.3 Graywater and Air Conditioning Condensate

As discussed in section 3.2.3 above, it is estimated that 30 gallons of graywater can be discharged from an LCU while the host ship is transiting to 12 n.m. LCUs are not normally carried onboard amphibious ships since LCACs are favored. Assuming 10 LCUs are carried onboard ships during a year, and assuming that each ship transits the 12 n.m. zone 6 times per year, it is estimated that, at most, 1800 gallons of graywater will be released per year during transit. These assumptions overestimate the amounts of graywater produced because it is unlikely that each LCU on a host ship is discharging graywater at the maximum design rate during the entire 12 n.m. transit. Graywater production is likely to be much lower during transit because the LCU crew is occupied with preparations for, or stand down from, welldeck operations. In port, mass loadings of graywater can equal the design rate so each LCU could produce 180 gallons per day (32,760 gallons per year assuming 6 months in port).

Based on the discussions in the Refrigeration/AC Condensate NOD Report, the condensate discharge contains little or no constituents and insignificant mass loadings are expected.

4.1.4 Vehicle, Equipment, and Landing Craft Washes

These washes are directed at the external surfaces of vehicles, equipment, and landing craft. The engine compartments are not washed. Any hydrocarbon constituents would be present as films on exterior surfaces. Assuming that a tablespoon (29.6 mL) of oil was present and washed off per vehicle, landing craft, etc., and that 1000 are washed in U.S. waters per year, only about 4 gallons of oil would be released per year. However, it is felt that a tablespoon is an overestimate of the amount of oil that could be removed by such washes.

4.1.5 USDA Washes and Inspections

Although somewhat similar to 4.1.3 discussed above, the vehicle portion of these washes are substantially longer and include a high-pressure wash of the engine compartments external to the vehicles. However since these washes are almost entirely performed shoreside, only the effluent from those vehicles washed in the welldeck has the potential to enter the water. Assuming 20 vehicles per year are given this wash while in U.S. waters, and half a pint (473 mL) of oil is removed from each, only 1.25 gallons of oil would be released per year. However, these assumptions will tend to overestimate of the amount of oil that could be removed by such washes.

The other portion of this discharge, the washing of the welldeck and vehicle storage areas, will only occur several times a year, at most, since the USDA washes and inspections are normally conducted while the ship is still overseas. Furthermore, the hydrocarbon constituents present will be in the form of surface films so significant mass loadings are not expected.

4.2 Environmental Concentrations

Since numbers that quantify the volumes and constituents of the various components of this discharge are unknown and variable, concentrations cannot be performed with any accuracy. However, generalized calculations and statements regarding the mass loadings can be made based upon the known physical features of the discharge.

4.2.1 Welldeck Washout

Spills from vehicle and equipment maintenance within the welldeck could potentially result in the discharge of substances such as oil. The spills can coat the deck with a residue. However, the spills are controlled by shipboard procedures for spill containment and clean-up. Oily patches on the decks are cleaned with a detergent.[2] The small amounts of constituents remaining as surface films in the welldeck do not support the production of significant mass loadings. The large water volumes involved (see 3.2.1) and the small volumes contained in the surface films do not appear to support the production of significant contaminant concentrations in the washouts and it is not expected that they will exceed federal or state water quality criteria. The visual criteria for oily discharges is that the discharge does not cause a sheen while the Act to Prevent Pollution from Ships limits the oil content of the discharge to 15 parts per million (approximately 15 mg/L). Florida has set a criterion of 5,000 micrograms per liter (µg/L) with no visible sheen.

4.2.2 LCAC Engine Washes

Since this discharge comprises a low volume of water which passes through an engine and is in contact with hydrocarbons, it is believed that water quality criteria can be exceeded. A rough estimate of contaminant concentrations can be performed to check the validity of assuming that hydrocarbon concentrations in the discharge can exceed water quality criteria. It does not seem unreasonable to assume that one teaspoon (4.9 mL) of hydrocarbon constituents could be deposited within the gas turbine engine and washed away in the discharge. The 4.9 mL placed in 12 gallons (45.42 L) of water (daily wash) will yield a hydrocarbon concentration of about 108,000 ppb of oil which exceeds the Florida water quality criterion of 5,000 ppb of oil. This rough calculation supports the assumption that water quality criteria can be exceeded. There is also the possibility that trace amounts of metals could be present that exceed federal and state water quality criteria. Furthermore, the nature of the detergent wash will liberate more hydrocarbon constituents and it is still assumed that water quality criteria can be exceeded, even though twice as much water is used.

4.2.3 Graywater and Air Conditioning Condensate

As discussed in section 3.2.3 above, it is estimated that 30 gallons of graywater can be discharged from an LCU while the host ship is transiting the 12 n.m. zone, or 180 gallons per day in port. LCU graywater has not been sampled, but it is possible that graywater sampling data for surface ships can be applied to the LCUs. According the Graywater NOD Report, the measured concentrations of several metals in the discharge exceed ambient water quality criteria and the estimated loadings of nutrients, solids, and oxygen-demanding substances are high.

As discussed in section 3.2.3 above, it is estimated that 30 to 48 gallons of air-conditioning condensate can be produced each day. Based on the Refrigeration/AC Condensate NOD Report, this discharge contains little or no constituents and has a low probability of producing an environmental effect.

4.2.4 Vehicle, Equipment, and Landing Craft Washes

Although concentrations have not been calculated, the low volumes of water that are mixed with small amounts of hydrocarbon constituents, are not considered to exceed federal or state water quality criteria or to have an environmental effect.

4.2.5 USDA Washes and Inspections

The discharge from the USDA washes of the welldeck and vehicle storage areas will contain dirt, debris, detergents, and hydrocarbons in concentrations that could possibly exceed federal discharge standards or state water quality criteria. The washes of the welldeck will also contain metals from the ship's firemain.

4.3 Potential for Introducing Non-Indigenous Species

Although washes and inspections are required by the USDA for the vehicles, equipment, landing craft, welldeck, and vehicle storage areas, the potential for introducing non-indigenous species exists when the washes occur in U.S. ports. The wash water effluent could potentially carry non-indigenous species from the ship into the water. It should be noted that the USDA washdowns are intended to prevent transfer of non-indigenous species to land and the viability of any waterborne species introduced is questionable since they generally would have been exposed to air for extended periods of time prior to their introduction into U.S. coastal waters (i.e., for the most part, these species would have been removed from vehicles and deck surfaces and thus it would not be a water-to-water transfer, in contrast to species transfers from ballast water systems).

5.0 CONCLUSIONS

If uncontrolled, discharges from the well deck could possibly have the potential to cause an adverse environmental effect because oil drippings spilled during vehicle and equipment maintenance would leave an oil film on the deck surface. When the welldeck is flooded, the oil film can be washed from the deck by the incoming water. An oil sheen could possibly be discharged when water within the welldeck is discharged. However, current management practices provide for the clean-up of oil and other substances spilled during routine maintenance. These practices reduce the possibility of discharging an oil sheen.

6.0 DATA SOURCES AND REFERENCES

To characterize the discharge, information from various sources was obtained. Process information and assumptions were used to estimate the rate of discharge. Information to determine the concentrations and loadings of constituents is not available. Table 1 shows the sources of data used to develop this NOD report.

Specific References

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2. Report on the Ship Check of USS Kearsarge (LHD 3) by M. Rosenblatt & Son, Inc. (MR&S) dated October 1, 1997.

3. UNDS Equipment Expert Meeting Minutes - Welldeck Washout, October 3, 1996.

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5. Operating Instructions for LCAC/Welldeck Operations, SEAOPS Manual for LCAC, Volume III, Revisions 1 and 2. September 30, 1995.

6. Eaton, Tim, CAPT USMC, USS Kearsarge. Gas Turbine Water Washes, 10 October 1997, David Eaton, MR&S, Inc.

7. Committee Print Number 95-30 of the Committee on Public Works and Transportation of the House of Representatives, Table 1.

8. The Water Quality Guidance for the Great Lakes System, Table 6A. Volume 60 Federal Register, p. 15366. March 23, 1995.

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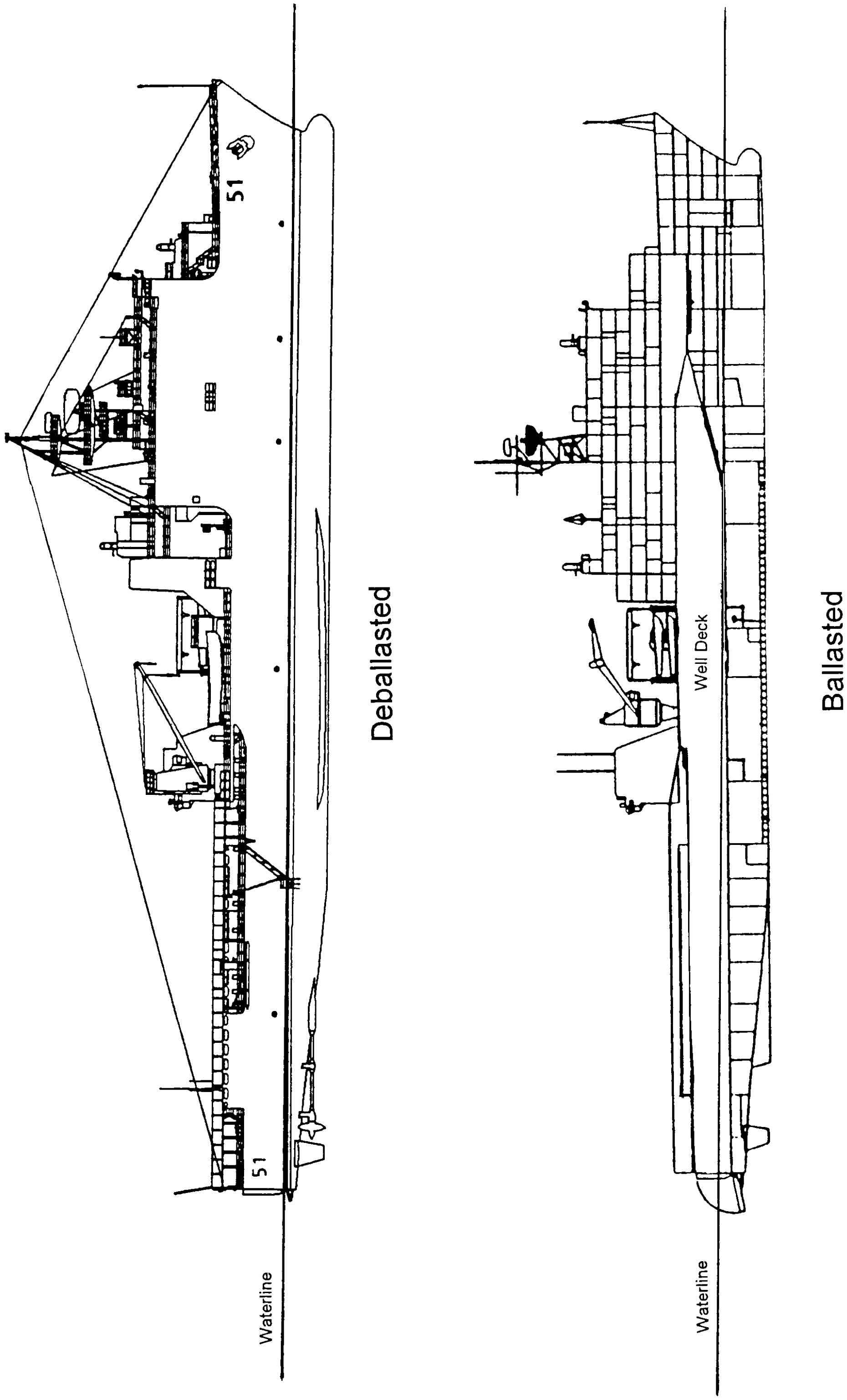

Figure 1. Basic View of an Amphibious Ship Ballasted and Deballasted

Table 1. Data Sources

	Data Source			
NOD Section	**Reported**	**Sampling**	**Estimated**	**Equipment Expert**
2.1 Equipment Description and Operation				X
2.2 Releases to the Environment				X
2.3 Vessels Producing the Discharge	UNDS Database			X
3.1 Locality				X
3.2 Rate			X	
3.3 Constituents	MSDS		X	
3.4 Concentrations		X	X	
4.1 Mass Loadings			X	
4.2 Environmental Concentrations			X	
4.3 Potential for Introducing Non-Indigenous Species				X