United States Environmental Protection Agency

# Containment and Disposal of Large Amounts of Contaminated Water:

## *A Support Guide for Water Utilities*


**Office of Water (4608T) EPA 817-B-12-002 September 2012 http://www.epa.gov/watersecurity**

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# Disclaimer

*The Containment and Disposal of Large Amounts of Water: A Support Guide for Water Utilities* is designed to provide recommendations that may be useful in preparing for contamination threats and events. While it may serve as a reference document for preparation and response to an actual contamination event when rapid decision making is needed, this guide does not address all facets of the decontamination phase of a response. It consists of broad recommendations that may be adaptable to a specific situation or incident. Use of this guide is voluntary. This guide is not a rule; it is not legally enforceable; and it does not confer legal rights or impose legal obligations upon any member of the public, water utilities, the U.S. Environmental Protection Agency (EPA), state and local governments, tribes, or any other agency. It includes references to statutes and regulations, but it does not change or substitute for any legal requirements. While EPA has made every effort to ensure the accuracy of the discussion in this guide, the obligations of the regulated community are determined by the relevant statutes, regulations, or other legally binding requirements. In the event of a conflict between the discussion in this document and any statute or regulation, this document would not be controlling. The word "should" as used in this guide does not connote a requirement, but may indicate EPA's strongly preferred approach to ensure effective implementation of legal requirements.

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# List of Acronyms

| | |
|---|---|
| ACP | Area Contingency Plan |
| ADAMS | Agency-wide Documents Access and Management System |
| AEA | Atomic Energy Act |
| ALARA | As Low as Reasonably Achievable |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| BSL | Biosafety Level |
| CBR | Chemical, Biological, and Radiological |
| CDC | Centers for Disease Control |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CID | EPA Criminal Investigation Division |
| CRS | Congressional Research Service |
| CSO | Combined Sewer Overflow |
| CWA | Clean Water Act |
| CWT | Centralized Waste Treatment |
| DBP | Disinfection Byproduct |
| DDT | Dichlorodiphenyltrichloroethane |
| DHS | U.S. Department of Homeland Security |
| DOD | U.S. Department of Defense |
| DOE | U.S. Department of Energy |
| DOT | U.S. Department of Transportation |
| EDR | Electrodialysis Reversal |
| EMS | Emergency Management Service |
| EPA | U.S. Environmental Protection Agency |
| ERLN | Environmental Response Laboratory Network |
| ERP | Emergency Response Plan |
| FBI | Federal Bureau of Investigation |
| FEMA | Federal Emergency Management Agency |
| FIFRA | Federal Insecticide, Fungicide, and Rodenticide Act |
| FMCSA | Federal Motor Carrier Safety Administration |
| FOTW | Federally Owned Treatment Works |
| FR | Federal Register |
| GAC | Granular Activated Charcoal |
| HAA | Haloacetic Acid |

| | |
|---|---|
| HASP | Health and Safety Plan |
| HAZMAT | Hazardous Materials |
| HLRW | High-Level Radioactive Waste |
| HMR | Hazardous Materials Regulation |
| IC | Incident Commander |
| ICS | Incident Command System |
| ID | Identifier |
| IND | Improvised Nuclear Device |
| JTTF | Joint Terrorism Task Force |
| LDR | Land Disposal Restrictions |
| LLMW | Low-Level Mixed Waste |
| LLRW | Low-Level Radioactive Waste |
| LLRWDF | Low-Level Radioactive Waste Disposal Facility |
| LQG | Large Quantity Generators |
| MARPOL | Marine Pollution; more specifically, the designation for the International Convention for the Prevention of Pollution from Ships |
| MCL | Maximum Contaminant Level |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NHMRR | National HAZMAT (Hazardous Materials) Route Registry |
| NPDES | National Pollutant Discharge Elimination System |
| NRC | Nuclear Regulatory Commission |
| NRT | National Response Team |
| OPA | Oil Pollution Act |
| OSC | On-Scene Coordinator |
| OSHA | Occupational Safety and Health Administration |
| PCB | Polychlorinated Biphenyl |
| PHMSA | Pipeline and Hazardous Materials Safety Administration |
| POTW | Publicly Owned Treatment Works |
| RAP | Remediation Action Plan |
| RCP | Regional Contingency Plan |
| RCRA | Resource Conservation and Recovery Act |
| RDD | Radiological Dispersal Device |
| RPTB | Response Protocol Toolbox |
| SAFESTAT | Motor Carrier Safety Status Measurement System |
| SAM | Standardized Analytical Methods for Environmental Restoration following Homeland Security Events |
| SDWA | Safe Drinking Water Act |

| | |
|---|---|
| SEB | Staphylococcal Enterotoxin B |
| THM | Trihalomethane |
| TRAGIS | Transportation Routing Analysis Geographic Information System |
| TSCA | Toxic Substances Control Act |
| UIC | Underground Injection Control |
| USACE | U.S. Army Corps of Engineers |
| USAPHC | U.S. Army Public Health Command |
| USC | United States Code |
| USCG | U.S. Coast Guard |
| USDW | Underground Source of Drinking Water |
| UST | Underground Storage Tank |
| UV | Ultraviolet |
| WCIT | Water Contaminant Information Tool |
| WLA | Water Laboratory Alliance |
| WSi CMP | Water Security Initiative Interim Guidance on Developing Consequence Management Plans for Drinking Water Utilities |
| WWTP | Wastewater Treatment Plant |

# Glossary

The following terms are defined for purposes of this guidance document:

**Agency** – A division of government with a specific function, or a non-governmental organization (e.g., private contractor, business, etc.) that offers a particular kind of assistance. In the incident command system (ICS), agencies are defined as jurisdictional (having a statutory role in incident mitigation) or assisting and/or cooperating (providing resources and/or assistance).

**Agreement State** – Any State with which the Nuclear Regulatory Commission or the Atomic Energy Commission has entered into an effective agreement under subsection 274b of the Atomic Energy Act of 1954, as amended in 68 Stat. 919 (Per 40 CFR 191.02(f)).

**All Hazards** – An incident, natural or manmade, that warrants action to protect life, property, environment, and public health or safety, and to minimize disruptions of government, social, or economic activities. (From U.S. Department of Homeland Security, *National Response Framework,* FEMA Publication P-692, 2008)

**As Low as Reasonably Achievable (ALARA)** – Making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest (Per 10 CFR 20.1003).

**Before the Drinking Water Distribution System** – Water is considered to be located before the drinking water distribution system after it has been withdrawn from the source water (e.g., surface water or ground water) and before it is released to the pipes in the drinking water distribution system. Therefore, for the purposes of this guide, this does not include source water, but does include water located within a drinking water treatment plant or reservoir that has not entered the distribution system.

**Biosafety Level** – The level of precaution that must be taken to minimize the exposure of workers and the environment to infectious agents. The greater the threat of infection a contaminant poses, the greater the biosafety level. (From Centers for Disease Control and Prevention, *Biosafety in Microbiological and Biomedical Laboratories,* 5th ed., HHS Publication (CDC) 21-1112, 2009)

**Brine** – Treatment residual highly saturated with salt.

**Cancelled Pesticide** – A pesticide for which the registration (i.e., license) has been cancelled through one of the following actions:

- Voluntary cancellation by the registrant
- Cancellation by EPA because required fees were not paid
- Cancellation by EPA because unacceptable risk existed that could not be reduced by other actions such as amendment to terminate one or more uses or amendment to change the terms and conditions of registration and labeling

For more information, see 7 U.S.C. 136d Section 6(b) and EPA's Web page on regulating pesticides: http://www.epa.gov/pesticides/regulating/restricted.htm#canceled.

**Catch Basins** – Chambers or sumps, usually built at the curb line, which allow surface water runoff to enter the stormwater conveyance system.

**Centralized Waste Treatment (CWT) Facility** – Any facility that treats (for disposal, recycling, or recovery of material) any hazardous or non-hazardous industrial wastes, hazardous or non-hazardous industrial wastewater, and/or used material received from off site. "CWT facility" includes both a facility that treats waste received exclusively from off site and a facility that treats wastes generated on site as well as waste received from off site. For example, an organic chemical manufacturing plant may, in certain circumstances, be a CWT

facility if it treats industrial wastes received from off site as well as industrial waste generated at the organic chemical manufacturing plant. CWT facilities may also include re-refiners and may be owned by the federal government (Per 40 CFR 437.2).

**Code of Federal Regulations (CFR)** – The CFR is the codification of the federal regulations published in the Federal Register by the executive departments and agencies of the federal government. Each volume of the CFR is updated once each calendar year and is issued on a quarterly basis. See http://www.gpoaccess.gov/cfr/index.html.

**Combined Sewer System** – Sewer system that is designed to collect stormwater runoff, domestic sewage, and commercial and industrial wastewater in a single pipe and transport it to a treatment plant, where it is treated and then discharged to a water body. Combined sewer systems generally include some combined sewer overflow (CSO) discharge points prior to reaching the treatment plant. For more information, see EPA's National Pollutant Discharge Elimination System (NPDES) Web page on combined sewer overflows: http://cfpub.epa.gov/npdes/home.cfm?program_id=5.

**Containment** – The temporary storing of water to prevent further contamination or harm to human health and the environment.

**Contaminated Water** – Water contaminated with a biological, chemical, or radiological contaminant.

**Decontamination** – The inactivation or reduction of contaminants from surfaces by physical, chemical or other methods to meet a cleanup goal. Decontamination does not include treatment of contaminated water or wastewater.

**Drinking Water Distribution System** – System consisting of pipes, pumps, control valves and storage facilities designed to provide water for human consumption (e.g., to homes, businesses, hospitals, government facilities, etc.). For the purposes of this guide, this does not include the end point of the water (e.g., the home, business, etc.).

**Drinking Water Primacy Agency** – The agency that has primary responsibility for administration and enforcement of primary drinking water regulations and related requirements applicable to public water systems within a state (Per 40 CFR Part 142). Drinking water primacy for a particular state or tribe may reside in one of a variety of agencies, such as health departments, environmental quality departments, etc., or in the applicable EPA region. The drinking water primacy agency may also play the role of technical assistance provider to drinking water utilities.

**Drinking Water System** – A utility, its components, personnel, and assets that are involved in providing drinking water to its customers.

**Emergency** – Any incident, whether natural or manmade, that requires responsive action within hours to protect life or property. As defined in the Stafford Act, any occasion or instance for which, in the determination of the President, federal assistance is needed to supplement state and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States (Per 42 U.S.C. 5122).

**Emergency Response Plan** – A document that describes the actions that a drinking water or wastewater utility might take in response to various emergencies, disasters, and other unexpected incidents. (From EPA *Emergency Response Plan Guidance for Small and Medium Community Water Systems to Comply with the Public Health Security and Bioterrorism Preparedness and Response Act of 2002,* EPA 816-R-04-002, 2004)

**Federal Register (FR)** – The *Federal Register* is the official daily publication for rules, proposed rules, and notices of federal agencies and organizations, as well as executive orders and other presidential documents. See http://www.gpo.gov/fdsys/browse/collection.action?collectionCode=FR.

**Force Main** – Pipeline that conveys wastewater under pressure from the discharge side of a pump or pneumatic ejector to a discharge point. Pumps or compressors located in a lift station provide the energy for wastewater conveyance in force mains.

**Hazardous Substance** – Consistent with the definitions in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (see 40 CFR 300.5), this term generally includes (but is not limited to):

- Any of more than 400 hazardous substances designated under section 311(b)(2)(A) of the Clean Water Act (CWA) or toxic pollutants listed under section 307(a) of the CWA
- Any substance designated pursuant to section 102 of CERCLA
- Any hazardous waste having the characteristics identified or listed under section 3001 of the Resource Conservation and Recovery Act (RCRA)
- Any of more than 200 hazardous air pollutants listed under section 112 of the Clean Air Act (CAA), as amended
- Any imminently hazardous chemical substance or mixture about which the EPA Administrator has "taken action pursuant to" section 7 of the Toxic Substances Control Act (TSCA)

The term does not include petroleum, including crude oil or any fraction thereof that is not otherwise listed or designated above. The term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

**High-Level Radioactive Waste (HLRW)** – The highly radioactive materials produced as byproducts of fuel reprocessing or of the reactions that occur inside nuclear reactors. HLRW includes: (1) irradiated reactor fuel; (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel; and, (3) solids into which such liquid wastes have been converted (Per 10 CFR 60.2). Containment and disposal of this type of radioactive waste is not covered in this guide.

**Hydrophobic** – Having a strong aversion for water.

***In Situ*** – In place.

**Incident Command System (ICS)** – A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is a management system designed to enable effective incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in the management of resources during incidents. It is used for all kinds of emergencies and is applicable to small as well as large and complex incidents. ICS is used by various jurisdictions and functional agencies, both public and private, to organize field-level incident management operations. (From U.S. Department of Homeland Security, *National Response Framework*, 2008, FEMA Publication P-692.)

**Individual Control Mechanism** – Individual permit, order, or similar control mechanism. For example, this phrase is used in EPA's General Pretreatment regulations at 40 CFR 403.8(f)(1)(iii).

**Initial Response** – Actions taken immediately following notification of a contamination incident or release. In addition to search and rescue, scene control, and law enforcement activities, initial response may include initial site containment, environmental sampling and analysis, and public health activities, such as treatment of potentially exposed persons.

**Injection Well** – A "well" into which "fluids" are being injected. A well is defined as a bored, drilled, or driven shaft whose depth is greater than the largest surface dimension; or, a dug hole whose depth is greater than the largest surface dimension; or, an improved sinkhole; or, a subsurface fluid distribution system (Per 40 CFR 144.3.) For more information see http://water.epa.gov/type/groundwater/uic/basicinformation.cfm.

**Large Quantity Generators (LQG)** – A facility that generates 1,000 kilograms per month or more of hazardous waste, more than 1 kilogram per month of acutely hazardous waste, or more than 100 kilograms per month of any residue, contaminated soil, waste or other debris from the cleanup of spills of acute hazardous waste (Per 40 CFR 261.5(e)(2) and 40 CFR 262). For more information on LQG, see http://www.epa.gov/osw/hazard/generation/lqg.htm.

**Lift Station** – A tank or chamber accompanied by a pump and related controls used to retain and periodically discharge effluent.

**Lined Evaporation Pond** – Man-made pond having a large surface area for maximum exposure (e.g., exposure to sunlight or atmosphere).

**Local Limits** – Limitations and requirements that an industrial user must meet before discharging into a publicly owned treatment works (POTW). Developed in accordance with 40 CFR 403.5(c), local limits are Pretreatment Standards for the purpose of CWA section 307(d) [per 40 CFR 403.5(d)]. Each POTW pretreatment program must develop, implement, and enforce technically based local limits. (From EPA *Local Limits Development Guidance,* EPA-833-R-0-4002A, July 2004)

**Low Level Mixed Waste (LLMW)** – Material containing low-level radioactive waste and hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).

**Low Level Radioactive Waste (LLRW)** – Radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in section 11e (2), (3) or (4) of the definition of byproduct material set forth in 10 CFR 20.1003 (Per 10 CFR 61.2). LLRW may contain either high or low concentrations of radioactivity.

**Low Level Radioactive Waste Disposal Facility (LLRWDF)** – Commercially operated sites licensed by the NRC or an Agreement State to dispose of solid LLRW.

**Maximum Contaminant Level (MCL)** – The maximum permissible level of a contaminant in water which is delivered to any user of a public water system (Per 40 CFR 141.2). Under CERCLA, ground waters and surface waters that are current or potential drinking water sources are generally expected to be returned to beneficial reuse, which includes achieving MCLs.

**Mixed Waste** – RCRA section 1004(41) defines mixed waste as waste that contains both hazardous waste and source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954.

**National Oil and Hazardous Substances Pollution Contingency Plan (NCP)** – Also called the National Contingency Plan, the NCP (40 CFR part 300) generally provides a blueprint for carrying out response actions under CERCLA and section 311 of the CWA. The NCP is designed to provide for efficient, coordinated, and effective response to discharges of oil and releases of hazardous substances, pollutants, and contaminants. The NCP describes the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.

**National Pollutant Discharge Elimination System (NPDES)** – The national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of CWA (Per 40 CFR 122.2). This permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

**Oil** – Consistent with the definition published in the NCP at 40 CFR 300.5, this term includes:

- Oil as defined by section 311(a)(1) of the CWA, which means oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil.
- Oil as defined by section 1001 of the Oil Pollution Act (OPA), which means oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil, but does not include petroleum, including crude oil or any fraction thereof, which is specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of section 101(14) of CERCLA (42 U.S.C. 9601) and which is subject to the provisions of that Act.

**On-Scene Coordinator (OSC)** – The federal official predesignated by EPA or the U.S. Coast Guard to coordinate and direct responses under subpart D, or the government official designated by the lead agency to coordinate and direct removal actions under subpart E of the NCP (Per 40 CFR 300.5). The specific duties of the OSC are provided in 40 CFR 300.120.

**Paint Filter Liquids Test** – This method is used to determine the presence of free liquids in a representative sample of waste and compliance with 40 CFR 264.314 and 40 CFR 265.314 (disposal of bulk and containerized liquids at hazardous waste landfills). See *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Method 9095B, EPA Publication SW-846, November 2004, for more information.

**Potable Water** – Water of sufficiently high quality that it can be consumed or used without risk of immediate or long-term harm.

**Public Health** – The practice of preventing disease and promoting good health within groups of people, from small communities to entire countries.

**Public Water System** – A system for the provision to the public of water for human consumption through pipes or, after August 5, 1998, other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Such term includes: any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system; and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Such term does not include any "special irrigation district." A public water system is either a "community water system" or a "noncommunity water system" (Per 40 CFR 141.2).

**Publicly Owned Treatment Works (POTW)** – A treatment works as defined by section 212 of the CWA which is owned by a state or municipality (as defined by section 502(4) of the CWA). This definition includes any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW plant. The term also means the municipality as defined in section 502(4) of the CWA, which has jurisdiction over the indirect discharges to and the discharges from such a treatment works (Per 40 CFR 403.3(q)).

**Publicly Owned Treatment Works (POTW) Pretreatment Program or Approved Pretreatment Program** – A program administered by a POTW that meets the criteria established in 40 CFR 403.8 and 403.9 and that has been approved by a Regional Administrator or State Director in accordance with 40 CFR 403.11 (Per 40 CFR 403.3(d)). The program may include requirements for the reduction of the amount of contaminants, the elimination of contaminants, or the alteration of the nature of contaminant properties in wastewater prior to release into a POTW.

**Pump Station** – Facility that consists of pumps and service equipment designed to pump flows from lower to higher elevations to allow continuous and cost-effective treatment.

**Radiological Dispersal Device (RDD)** – Any device that causes the purposeful dissemination of radioactive material, across an area with the intent to cause harm, without a nuclear detonation occurring.

**Raw Water** – Untreated water.

**Raw Water Main** – Transmission, arterial, or distribution water main, but not a service line that transports raw water from source to the treatment plant.

**Receiving Body** – The body of water into which water and/or effluent is discharged from wastewater systems, stormwater systems, and other point-source dischargers.

**Remediation** – Remediation includes the processes of characterizing, decontaminating, and clearing a contaminated site or items, including disposal of wastes. It is a synonym for cleanup. (From U.S. DHS/EPA, *Draft Planning Guidance for Recovery Following Biological Incidents*, May 2009)

**Reservoir** – Any natural or artificial holding area used to store, regulate, or control water.

**Residual** – Byproducts from the treatment of contaminated water, including water, water-soluble materials, and solids.

**Resource Conservation and Recovery Act (RCRA) Hazardous Waste** – RCRA section 1004(5) defines a waste as hazardous if it is a solid waste that may cause an increase in mortality or serious illness or pose a

substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed or otherwise managed. See Solid Waste (below) for the statutory and regulatory definition of a RCRA solid waste. RCRA hazardous wastes can be liquids, solids, gases, or sludges. The regulatory definition of hazardous waste is found in 40 CFR Part 261. A waste may be considered hazardous if it exhibits certain hazardous properties (characteristics) in 40 CFR 261.21 to 261.24 or if it is listed as hazardous waste in 40 CFR 261.31 to 261.33, Subpart D-Lists of Hazardous Wastes). They can be discarded commercial products, such as cleaning fluids or pesticides, or the byproducts of manufacturing processes. See RCRA 1004(5) and 40 CFR 261.3 for the complete definitions, and http://www.epa.gov/osw/hazard/index.htm for more information.

**Response** – Includes immediate actions to save lives, protect property and the environment, and meet basic human needs. Response also includes the execution of emergency plans and actions to support short-term recovery. (From U.S. Department of Homeland Security, *National Response Framework*, FEMA Publication P-692, 2008)

**Service Reservoir** – A water storage container that holds clean water after it has been treated in a water plant, and before it is piped to the end users.

**Solid** – State of matter characterized by particles arranged such that their shape and volume are relatively stable. The constituents of a solid tend to be packed together much closer than the particles in a gas or liquid.

**Solid Waste** – RCRA section 1004(27) defines a solid waste as any garbage, refuse or sludge from waste treatment, water supply treatment and air pollution control and other discarded materials from industrial, commercial, mining and agricultural operations and from community activities. The statutory definition also includes several exclusions. The RCRA regulatory definition of solid waste is any discarded material that is abandoned, recycled, inherently waste-like, or a military munition, subject to certain exclusions. See 40 CFR 261.2 for the complete definition and http://www.epa.gov/waste/hazard/dsw/index.htm.

**Soluble** – Susceptible of being dissolved in or as if in a liquid, especially water.

**Source Water** – Water in its natural state, prior to any treatment for drinking.

**Stabilization/Solidification** – Waste stabilization means any physical or chemical process used to either reduce the mobility of hazardous constituents in a hazardous waste or eliminate free liquids as determined by Test Method 9095B (Paint Filter Liquids Test) in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, EPA Publication SW-846, as incorporated by reference in 40 CFR 260.11. A waste stabilization process includes mixing the hazardous waste with binders or other materials, and curing the resulting hazardous waste and binder mixture. Other synonymous terms used to refer to this process are "waste fixation" or "waste solidification." This does not include the adding of absorbent materials to the surface of a waste, without mixing, agitation, or subsequent curing, to absorb free liquid (Per 40 CFR 265.1081).

**Storage** – Long term containment of water.

**Stormwater System or Separate Storm Sewer System** – A conveyance or system of conveyances (including roads with drainage systems and municipal streets) that is designed or used for collecting or conveying stormwater for discharge to waters of the United States.

**Surface Water** – Water that is open to the atmosphere and subject to surface runoff, such as rivers and lakes.

**Suspended Pesticide** – A pesticide for which the registration (i.e., license) has been suspended for one of the following reasons:

- If a registrant does not take appropriate steps to address an Agency-imposed requirement for the generation and submission of data that are necessary to support continued registration of a pesticide product or does not submit timely and acceptable data in response to such requirement
- If necessary to prevent an imminent hazard during the time required for cancellation or change of classification proceedings

For more information, see 7 U.S.C. 136d Section 6(c) and EPA's Web page on suspended pesticides at: http://www.epa.gov/opp00001/regulating/registering/.

**Temporary Storage** – Short-term containment of water in a storage area or container specifically designed to hold water (e.g., holding ponds and holding tanks).

**Transuranic Waste** – Waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, with half-lives greater than twenty years, per gram of waste, except for: (1) High-level radioactive wastes; (2) wastes that the Department of Energy has determined, with the concurrence of the EPA Administrator, do not need the degree of isolation required by this part; or (3) wastes that the Nuclear Regulatory Commission (NRC) has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61 (Per 40 CFR 191.02(i)). Transuranic elements are artificially made radioactive elements, such as neptunium, plutonium, americium, and others that have atomic numbers higher than uranium in the periodic table of elements. Transuranic waste is primarily produced from recycling spent nuclear fuel or using plutonium to fabricate nuclear weapons.

**Treatment** – The removal of contaminants from water or wastewater. Treatment is not the same as "decontamination." (See separate definition for this term.)

**Underground Source of Drinking Water** – An aquifer or its portion: (a)(1) Which supplies any public water system; or (2) Which contains a sufficient quantity of ground water to supply a public water system; and (i) Currently supplies drinking water for human consumption; or (ii) Contains fewer than 10,000 mg/l total dissolved solids; and (b) Which is not an exempted aquifer.

**Volume Reduction** – A process used to decrease the quantity or amount of space the contaminated water occupies.

**Wastewater System** – A utility, its components, personnel, and assets that are involved in the handling, collecting, and treating of wastewater.

**Wastewater Treatment Plant** – A treatment system that may consist of physical, biological, chemical, and mechanical processes for the purpose of removing and/or reducing contaminants in the wastewater. Generic term that includes publicly owned treatment works (POTW), federally owned treatment works (FOTW), centralized waste treatment (CWT) facilities, and other wastewater treatment plants.

**Water Contaminant** – Any physical, chemical, biological, or radiological substance or matter in water (Per section 1401(6) of the Safe Drinking Water Act (SDWA) and 40 CFR 141.2). For the purposes of this guide, this definition will be used for drinking water and wastewater.

**Water Profile** – The characteristics of the water including but not limited to contaminant levels, temperature, pH, and turbidity.

**Water System** – The water supply source, treatment plant infrastructure and processes, and the water distribution system.

**Within the Drinking Water Distribution System** – Water located within the pipe, pumps, control valves, and storage facilities of the distribution system which are designed to provide water for human consumption to homes, businesses, hospitals, government facilities, etc. This does not include water at the end point of the system (e.g., the home, business, etc.).

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# 1.0 Introduction

In the event that a drinking water, wastewater, or stormwater system is contaminated with a chemical, biological (including toxins), or radiological (CBR) contaminant, the system may need to contain, treat, and/or dispose of large volumes of water as a part of the decontamination efforts to return to service. This guide is intended for events involving emergency response activities at water utilities. In these types of events, an Incident Command System (ICS) may be established to manage the response, including decontamination activities.[1] This guide provides a summary of key information that may be useful in addressing containment, treatment, and disposal of water contaminated with a CBR agent within any part of a drinking water, wastewater, and/or stormwater system resulting from an "all hazards" contamination event.[2,3]

## Who May Find this Guide Useful?

The information and recommendations in this guide were developed primarily for drinking water, wastewater, and stormwater utility personnel involved in response activities. Decision makers involved with emergency response planning, such as emergency management agencies, environmental agencies, public health agencies, law enforcement, as well as other federal, state, local, and tribal agencies, may also find the information and recommendations in this guide useful as a reference source.

### Potential Locations of Large Amounts of Contaminated Water at the Utility

#### Drinking Water System

- Raw water pipe (intake to treatment plant)
- Drinking water treatment plant
- Transmission mains
- Service reservoir
- Drinking water distribution network
- Pump stations
- Storage tanks

#### Wastewater System

- Collection system
- Wastewater treatment plant
- Effluent pipes
- Lift stations
- Treatment lagoons

#### Stormwater System

- Catch basins
- Collection system
- Force mains

## What is the Scope of this Guide?

This guide provides the following for water within drinking water, wastewater, and/or stormwater systems:

- An overview of the issues associated with containment, treatment, and disposal of water contaminated with CBR agents after a decision to contain the water has been made, including:
  - Potential types of containment
  - Potential treatment methods
  - Potential disposal options and associated considerations
  - Information on some of the key relevant statutes and regulations that may be applicable for containment and disposal
- Recommended decision-making frameworks for containment, treatment, and disposal of water contaminated with CBR agents

This guide is *not* intended to provide recommendations on:

- Initial response activities immediately following a confirmed contamination incident[4]
- Source water, such as ground water or surface water that has not entered the drinking water, wastewater, or stormwater system

1 For more information on the ICS and how ICS applies to water facilities, see http://water.epa.gov/infrastructure/watersecurity/emerplan/index.cfm#pp5.

2 Potential treatment options are included in this guide because disposal options may be affected by the type of treatment employed.

3 For more information on how the U.S. manages an all-hazards response, see http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf.

4 Please note that water should not be released without regard to statutory and regulatory requirements.

- Development of clearance goals
- Decontamination of system infrastructure
- Decontamination of household infrastructure/equipment (e.g., hot water heaters, etc.)
- Disposal of solids including treatment residuals[5]
- Disposal of source water or water residing at consumer locations
- Roles and responsibilities during decontamination and/or treatment activities and disposal
- Details of coordination activities among involved parties
- Wash water generated from decontamination activities that has not been discharged to a wastewater or stormwater system[6]

If the contamination event requires a criminal investigation, additional actions that are outside of the scope of this guide may be required to preserve and collect evidence. In this case, the responding agencies should coordinate evidence preservation/collection and treatment/disposal activities with applicable agencies, such as local law enforcement, U.S. Environmental Protection Agency (EPA) Criminal Investigation Division (CID), or the Federal Bureau of Investigation (FBI).

## How Should this Guide be Used?

This guide is intended to be used as a preparedness tool and as a reference during emergency response-related containment, treatment, and disposal activities for large amounts of water. Information and recommendations presented in this guide are subject to change, and users are encouraged to consult current versions of the laws, regulations, resources, and references presented. In addition to the methods, statutes, regulations, and issues discussed in this guide, it may be appropriate to consider other factors such as system size, available assets, and state and local regulations pertaining to the treatment, storage, and disposal of large amounts of contaminated water.

This guide does not supersede any federal or state statutes or regulations. Please consult state authorities for guidance on additional requirements, as states may have laws or regulations that are more stringent than federal laws and regulations.

### How is this Guide Organized?

**This guide is organized in the following sections:**

1.0 Introduction

2.0 Containment, Treatment, and Disposal as Part of Response and Recovery

3.0 Containment and Treatment of Water

4.0 Disposal of Water

5.0 Storage and Transportation

Appendix A: Risk Communication

Appendix B: Potential Treatment Methods

Appendix C: Sample Disposal Checklist

Appendix D: Resources

Appendix E: Summary of Potentially Applicable Laws and Regulations

Appendix F: References

## Which Contaminants Are Included in this Guide?

Chemical, biological, toxin, and radiological contaminants of concern to the Water Sector are included in this guide. Contaminant-specific information is identified through color-coding and the use of contaminant-specific icons. **Table 1-1** presents the contaminant classes covered in each section of the guide.

5 This document is not meant to provide guidance for the disposal of solids. However, under RCRA, solid waste includes solid, liquid, semisolid, or contained gaseous material. Liquids considered solid waste by RCRA are included in this guide. Please refer to the glossary for the definitions of both solid and solid waste. For information and resources on disposal of solids, refer to Appendix D, Table D-5.

6 While this document is not intended to provide recommendations for the disposal of wash water, some of the information in this guide may be applicable to wash water.

### Table 1-1: Classes of Contaminants Addressed in Guide

| Treatment Method | Method Description | Representative Contaminants | |
|---|---|---|---|
|  CHEM | Chemical Warfare Agents | • BZ<br>• Cyclosarin<br>• Lewisite<br>• Sarin | • Sulfur Mustard<br>• Tabun<br>• VX |
| | Heavy Metals | • Arsenic<br>• Cadmium<br>• Chromium<br>• Copper | • Mercury<br>• Nickel<br>• Thallium |
| | Hydrophobics | • Chlordane<br>• Chlorinated solvent mixtures<br>• Coal Tars<br>• Diesel<br>• Gasoline | • Heating oil<br>• Industrial dyes and solvents<br>• Petroleum products (including oil and petroleum)<br>• PCBs |
| | Pesticides | • Aldicarb<br>• Carbofuran<br>• Dichlorvos<br>• Dicrotophos | • Fenamiphos<br>• Mevinphos<br>• Phorate |
|  BIO | Bacteria | • *Bacillus anthracis*<br>• *Brucella spp.*<br>• *Burkholderia spp.*<br>• *Clostridium perfringens*<br>• *Coxiella burnetii*<br>• *Escherichia coli* O157:H7 | • *Francisella tularensis*<br>• *Salmonella Typhi*<br>• *Shigella dysenteriae*<br>• *Vibrio cholerae*<br>• *Yersinia pestis* |
| | Viruses | • Caliciviruses<br>• Hepatitis A virus | • Rotavirus<br>• Variola major virus (Smallpox) |
| | Protozoa | • *Cryptosporidium spp.*<br>• *Giardia* spp. | • *Toxoplasma gondii* |
|  TOXIN | Plant Toxins | • Digoxin | • Ricin |
| | Bacterial Toxins | • Anatoxin A<br>• Botulinum | • Staphylococcal enterotoxin B (SEB) |
| | Algal Toxins | • Brevetoxin<br>• Microcystins | • Saxitoxin |
| | Fungal Toxins | • Aflatoxin | • T2 mycotoxin |
|  RAD | Alpha | • Americium-241 | |
| | Beta† | • Cesium-137<br>• Cobalt-60 | • Iridium-192<br>• Strontium-90 |
| | Gamma‡ | • Americium-241<br>• Cesium-137 | • Cobalt-60<br>• Iridium-192 |

* High-level radioactive waste (HLRW) is not covered in this document.

† Of the four radioisotopes shown here, only Strontium-90 is predominantly a beta emitter; Cesium-137, Cobalt-60, and Iridium-192 are predominantly gamma emitters.

‡ Americium-241 is predominantly an alpha emitter.

**Figure 1-1** presents a high-level overview of the recommended process for containment, treatment, and disposal of water contaminated with CBR contaminants for drinking water, wastewater, and stormwater systems. Flowcharts in Section 3.0 and Section 4.0 incorporate more detail on containment/treatment and disposal, respectively. The recommended processes for containment/treatment and disposal for drinking water systems and wastewater/stormwater systems differ, and, therefore, separate flowcharts are provided.

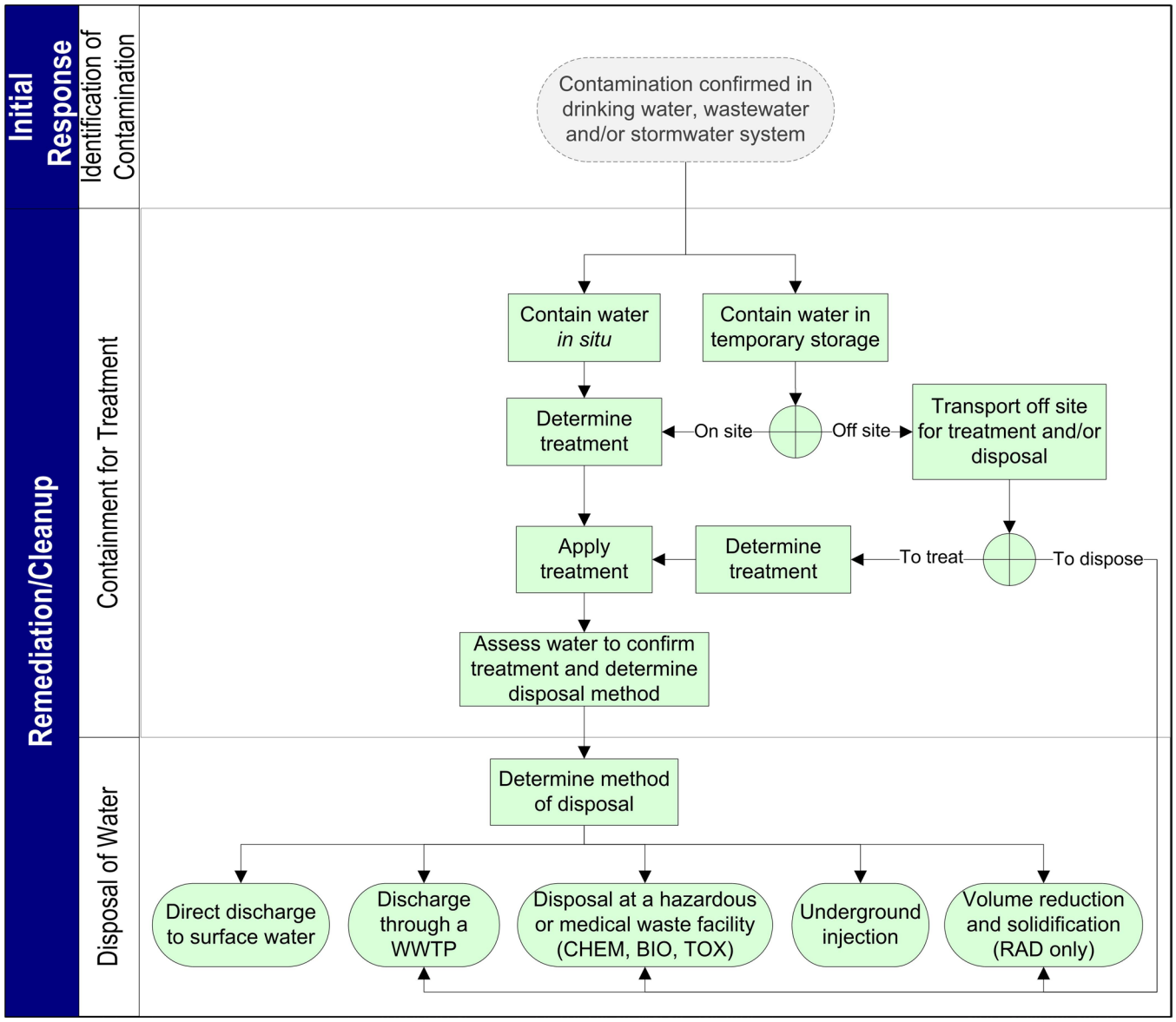


**Figure 1-1: Overview of Potential Options for Containment, Treatment, and Disposal of Large Amounts of Water from Drinking Water, Wastewater, and/or Stormwater Systems**

# 2.0 Containment, Treatment, and Disposal as Part of Response and Recovery

Containment, treatment, and disposal of large amounts of water associated with decontamination activities may be critical to response and recovery after a contamination event at a water utility. This section provides information that may be taken into consideration, including actions taken prior to containment, additional response and recovery guidance, statutes and regulations, and potential partners in disposal operations.

## 2.1 Actions Prior to Containment

Response actions taken prior to containment may include confirmation of contamination and identification of contaminant type.[7] Response and recovery actions that support containment, treatment, and disposal planning may include:

- **Characterization of the CBR contaminant and utility system** – After initial identification, further characterization of the chemical, biological, and radiological (CBR) agent may provide critical information regarding contaminant concentrations and any potential health risks. Characterization of the affected utility may provide critical information concerning the location and status of the contaminant in the system (e.g., whether the agent is stable or prone to hydrolysis or natural attenuation).
- **Determination of clearance goals** – Prior to containment, treatment, and/or disposal, clearance goals may be established on a site-specific and incident-specific basis by the Incident Command (IC) in accordance with applicable statutory and regulatory requirements. Clearance goals may also specify measurable criteria, in accordance with any applicable laws and regulations, for determining the success of treatment.
- **Development of the Remediation Action Plan** – The drinking water, wastewater, and/or stormwater system may develop a site-specific and incident-specific Remediation Action Plan that describes actions to remove, reduce, or eliminate contaminates in or on a site. It includes a treatment and decontamination strategy in accordance with any applicable laws and regulations. This plan may consider the capabilities and limitations of the system, the circumstances of the contamination incident, volume and location of contaminated water, and any applicable statutory and regulatory requirements.

## 2.2 EPA Water Sector Response and Recovery Guidance

The following documents provide additional information regarding response and recovery and may be used in conjunction with this guide:

- **Water Security Initiative: Interim Guidance on Developing Consequence Management Plans for Drinking Water Utilities, October 2008 (WSi CMP)[8]** – Assists drinking water utilities with the development of plans to guide the utility and partner agencies through the processes of validating, responding to, and recovering from a contamination incident in the distribution system. While the WSi CMP recommends proper disposal of wastewater, it does not provide specific guidance on the disposal of large amounts of water. However, it provides in-depth information concerning actions taken prior to containment, including characterization and development of a Remediation Action Plan, as described in Section 2.1 above.

7 Please note that the water also may be contained during the initial response.

8 See EPA 817-R-08-001, http://water.epa.gov/infrastructure/watersecurity/upload/2008_10_24_watersecurity_guide_interim_cmp_wsi.pdf.

- **Response Protocol Toolbox: Planning for and Responding to Drinking Water Contamination Threats and Incidents, Interim Final, April 2004 (RPTB – Module 6)**[9] – Describes response and recovery activities following a confirmed contamination incident; however, it provides only limited information on disposal options for water. A similar toolbox is currently under development for wastewater but is not yet available to the public.

## 2.3 Statutes and Regulations

This section identifies statutory and regulatory requirements that may apply to planning and decision making for containment, treatment and disposal of large amounts of water contaminated with CBR contaminants. **Table 2-1** lists these statutes and regulations by contaminant category. Summaries are available in Appendix E. The applicability of these statutes and regulations should be evaluated on a case-by-case and incident-specific basis.

States may have EPA-approved programs for implementing certain requirements in the Resource Conservation and Recovery Act (RCRA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), or other federal environmental statutes. States may also have additional, more stringent statutes or regulations as part of these programs. Please consult state authorities for guidance on additional requirements.

### Clean Water Act Sections 301(f) and 311(b)

While a number of statutes and regulations may apply, two sections of CWA are particularly relevant to the contaminants included in this guide.

Section 301(f): "Not withstanding any other provisions of [the Clean Water] Act it shall be unlawful to discharge any radiological, chemical, or biological warfare agent, any high-level radioactive waste, or any medical waste, into the navigable waters."

Section 311(b): "The Congress hereby declares that it is the policy of the United States that there should be no discharges of oil or hazardous substances into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone, or in connection with activities under the Outer Continental Shelf Lands Act or the Deepwater Port Act of 1974, or which may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States (including resources under the Magnuson Stevens Fishery Conservation and Management Act of 1976)."

9 See EPA 817-D-03-006, http://water.epa.gov/infrastructure/watersecurity/upload/2004_05_19_watersecurity_guide_response_module6.pdf.

**Table 2-1: Potentially Applicable Federal Statutes and Regulations for Containment, Treatment, and Disposal**

| | Clean Water Act (CWA)* | Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)† | Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)‡ | Hazardous Materials Regulations (HMR)¶ | Oil Pollution Act (OPA)§ | Resource Conservation and Recovery Act (RCRA)** | Safe Drinking Water Act (SDWA)†† | Toxic Substance Control Act (TSCA)‡‡ | The Atomic Energy Act of 1954 (AEA), as Amended¶¶ | Low Level Radioactive Waste Policy Act§§ |
|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | • | • | | • | • | • | • | • | | |
| **Biological** | • | • | • | • | | | • | | | |
| **Toxin** | • | • | | • | | • | • | | | |
| **Radiological** | • | • | | • | | | • | • | • | • |

* 33 USC 1251 et seq.

† 42 USC 9601 et seq. CERCLA may apply in incidents involving federal response or requiring federal assistance. This guide does not include all exemptions that may apply during incidents requiring federal assistance or federal response. See http://www.epa.gov/lawsregs/laws/cercla.html for more information.

‡ 7 USC 136 et seq.

¶ 49 CFR Parts 100–185.

§ 33 USC 40 2701–2720; applicable when dealing with a discharge of oil (may also apply for discharge of a mixture of oil and Clean Water Act section 311 hazardous substances).

** 42 USC 6901 et seq.

†† 42 USC 300f et seq.

‡‡ 15 USC 2601 et seq.

¶¶ 42 USC 2011 et seq.

§§ 42 USC 2021b et seq.

## 2.4 Potential Partners

The following entities may be involved in containment, treatment, and disposal operations, depending on site-specific and incident-specific characteristics of the contamination event:

- Drinking water utility
- Stormwater utility
- Wastewater utility
- Neighboring utilities (drinking water and/or wastewater)
- Local health department
- Local law enforcement

- Local government
- Local emergency planning committees and emergency management agencies
- Local fire, emergency medical service (EMS), and hazardous materials (HAZMAT) responders
- State government
- State environmental and/or public health laboratories
- State environment or health department
- State emergency responders
- State emergency management and homeland security agencies
- State law enforcement
- State drinking water and wastewater primacy agencies
- Mutual aid and assistance partners
- Media
- Centers for Disease Control and Prevention (CDC)
- EPA regional offices and/or laboratories
- EPA Criminal Investigation Division (CID)
- Joint Terrorism Task Force (JTTF)
- Federal Bureau of Investigation (FBI)
- National Guard
- National Response Center
- Nuclear Regulatory Commission (NRC)
- U.S. Army Corps of Engineers (USACE)
- U.S. Department of Homeland Security, including Federal Emergency Management Agency (FEMA) and U.S. Coast Guard (USCG)

# 3.0 Containment and Treatment of Water

Contaminated water generally should be contained and treated either *in situ* or using temporary storage consistent with applicable regulatory requirements. **Figure 3-1** and **Figure 3-2** illustrate a recommended decision-making process for choosing whether to contain *in situ* or in temporary storage for drinking water systems and wastewater/stormwater systems, respectively. Numbers in the flowcharts indicate sections in this guide where the specific topics are discussed in more detail.

A number of factors should be considered when evaluating containment and treatment methods, including:

- Risk to public health and the environment
- Worker health and safety
- Contaminant properties
  - Potential adherence to infrastructure and subsequent contamination of additional water
  - Formation of, or interaction with, biofilms
  - Potential formation of secondary contaminants through hydrolysis or other mechanisms
  - Aerosolization and/or vaporization potential
- Any isolation of water that may be needed during confirmation of contamination

## 3.1 Containment of Water *In Situ*

Depending on the location of the contaminated water, containment and treatment *in situ* may be an option. A hydraulic map of the water system may assist in identifying potential locations of contamination. Water may be able to be contained:

- **Before the Drinking Water Distribution System** – Contaminated water that has not yet entered the drinking water distribution system (e.g., it is in storage tanks at the drinking water treatment facility)
- **Within the Drinking Water Distribution System** – Contaminated water that has entered the distribution system may be contained within the system by turning off valves and pumps and advising customer(s) to keep faucets closed[10]
- **Within the Wastewater or Stormwater System** – Contaminated water that is contained in the wastewater system (e.g., in overflow tanks, sanitary sewer pipes) or stormwater system (e.g., in stormwater collection pipes)

10 When making the decision to contain contaminated water within a distribution system, it is important to consider any potential exposure risks to people served by the closed off portion of the system.

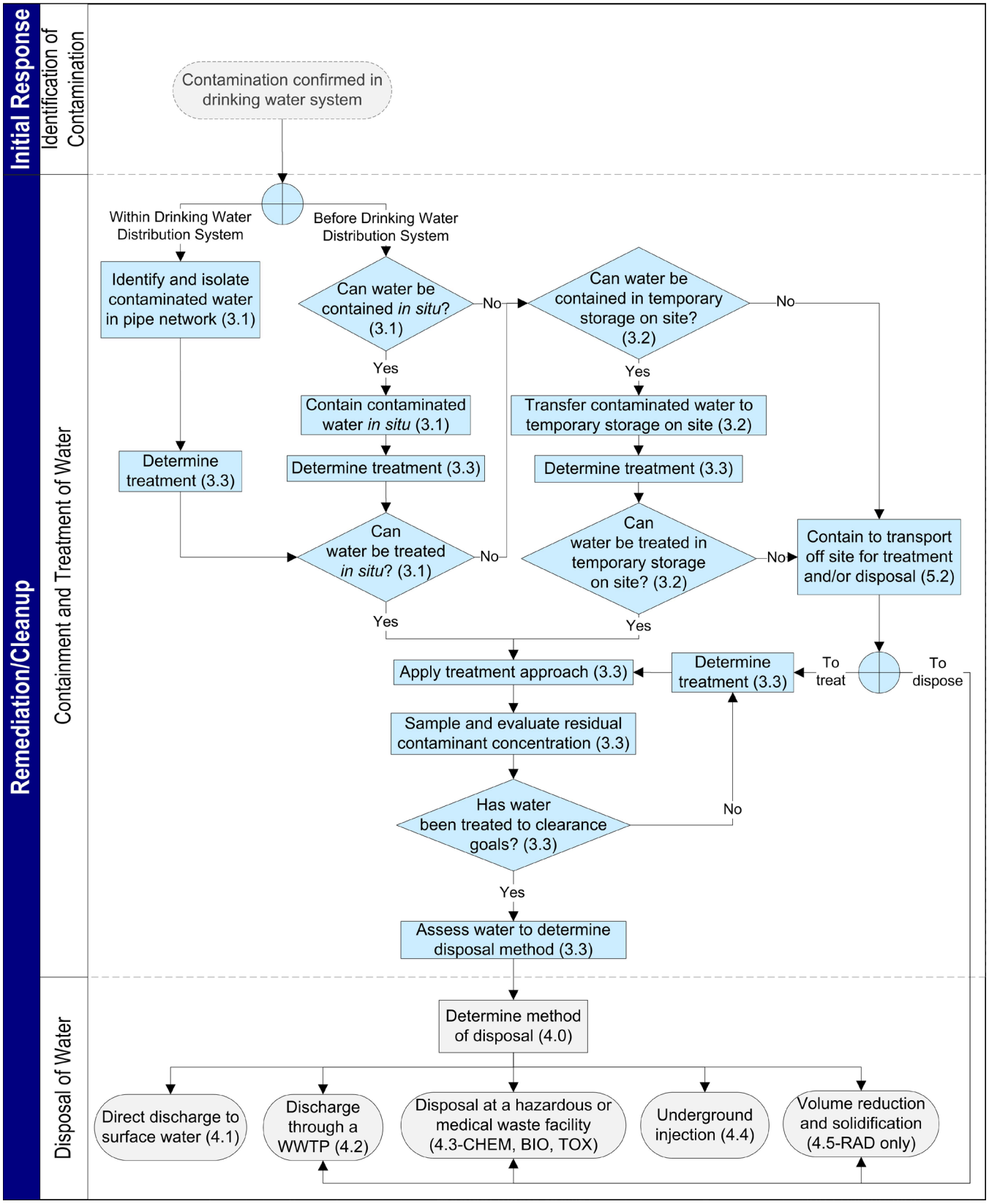


**Figure 3-1: Recommended Decision-Making Framework for Containment and Treatment of Contaminated Water for Drinking Water Systems**

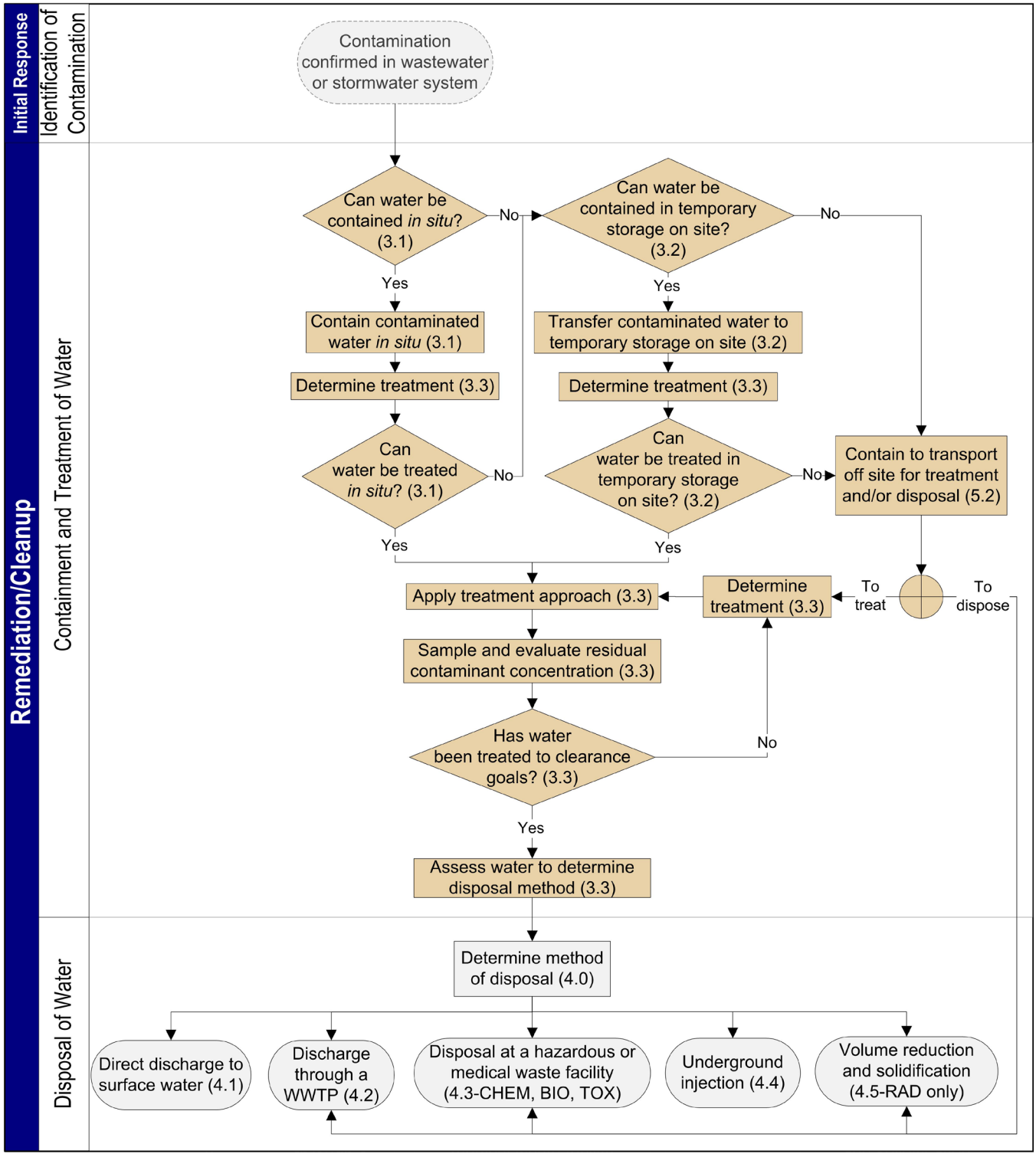


**Figure 3-2: Recommended Decision-Making Framework for Containment and Treatment of Contaminated Water for Wastewater and Stormwater Systems**[11]

11 If it is decided that treatment will occur off site, it may be disposed of at a WWTP. However, prior to considering disposal through a WWTP as an option, utilities should check with the proposed receiving WWTP to ensure that contaminated water can be safely treated and/or discharged according to the terms contained within the facility's discharge permit issued by EPA or an authorized state or tribe. WWTPs are not allowed to discharge contaminates above the thresholds established within their NPDES permits.

**Table 3-1** provides potential additional considerations for evaluating each of these containment options.

**Table 3-1: Potential Additional Considerations Related to Containment *In Situ***

| Storage Location | Additional Considerations |
|---|---|
| **Before the Drinking Water Distribution System** | • Feasibility of containing water and preventing it from entering the distribution system<br>• Health and safety of drinking water system personnel (e.g., will containment result in further exposure of workers to contaminants?) |
| **Within the Drinking Water Distribution System** | • Feasibility of containing water within the system (e.g., construction, age, and design life of infrastructure as well as the ability to shut off valves and the timeline for these activities)<br>• Water within the drinking water distribution system posing a risk to those serviced by the closed-off portion of the system<br>• Notifying the public when contaminated water is contained within the distribution system (see Appendix A for more information on risk communication and public notification)<br>• Leaks, poorly sealed connections, corrosion, old breaks, etc., that may also allow release of vapors and water<br>• Contaminated water exacerbating corrosion of connections, pumps, etc. |
| **Within the Wastewater or Stormwater System** | • Feasibility of containing water within the system; factors that may affect the ability to contain *in situ*, such as system capacity, intake flow rates, design life of infrastructure, and availability of shutoff valves<br>• Leaks, poorly sealed connections, corrosion, old breaks, etc., that may also allow release of vapors and water<br>• Contaminated water exacerbating corrosion of connections, pumps, etc.<br>• Health and safety of wastewater and/or stormwater system personnel (e.g., will containment result in further exposure of workers to contaminants?)<br>• Notifying the public when contaminated water is contained within the system and preventing sewage backups in homes (see Appendix A for more information on risk communication and public notification)<br>• Leaks within the system (e.g., collection and conveyance) that, depending on the severity, may require action (e.g., deploying HAZMAT teams) by the appropriate authority (e.g., fire department, health department) once they are identified |

## 3.2 Containment of Water in Temporary Storage

Temporary storage may be appropriate for containment of the contaminated water under a number of circumstances including, but not limited to:

- Containment *in situ* is not feasible (e.g., stormwater or combined[12] systems may not have the infrastructure or capacity to contain *in situ* or may result in leakage to ground water)
- Treatment *in situ* is not feasible
- Contaminant(s) may adhere to the walls of pipes or other system infrastructure and re-contaminate water later conveyed through the system

12 See NPDES CSO 9 Minimum Control Plan at http://cfpub.epa.gov/npdes/cso/ninecontrols.cfm?program_id=5 for more information.

Potential considerations for all contaminant types when determining the type of temporary storage to use include:

- Quantity of water
- Feasibility of treatment within temporary storage
- Availability of tanks, containers, holding ponds, etc.
- Potential location of temporary storage and transportation requirements
- Structure and integrity of new or existing temporary storage area(s)
- Security of temporary storage location(s)
- Duration of storage
- Applicable regulations on construction of temporary storage area(s)
- Threat posed by temporary storage to the public, environment, and emergency responders
- Public health threat posed while transferring the water to storage

**Potential Types of Temporary Storage**

- 55-gallon drums
- Single tank trucks hold 5,000 to 9,000 gallons
- Multiple truck tankers
- Use of railway tanks to hold in large facilities
- On-site or off-site holding tanks
- Empty water basins

**Table 3-2** provides additional contaminant-specific considerations that should be contemplated when evaluating options for containing water in temporary storage.

**Table 3-2: Additional Contaminant Specific Considerations for Temporary Storage**

| Contaminant Type | Contaminant-Specific Considerations |
|---|---|
|  CHEM | • Applicability of underground storage tank (UST) regulations (40 CFR Part 280)*<br>• Chemical properties of contaminant (e.g., toxicity, reactivity)<br>• Applicability of RCRA regulations† |
|  BIO | • State regulations regarding medical/infectious waste<br>• Labeling containers with appropriate Biosafety Level‡ |
|  TOXIN | • State regulations regarding medical/infectious waste<br>• Applicability of UST regulations (40 CFR Part 280)<br>• Chemical properties of contaminant (e.g., toxicity, reactivity)<br>• Labeling containers with appropriate Biosafety Level<br>• Applicability of RCRA regulations |
|  RAD | • Nuclear Regulatory Commission (NRC) licenses (e.g., unless the NRC license requirement is waived, one should apply for a license once the type of temporary storage has been chosen)<br>• Other NRC requirements<br>• RCRA requirements, if any, applicable to mixed waste |

* See http://www.epa.gov/swerust1/fedlaws/cfr.htm for an overview of regulations pertaining to underground storage tanks.

† If temporary storage of a RCRA hazardous waste exceeds 90 days, RCRA regulations for treatment, storage and disposal facilities may apply.

‡ See www.cdc.gov/od/ohs/biosfty/biosfty.htm for information on biosafety and the 5th edition of Biosafety in Microbiological and Biomedical Laboratories, http://www.cdc.gov/biosafety/publications/bmbl5/index.htm, for specific BSL definitions.

¶ Contact the NRC or Agreement State for more information on NRC requirements. Also see http://www.nrc.gov/.

## 3.3 Treatment of Water

The following should be considered when determining which treatment methods to use:

- **Clearance goals** – Water should be treated until it meets the clearance goals in accordance with any applicable laws and regulations. Sampling and analysis should be used to verify if the clearance goals have been met.
- **Quality and characteristics of the water** – Characteristics such as water alkalinity, hardness, and turbidity may influence the efficacy of treatment and the ability to accurately analyze water samples.
- **CBR contaminant** – Characteristics of the contaminant, such as solubility and specific gravity, concentration of the contaminant, potential for aerosolization, possible toxicologically significant hydrolysis products (see Appendix B, Table B-2), and treatment byproducts and residuals (Table B-3) may dictate which treatment methods will successfully remove or inactivate the contaminant.
- **Location of water** – Whether the water is located within a water distribution system, wastewater conveyance system, or other location can limit treatment options.
- **System capabilities and limitations** – The capabilities of the affected system may limit the system's options for treatment.
- **Health and safety considerations**[13] – During the treatment process, contaminants may become concentrated. Safety precautions may include appropriate safety placards and labeling, use of personal protective equipment (PPE), and limiting periods of exposure. Extra safety precautions should be taken with residuals which may have high levels of radioactivity.[14]
- **FIFRA regulations** – Chemicals, such as chlorine, chlorine dioxide, and chloramines, used to treat water contaminated with biological contaminants, are typically regulated as pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), in which case they may be used only in accordance with their label or labeling.[15] A FIFRA exemption should be requested and obtained for off-label use of a registered pesticide or use of an unregistered pesticide.
- **Federal, state, and local laws and regulations** – Applicable laws and regulations regarding treatment and other actions may affect the available range of treatment options.

**Tables 3-3, 3-4, 3-5**, and **3-6** indicate candidate treatment methods for specific contaminants in each contaminant class (see Appendix B for method descriptions and considerations, including the formation of toxic treatment byproducts).[16] These tables summarize data available in EPA's online Water Contaminant Information Tool (WCIT).[17] Users are encouraged to consult WCIT directly as needed since this tool is updated periodically as new information becomes available. Tables 3-3 through 3-6 reflect current WCIT data and should not be viewed as an exhaustive or critical review of the state of the science for treatment technologies listed.

13 See http://www.osha.gov/index.html.

14 See http://www.epa.gov/safewater/radionuclides/pdfs/webcast/presentations/worker_safety_loren_setlow.pdf.

15 See http://www.epa.gov/pesticides/regulating/laws.htm#fifra.

16 Tables 3.4, 3.5, and 3.6 do not address treatment residuals.

17 See http://www.epa.gov/wcit/ for more information and updates on treatment methods. Registration is required.

**Table 3-3: Potential Treatment Methods for Water Contaminated with Chemicals**

| | CHEM | Activated alumina | Booms | Chlorination | Coagulants | Filtration | Hydrogen peroxide | Ion Exchange | Lime softening | Oil-water separators | Ozone | Reverse osmosis | Skimmers | Sorbents* | UV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical Warfare Agents | BZ | | | • | | | | | | | | | | | |
| | Cyclosarin | | | • | | | | | | | | | | | |
| | Lewisite | | | • | | | | | | | | | | | |
| | Sarin | | | | | | | | | | | • | | • | |
| | Sulfur mustard | | | • | | | | | | | | | | | |
| | Tabun | | | | | | | | | | | | | | • |
| | VX | | | | | | | | | | | • | | • | |
| Heavy Metals | Arsenic | • | | | • | • | | | • | | | | | | |
| | Cadmium | | | | • | • | | • | • | | | • | | | |
| | Chromium | | | | • | • | | • | • | | | • | | | |
| | Copper | | | | • | • | | | • | | | • | | | |
| | Mercury | | | | • | • | | | • | | | | | • | |
| | Nickel | | | | | | | • | • | | | • | | | |
| | Thallium | • | | | | | | • | | | | | | | |
| Hydrophobic contaminants | Chlorinated solvent mixtures | | | | • | • | | | | • | | | | • | |
| | Chlordane | | | | | | | | | | | | | • | |
| | Coal tars | | | | • | • | | | | • | | | | • | |
| | Diesel fuel | | • | | • | • | | | | • | | | • | • | |
| | Gasoline | | • | | • | • | | | | • | | | • | • | |
| | Heating oil | | • | | • | • | | | | • | | | • | • | |
| | Industrial dyes and solvents | | | | | | | | | | | | | • | |
| | Petroleum products (e.g., oil and petroleum) | | • | | | • | | | | • | | | • | • | |
| | PCBs | | | | | • | | | • | | | | | • | |
| Pesticides | Aldicarb | | | • | | | | | | | • | | | • | • |
| | Carbofuran | | | | | | | | | | • | • | | • | • |
| | Dichlorvos | | | | | | • | | | | • | • | | • | • |
| | Dicrotophos | | | | | | | | | | | • | | | • |
| | Fenamiphos | | | | | | | | | | | • | | | • |
| | Mevinphos | | | | | | | | | | • | • | | • | • |
| | Phorate | | | | • | | | | | | • | | | | • |

* The term “sorbents” includes granular activated carbon and powdered activated carbon.

**Table 3-4: Potential Treatment Methods for Water Contaminated with Biologicals**

| | BIO | Chloramination | Chlorination | Chlorine dioxide | Filtration | Ozone | Reverse osmosis | UV |
|---|---|---|---|---|---|---|---|---|
| Bacteria | *Bacillus anthracis* | | • | | | | | |
| | *Brucella* spp. | | • | | | | | |
| | *Burkholderia* spp. | | • | | | | | • |
| | *Clostridium perfringens* | | • | • | • | | • | • |
| | *Coxiella burnetii* | | • | | | | | |
| | *Escherichia coli* O157:H7 | | • | • | • | • | | • |
| | *Francisella tularensis* | | • | | | | | |
| | *Salmonella* Typhi | | • | | | | | • |
| | *Shigella dysenteriae* | | • | | | • | | • |
| | *Vibrio cholerae* | | • | | | • | | |
| | *Yersinia pestis* | | • | | | | | |
| Viruses | Caliciviruses | | • | | | • | | • |
| | Hepatitis A virus | • | • | • | • | | | • |
| | Rotavirus | | • | | • | • | | • |
| | Variola major virus (Smallpox) | | | | | | • | |
| Protozoa | *Cryptosporidium* spp. | | • | | • | • | • | • |
| | *Giardia* spp. | | • | | • | | • | • |
| | *Toxoplasma gondii* | | • | | | | | • |

### Table 3-5: Recommended Treatment Methods for Biotoxin Contaminated Water

| | TOXIN | Chlorination | Coagulants | Filtration | Hydrogen peroxide | Ozone | Reverse osmosis | Sorbents |
|---|---|---|---|---|---|---|---|---|
| Plant Toxins | Digoxin | | | | | | | • |
| | Ricin | • | | | | | • | |
| Bacterial Toxins | Anatoxin A | | | | | • | • | • |
| | Botulinum | • | | | | • | • | |
| | Staphylococcal Enterotoxin B (SEB) | • | • | | | | • | • |
| Algal Toxins | Brevetoxin | | • | | | | | |
| | Microcystins | • | • | • | | • | • | • |
| | Saxitoxin | • | • | | | | • | • |
| Fungal Toxins | Aflatoxin | • | • | • | • | • | | |
| | T2 Mycotoxin | | | | | | • | |

### Table 3-6: Potential Treatment Methods for Water Contaminated with Radiologicals*

| | RAD | Activated alumina | Activated sludge | Biosorption | Coagulants | Co-precipitation with barium sulfate | Electrodialysis/EDR† | Filtration | Hydrous manganese oxide | Ion Exchange | Lime softening | Magnetic polyamine epichlorhydrin resin | Particle separation and magnetic separation | Precipitation | Reverse osmosis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alpha- and Gamma-Emitter | Americium-241 | | | | • | | | | | | | • | • | | • |
| Beta- and Gamma-Emitter | Cesium-137 | | | | | | • | • | • | • | | | | | • |
| | Cobalt-60 | | • | • | | | | • | • | • | • | | | • | • |
| | Iridium-192 | | | • | • | | | | | | | | | | • |
| Beta-Emitter | Strontium-90 | • | | | | • | • | | | • | • | | | | • |

* See WCIT at http://www.epa.gov/wcit/ for more information and updates on treatment methods. Registration is required. In addition to WCIT, this table includes treatment methods investigated in other EPA preliminary scoping studies on existing methods.

† EDR = Electrodialysis reversal.

The following methods and resources should be consulted in support of laboratory analyses before and after treatment:

- **Water sampling and analysis methods** – EPA's *Sampling Guidance for Unknown Contaminants in Drinking Water*, November 2008 (EPA-817-R-08-003), EPA's *Standardized Analytical Methods for Environmental Restoration Following Homeland Security Events* - 2010 (Revision 6.0, EPA-600-R-10-122), or state-approved methods (EPA-817-R-08-003, EPA-600-R-10-122)[18,19]
- **Laboratory capabilities and capacities** – Environmental Response Laboratory Network (ERLN) and the Water Laboratory Alliance (WLA)[20]
- **Analytical methods for response to contamination with CBR contaminants** – WCIT[21]
- **Test procedure guidelines and methods** – *Guidelines Establishing Test Procedures for the Analysis of Pollutants* (40 CFR Part 136) for certain CWA programs and methods included in the National Primary Drinking Water Regulations (40 CFR Part 141)
- **Certified drinking water laboratories** – Laboratories certified by EPA or the state to analyze drinking water samples for monitoring compliance with drinking water standards. Contact EPA's State Certification Program for a list of certified laboratories.[22]

18 See http://water.epa.gov/infrastructure/watersecurity/wla/upload/2008_12_31_watersecurity_pubs_guide_watersecurity_samplingforunknown.pdf

19 See SAM at http://www.epa.gov/sam/SAM_2012_07162012.pdf; SAM is updated as new information becomes available; users should consult the most current version of this document.

20 See www.epa.gov/compendium/ for ERLN and WLA (registration required).

21 See http://www.epa.gov/wcit/ for more information on analytical methods (registration required).

22 See http://water.epa.gov/scitech/drinkingwater/labcert/ for more information on the Drinking Water Laboratory Certification program.

# 4.0 Disposal of Water

After the contaminated water has been treated, the sampling and analyses have been completed, and the clearance goals for treatment have been met, the water should be assessed to determine suitable disposal options in accordance with applicable laws and regulations. For example, when water contains certain contaminants or exhibits certain characteristics, statutes such as RCRA, CWA, and FIFRA and their implementing regulations may have additional requirements for disposal.

The following potential disposal methods are discussed in Sections 4.1– 4.5:

- Direct discharge to surface water
- Disposal through a wastewater treatment plant (WWTP)
- Transfer to a hazardous or medical/infectious waste facility
- Disposal in an underground injection well
- Volume reduction and solidification (radiological contaminants only)

## RCRA Hazardous Waste Permits and Manifests


Disposal of water that is considered RCRA hazardous waste may require:

- An EPA identification number (EPA Form 8700-12)
- A hazardous waste manifest for transport (EPA Form 8700-22)
- Permits for the disposal facility

EPA RCRA forms can be obtained either online at http://www.epa.gov/osw/hazard/index.htm or by contacting the state waste and/or environmental office. Water utilities sending RCRA hazardous waste off site should ensure that the transporter and disposal facility are in compliance with all RCRA requirements.

WWTPs that treat hazardous wastewater may qualify for a Permit-By-Rule exemption (40 CFR 270.60) whereby the facility's non-RCRA permit serves in place of a RCRA permit, provided that the facility is in compliance with its permit and other RCRA administrative requirements. Waste discharged under a Permit-By-Rule must meet all federal, state, and local pretreatment requirements. For information regarding state-specific RCRA requirements, state agencies should be contacted.

## NRC Disposal Application


In some instances of radiological contamination, an NRC disposal application may be required. If required, an NRC disposal application should be submitted to obtain approval of the disposal method selected (authority provided to NRC under the AEA, as amended). The NRC or Agreement State should be contacted to determine if this approval is required.

The NRC provides a list of provisions in 10 CFR 20.2002 for the approval of a disposal procedure not otherwise authorized by NRC regulations. If a disposal application is required, all the following information needs to be submitted in an NRC application before disposing of the water:

- A description of the waste, including the physical and chemical properties important to risk evaluation, and the proposed manner and conditions of disposal
- An analysis and evaluation of pertinent information on the nature of the environment/location of disposal
- The nature and location of other potentially affected licensed and unlicensed facilities
- Analyses and procedures used to ensure that doses are maintained as low as reasonably achievable (ALARA) and within the dose limits in this part

**Table 4-1** provides a high-level overview of potential characteristics and corresponding disposal requirements which may be helpful when evaluating the above options. The column titled "Potential Disposal Requirements" in particular highlights potential limiting factors to consider.

**Table 4-1: Characteristics of Treated Water and Potential Disposal Requirements**

| Characteristic | Class | Potential Disposal Requirements | Other Potential Considerations To Evaluate |
|---|---|---|---|
| **Contains chemical, biological, or radiological warfare agent** |  CHEM  BIO  TOXIN  RAD | • The Clean Water Act Section 301(f) prohibits the discharge of any radiological, chemical, or biological warfare agent, any high-level radioactive waste, or any medical waste into the navigable waters. | • If the contaminant is a chemical warfare agent, the water also may be considered RCRA hazardous waste.<br>• If the contaminant is a biological warfare agent, the water also may be considered infectious/medical waste.<br>• If the contaminant is a radiological warfare agent, determine whether the contaminant is an alpha, beta, or gamma emitter. |
| **Contains harmful quantities pursuant to the Clean Water Act 311(b) and the sheen rule (40 CFR 110.3) promulgated thereunder. Rule prohibits a discharge that would:**<br>• Cause a sheen or discoloration on the surface of a body of water<br>• Violate applicable water quality standards<br>• Cause a sludge or emulsion to be deposited beneath the surface of the water or on adjoining shorelines |  CHEM | • Oil that violates the sheen rule should not be discharged to navigable waters as outlined in the Clean Water Act Section 311(b) and 40 CFR Part 110. | • For disposal of water contaminated with oil, users should contact the appropriate EPA regional office or the state and local authorities (e.g., departments of environmental protection, fish & wildlife, etc.) for the applicable Area Contingency Plan (ACP). Please refer to Appendix E for more information on the ACP.<br>• EPA reporting exemptions for releases include:<br>– Discharges from properly functioning vessel engines<br>– Research and development releases<br>– National Pollutant Discharge Elimination System (NPDES)-permitted releases<br>– Discharges permitted under International Convention for the Prevention of Pollution from Ships (MARPOL)<br>• See http://www.epa.gov/emergencies/content/reporting/oilexem.htm for more information. |

| Characteristic | Class | Potential Disposal Requirements | Other Potential Considerations To Evaluate |
|---|---|---|---|
| **Contains cancelled or suspended pesticide (7 USC 136d)**<br>See http://www.epa.gov/pesticides/regulating/registering/suspensions.htm for a current list of suspended pesticides and http://www.epa.gov/pesticides/regulating/restricted.htm for more information on cancelled pesticides |  <br>CHEM | • EPA may have issued additional requirements and/or procedures for those who dispose of the pesticide (varies by pesticide).<br>• The EPA regional or headquarters pesticides program office should be contacted to determine if there are additional requirements and/or procedures for the cancelled or suspended pesticide and to determine if those requirements and/or procedures apply to the contaminated water. | • Additional requirements and/or procedures may include:<br>– Labeling and disposal of the pesticide<br>– Labeling and disposal of any container of a pesticide, any rinsate containing the pesticide, or any other material used to contain or collect excess or spilled quantities of the pesticide |
| **Contains PCBs or other TSCA-regulated chemicals**<br>Contact the EPA regional office to determine if the contaminant is regulated under TSCA |  <br>CHEM | • Restrictions will depend on the contaminant. For example, PCB-contaminated waters are subject to specific requirements under 40 CFR Part 761.<br>• States may have additional regulations governing PCB disposal. | • State or local officials should be consulted for additional considerations as they vary by state. |
| **Considered RCRA hazardous waste (40 CFR Part 261)**<br>• The water is considered a RCRA hazardous listed waste* or<br>• The water exhibits hazardous waste characteristics of ignitability, corrosivity, toxicity, or reactivity |  <br>CHEM<br>  <br>TOXIN | • Subject to RCRA hazardous waste requirements for transportation, storage, and disposal including:<br>– An EPA identification number<br>– Hazardous waste manifest<br>– Permits | • If the treated water is considered a RCRA hazardous waste and is shipped to a WWTP for disposal (or another WWTP if the contamination occurred at a wastewater treatment system), the receiving WWTP may be subject to additional RCRA regulations. |
| **Considered medical or infectious waste**<br>State or local officials should be consulted to determine if the water qualifies as medical or infectious waste |  <br>BIO | • CWA Section 301(f) prohibits discharge of medical waste to navigable waters as noted above.<br>• Some states require medical/infectious waste to be disposed of as RCRA hazardous waste while others enforce special medical/infectious waste requirements. | • State or local officials should be consulted for additional considerations as requirements vary by state. |

| Characteristic | Class | Potential Disposal Requirements | Other Potential Considerations To Evaluate |
|---|---|---|---|
| **Considered low-level radioactive waste (LLRW)**<br>Confirm that the water is considered LLRW (i.e., radioactive by coming in contact or co-existing with low levels of radioactive materials or neutron activation) | RAD | • Maximum federal or state regulatory concentrations for direct discharge to surface water and release into sewers may apply. | • An NRC or Agreement State license may be required to handle and dispose of the water.<br>• Consider whether the contaminant is an alpha, beta, or gamma emitter. |
| **Considered low-level mixed waste (LLMW)**<br>• Confirm that the water is considered LLMW (see above)<br>• Confirm the water is a RCRA hazardous waste (see above) | RAD | • Maximum federal or state regulatory concentrations for direct discharge to surface water and release into sewers may apply for radioactivity.<br>• Subject to RCRA hazardous waste regulations for transportation, storage, and disposal unless an exemption is obtained (Appendix E, Table E-2). | • An NRC or Agreement State license may be required to handle and dispose of the water.<br>• Consider whether the contaminant is an alpha, beta, or gamma emitter.<br>• If the treated water is considered a RCRA hazardous waste and is shipped to a WWTP for disposal (or another WWTP if the contamination occurred at a wastewater treatment system), the receiving WWTP may be subject to additional RCRA regulations. |

* See http://www.epa.gov/osw/hazard/wastetypes/listed.htm.

**Figures 4-1** and **4-2** provide a suggested order for evaluating these disposal methods depending on the characteristics of the water and typical availability of the method. One may evaluate any of these methods, as long as the disposal is conducted in accordance with applicable statutory and regulatory requirements. Numbers in the flowcharts indicate sections in this guide where the topic is discussed in more detail.

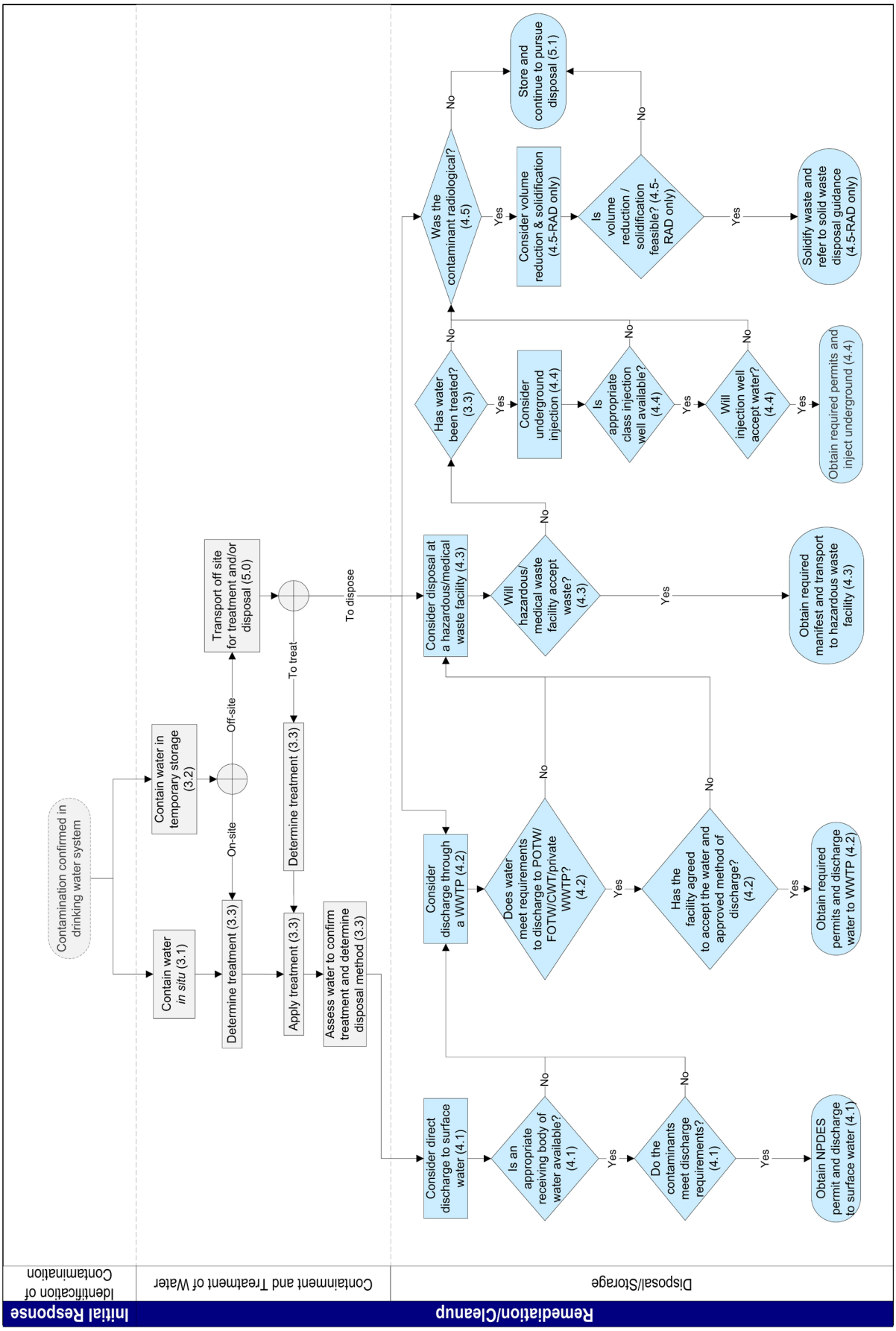


**Figure 4-1: Recommended Decision Tree for Evaluating Disposal of Treated Water for Drinking Water Systems**

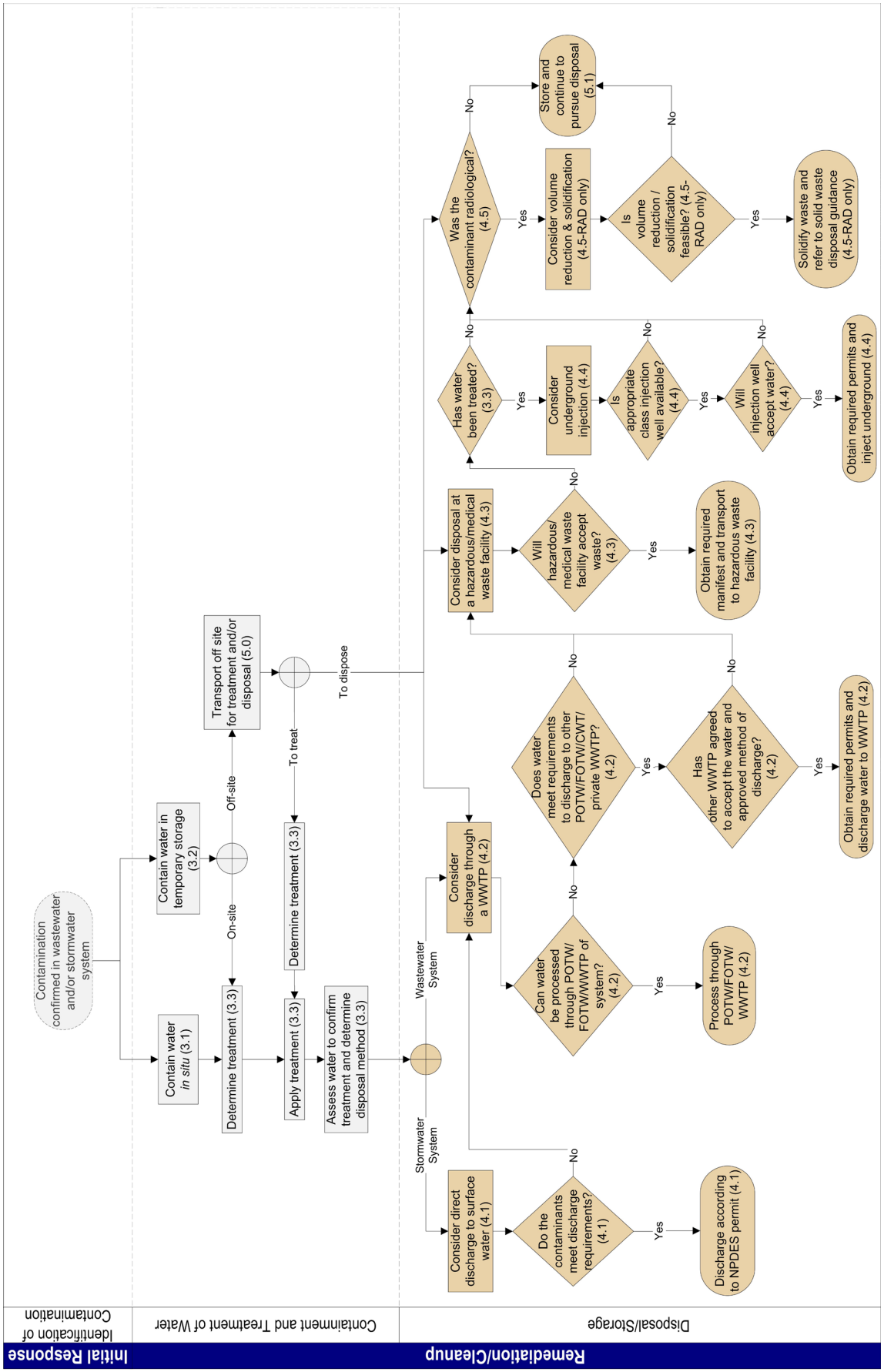


**Figure 4-2: Recommended Decision Tree for Evaluating Disposal of Treated Water for Wastewater and Stormwater Systems**

## 4.1 Direct Discharge of Water to Surface Water

Direct discharge to surface water may be an option for disposing of water from a drinking water system, storm-water system, or water contained and treated in temporary storage. **Table 4-2** summarizes the process of obtaining approval and discharging the water, along with any specific requirements or characteristics of the water that should be considered prior to discharge.

**Table 4-2: Information on Disposal by Direct Discharge to Surface Water (Chemical, Biological, Toxin, and Radiological)**

| Contaminant Type | Contaminant-Specific Considerations | Potential Discharge Specifications/ Requirements |
|---|---|---|
|  CHEM  BIO  TOXIN  RAD | 1. Locate an accessible and appropriate body of water.<br>2. Contact the state environmental office or EPA regional office to apply to obtain or modify an existing NPDES permit. Note that in some circumstances, discharges in compliance with the instructions of an On-Scene Coordinator may not require an NPDES permit. For more information, see 40 CFR 122.3(d).<br>3. Test the water using methods in EPA's SAM or other appropriate methods to confirm that contaminant levels are below the acceptable discharge levels listed on the NPDES permit.<br>4. Discharge to surface water following the specifications listed in the NPDES permit.<br>5. Obtain a license or other approval from the NRC or Agreement State to discharge to the receiving body of water, if applicable. (Radiological only) | • The following characteristics of the discharge should be considered:<br>– Location of discharge<br>– Method of discharge<br>– Time of discharge<br>– Volume of discharge<br>– Flow rate of discharge<br>– Water profile<br>• The Clean Water Act Section 301(f) prohibits the discharge of any chemical, biological or radiological warfare agent, any high-level radioactive waste, or any medical waste into the navigable waters.<br>• Oil that meets the Sheen Rule should not be discharged to navigable waters as per CWA 311(b) and 40 CFR Part 110. (Chemical, Biological, and Toxin Only) |

### NPDES Permits

Discharge to surface water is regulated by the CWA, which prohibits discharge of pollutants to waters of the United States except as in compliance with specified provisions of the Act. To discharge to surface water, an NPDES permit should be obtained from the authorized state or EPA region (40 CFR Part 122 et seq.). An NPDES permit includes the following:

- Technology-based and water quality-based limitations on pollutant discharges to surface water
- Additional provisions such as monitoring and reporting requirements

EPA's national recommended water quality criteria are available at http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm. These criteria are published pursuant to Section 304(a) of the CWA and provide guidance for states and tribes to use in adopting water quality standards.

For more information, please see: http://cfpub.epa.gov/npdes/home.cfm?program_id=45.

## 4.2 Disposal of Water through a Wastewater Treatment Plant (WWTP)

Water from all systems may be disposed through four types of WWTPs depending on a variety of factors including, but not limited to, the availability of the facility and characteristics of the water. These four types of WWTPs are the following:

- Publicly owned treatment works (POTW)
- Federally owned treatment works (FOTW)
- Centralized waste treatment facility (CWT) (chemical contaminants only)
- Privately owned WWTPs

If the water from the incident was contained within the wastewater system, disposal may be appropriate through the WWTP of the system consistent with the NPDES permit requirements and any applicable permit. It should be determined if the water can be processed through the WWTP of the system without causing an untreated pass-through or interference or violating any applicable pretreatment requirements, or if the water should be transported to another WWTP.

Different types of WWTPs may have different requirements for accepting water.[23] **Table 4-3** lists requirements that may apply and other potential considerations pertaining to the type of WWTP. **Table 4-4** summarizes the recommended process a system may use to identify a receiving treatment works and provides additional information for the process of requesting a permit to discharge to a WWTP.

23 Water discharged from a WWTP should be authorized by and consistent with a discharge permit issued by EPA or an authorized state or tribe.

**Table 4-3: Some Key Additional Requirements and Considerations for WWTPs***

| WWTP Type | Additional Requirements | Contaminant-Specific Considerations | |
|---|---|---|---|
| POTW | • Water meets all the:<br>– Federally prohibited discharge standards<br>– Federal categorical pretreatment requirements (which vary by industrial process category)<br>– State laws and regulations<br>– Local limits established by the POTW to prevent either:<br>· Pollutants in the treated water from passing through the POTW untreated<br>· Interferences with the POTW (i.e., inhibition or disruption of POTW treatment process or operations or sludge process, use, or disposal) |  CHEM<br>  TOXIN | • Water considered a RCRA hazardous waste may be subject to additional disposal requirements described in the following documents:<br>– EPA's *Guidance Manual for the Control of Wastes Hauled to Publicly Owned Treatment Works, September, 1999*, which explains how smaller POTWs without pretreatment programs (see box below) accept and control hauled wastewater†<br>– EPA's *Guidance Manual for the Identification of Hazardous Waste Delivered to POTWs by Truck, Rail or Dedicated Pipe, June 1987*, which provides guidance on hazardous waste hauled to POTWs‡<br>• Water classified as hazardous may also be subject to additional reporting requirements, as listed in 40 CFR 403.12(p).<br>• If the treated water is considered a RCRA hazardous waste and is shipped to a WWTP for disposal (or another WWTP if the contamination occurred at a wastewater treatment system), the receiving WWTP may become a hazardous waste facility and may be subject to additional RCRA regulations. |
| | |  RAD | Maximum federal or state regulatory concentrations for direct discharge to surface water and release into sewers may apply for radioactivity. |
| | |  BIO | Some states require medical/infectious waste to be disposed of as RCRA hazardous waste while others enforce special medical/infectious waste requirements. |

* Please note that regardless of the type of facility, the discharge must be authorized and consistent with a discharge permit issued by EPA or an authorized state or tribe.

† Publication No. EPA-833B-98-003; see http://water.epa.gov/aboutow/owm/upload/2005_07_14_hwfinal.pdf.

‡ Publication No. EPA-833-B-87-100; see http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000SWI9.txt.

| WWTP Type | Additional Requirements | Contaminant-Specific Considerations | |
|---|---|---|---|
| **FOTW OR OTHER WWTP** | The discharge of the water should be covered by a permit as described below:<br>• The FOTW or WWTP addresses the specific discharge either in the FOTW/WWTP's NPDES permit or<br>• The discharge is subject to a separate NPDES regulation pursuant to 40 CFR 122.44(m) or analogous state, territorial, or tribal NPDES regulation in areas where such government is authorized to administer the NPDES permitting program |  <br>**CHEM**<br>  <br>**TOXIN** | Discharges to an FOTW/WWTP that are not subject to and in compliance with requirements such as federal prohibited discharge standards, federal categorical pretreatment standards, and local limits may be subject to requirements applicable to "solid waste" under RCRA as well as effluent guidelines and standards. |
| | |  <br>**RAD** | Maximum federal or state regulatory concentrations for direct discharge to surface water and release into sewers may apply for water exhibiting radioactivity. |
| **CWT** | • The CWT accepts wastewater from off site for treatment and/or recovery<br>• CWTs are subject to the Centralized Waste Treatment Rule (40 CFR Part 437), which may affect the CWT's conditions for acceptance of the water |  <br>**CHEM** | • Different CWTs may be better suited to treat water contaminated with different contaminants (e.g., CWT for oily wastes if the contaminant is oil or another hydrophobic, or CWT for metal-bearing wastes if the contaminant is a heavy metal).<br>• The resulting wastewaters from the CWT may be discharged directly to waters of the U.S. or indirectly to a POTW consistent with any applicable statutory or regulatory requirements or permit conditions. |

**Table 4-4: Information on Disposal by Transfer or Discharge to a WWTP**

| Recommended Process for Identifying and Contacting a POTW, FOTW, CWT, or Other WWTP | Common Specifications and/or Requirements |
|---|---|
| To transfer or discharge water to a POTW, FOTW, CWT, or other WWTP, one should:<br>1. Identify potential treatment facility.<br>2. Contact a POTW, FOTW, CWT, or other WWTP and request (in writing) formal permission to discharge to the treatment works.<br>3. In the written request, inquire about what requirements the WWTP has for accepting the treated water.<br>4. If the POTW agrees to accept the treated water, obtain an individual control mechanism from the POTW (e.g., permit, license, contract, etc.) and provide information for revising the NPDES permit if necessary. Alternatively, for discharges to an FOTW, CWT, or other WWTP, provide information for revising the NPDES permit for the FOTW, CWT, or other WWTP enabling it to accept the water, if necessary.<br>5. Confirm that contaminant levels are compliant with the individual control mechanism issued by the POTW or with the requirements of the NPDES permit for the FOTW, CWT, or other WWTP. If contaminant levels are not compliant, pursue alternate disposal options.<br>6. After an authorization to send the waters to the POTW, FOTW, CWT, or other WWTP is confirmed, discharge the water to the treatment works following the requirements and instructions listed on the individual control mechanism or the permit, as applicable. | • The following characteristics of the discharge should be considered:<br>– Method of discharge<br>– Time of discharge<br>– Location of discharge<br>– Volume of discharge<br>– Flow rate of discharge<br>– Discharge standards<br>• The Clean Water Act Section 301(f) prohibits the discharge of any chemical, biological, or radiological warfare agent, any high-level radioactive waste, or any medical waste into the navigable waters.<br>• Oil that meets the Sheen Rule should not be discharged to navigable waters as per CWA 311(b) and 40 CFR Part 110. |

## Pretreatment Programs

An analysis of pretreatment requirements designed to prevent pass through, inhibition, and sludge contamination at a WWTP should be conducted prior to any transfer or discharge of hazardous waste to the facility. Section 307(b) of the CWA established the National Pretreatment Program which sets and/or enforces the following:

- Prohibited discharge standards – apply to pollutants that can never be discharged to a POTW (given below)
- Categorical pretreatment standards – national, technology-based limits on pollutant discharges that vary according to industrial sector
- Local limits – standards to prevent untreated pass-through at or interference with specific POTWs

## National Pretreatment Standards: Prohibited Discharges (40 CFR 403.5)

The CWA prohibits the discharge of certain pollutants to a POTW, including chemical contaminant(s) and/or residuals from the treatment process. A POTW also may refuse to accept waste from a discharger. Potential applicable prohibitions include pollutants that may cause the following:

- A pass-through or interference with the treatment processes (including effects on the quality of sludge)
- Corrosive structural damage to the treatment works
- Acidification of the water to a pH lower than 5.0, unless the treatment works is designed to accommodate such a discharge

Additionally, potentially prohibited pollutants include the following:

- Solid or viscous pollutants in amounts that will cause obstruction to the flow of the POTW
- Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin that will cause interference or pass-through

## 4.3 Transfer of Water to a Hazardous or Medical/Infectious Waste Facility

Transfer to a hazardous waste facility may be an option for disposal of water from drinking water, wastewater, and stormwater systems. The following considerations should be evaluated prior to disposal:

- Is the treated water considered a RCRA hazardous waste or a medical/infectious waste handled by the state as RCRA hazardous waste?
- Does the facility agree to accept the water?
- Does the treated water meet the conditions that the facility has for acceptance?
- Does the facility have the appropriate licenses and permits?

Similarly, transfer to a medical/infectious waste facility may be an option for disposal of water from drinking water, wastewater, and stormwater systems. The following considerations should be evaluated prior to disposal:

- Is the treated water considered a medical/infectious waste?
- Does the facility agree to accept the water?
- Does the treated water meet the conditions that the facility has for acceptance?
- Does the facility have the appropriate licenses and permits?

## 4.4 Underground Injection of Water

Underground injection may be a disposal option for treated water if:

- The injection activity is permitted or authorized by rule, and the injection well is constructed and operated so that underground sources of drinking water are not endangered. Owners/operators of wells are responsible for obtaining the necessary permits or authorizations.
- An appropriate class of injection well is available and willing to accept the water, or a new well is constructed, and use of the well for injection is consistent with the existing or new Underground Injection Control (UIC) permit/authorization. A new or revised permit may need to be obtained, or in the case of an injection well authorized by rule, one may be required to submit updated inventory information. Only specific types of wastes are allowed to be injected into a given well class.
- The disposer of the water contacts the well owner/operator and receives permission to transfer the water.
- The well owner/operator contacts the EPA regional UIC program office or the state if the state has UIC primacy.

Table E-1 in Appendix E describes the different classes of injection wells, class uses, and considerations for using each well class in further detail.

More information on underground injection is available from the UIC program office in states with UIC primacy.[24] For states that do not have UIC primacy, information is available from the EPA regional UIC program office.[25]

24 See EPA's Underground Injection Control Programs Web page on UIC Primacy at: http://water.epa.gov/type/groundwater/uic/Primacy.cfm

25 See EPA's Underground Injection Control Programs Web page on UIC Regional Contacts at: http://water.epa.gov/type/groundwater/uic/whereyoulive.cfm .

## 4.5 Volume Reduction and Solidification of Water with Radiological Contaminants

For water considered LLRW or LLMW, solidification may allow for disposal at an LLRW disposal facility.[26] In this scenario, the feasibility of volume reduction and solidification should be determined. Smaller quantities of water may be solidified without volume reduction. For additional information on solidification of mixed waste, see http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P10094M5.txt.

### LLMW Requirements


Water considered LLMW may be subject to RCRA requirements. The EPA Regional RCRA or Authorized State RCRA program office should be contacted to determine applicable requirements or to determine if the water qualifies for an exemption if it is stored as LLRW (see Appendix E for a description of the exemption).

26 See Glossary for definition of *stabilization/solidification*.

# 5.0 Storage and Transportation of Water

As part of the response and recovery process, water may need to be stored or transported before, during, or after treatment and prior to disposal. The following subsections provide information on potential requirements for storage and transportation of water.

## 5.1 Storage of Water

Section 3.2 of this document discusses containment of water in temporary storage prior to disposal. If the contaminated water cannot be disposed, the water should be stored above ground until further treatment or disposal options become available. Long-term storage should be in a secure location, and detailed records should be maintained. Additional sampling and analyses may be necessary to monitor the characteristics, quality, and/or contaminant levels of the water over time. Several statutes and regulations may apply to the storage of water depending on the contaminants in the water, the characteristics of the water, and other factors specific to the event. State and local jurisdictions may have additional regulations regarding long-term storage of water contaminated with chemical, biological, and radiological (CBR) agents; users should contact state and local authorities.

### EPA Requirements


These statutes and regulations include:

- RCRA
  - In cases where the water is considered RCRA hazardous waste, RCRA storage regulations (40 CFR Part 264 and 265) may apply.
  - Storage of RCRA hazardous waste may require an EPA identification number and permits that may be required by state and local environmental and/or waste offices. Refer to Section 4.0 for information on these permits.
  - RCRA hazardous waste may be exempt from permitting regulations if specific requirements are met. Appendix E provides a list of exemptions from RCRA permitting regulations regarding storage.
  - Underground storage – UST systems that are used to store hazardous substances and/or petroleum products are regulated under RCRA, Subtitle I. USTs containing hazardous wastes are regulated under Subtitle C of RCRA. See 40 CFR 302.4 for the regulated list of hazardous substances.
- FIFRA
  - If the water or water system was intentionally treated with a pesticide (e.g., to control bacteria), the pesticide label or labeling may impose requirements affecting storage and/or disposal.
  - If the contaminant in the water is a pesticide that was canceled or suspended under FIFRA, EPA may have issued, pursuant to FIFRA section 19, additional requirements and/or procedures for storage and/or disposal of the contaminated water.
  - The regional EPA office should be contacted to determine if there are additional requirements and/or procedures for the canceled or suspended pesticide and to determine if those requirements and/or procedures apply to the contaminated water.

### NRC Requirements

RAD

For water containing radiological contaminants, the NRC or Agreement State should be contacted to identify storage or labeling requirements specific to the type and amount of radioactivity at hand (Per 10 CFR 61.55 – 57). For descriptions of potential storage requirements and considerations, refer to the NRC Regulatory Issue Summary 2008 12, *Considerations for Extended Interim Storage of Low Level Radioactive Waste by Fuel Cell and Materials License and/or Extended Storage of Low Level Radioactive Waste: Potential Problem Areas*, BNL-NUREG-36149. (See Appendices D and F for links to these documents.)

## 5.2 Transportation of Water

In some instances, the water may need to be transported from the contaminated site for treatment, storage, or disposal. The U.S. Department of Transportation (DOT) Hazardous Materials Regulations (HMR; 49 CFR Parts 100 – 185) provide requirements for the packaging, labeling, permitting, and transporting of hazardous materials, including chemical contaminants. For information about transportation requirements for hazardous materials, contact the DOT Hazardous Materials Information Line at 800-467-4922 or contact the state transportation department. States may have additional regulations, and state transportation agencies should be contacted for information regarding state-specific requirements.

### EPA Requirements

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In addition to DOT regulations and requirements, EPA may have additional requirements for those transporting waste under:

- RCRA – EPA provides regulatory requirements for transporters of RCRA hazardous waste (pursuant to RCRA, 40 CFR Part 263) such as requiring an EPA identification number, hazardous waste manifest, and permits that may be required by state and local environmental and/or waste offices.
- FIFRA – EPA may have labeling requirements and/or procedures for transporting canceled or suspended pesticides, any container of a pesticide, any rinsate containing the pesticide, or any other material used to contain or collect excess or spilled quantities of the pesticide, which may also apply to water contaminated with a canceled or suspended pesticide. (Per FIFRA, 7 USC 136q)

### NRC Requirements

RAD

The NRC works with DOT for the transportation and packaging of radioactive waste under the Hazardous Materials Regulations (HMR; 49 CFR Parts 100–185). These regulations establish requirements for the permitting, packaging, labeling, and shipping of contaminated materials.

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# Appendix A: Risk Communication

**Figure A-1** describes an example framework that can be used to develop a risk communication strategy for decontamination efforts related to containment, treatment, and disposal of large amounts of water from a drinking water, wastewater, or stormwater system.[27] The left-hand column depicts communication and coordination with federal, state, local and/or tribal agencies to notify them of the Remediation Action Plan and to coordinate the development of a public risk communication strategy. The third column illustrates aspects of the implementation of the public notification and risk communication strategy. As part of pre-incident planning, it is recommended that a communication strategy be developed and contact information for federal, state, local and/or tribal agencies, health agencies, emergency responders, and public officials be collected and compiled.

Resources on risk communication include:

- **Revised Public Notification Handbook**, March 2010 (EPA-816-R-09-013) – This handbook provides guidance to states, public water systems, and the general public regarding how EPA interprets public notification regulations. This handbook also provides example "boil water" alerts and "problem corrected" notices. See EPA's public notification Web page for more details and access to the handbook: http://water.epa.gov/lawsregs/rulesregs/sdwa/publicnotification/upload/PNrevisedPNHandbookMarch2010.pdf.
- **40 CFR 141.201**, National Primary Drinking Water Regulations Subpart Q – Public Notification of Drinking Water Violations – 40 CFR 141.201 describes general public notification requirements including Tier 1 requirements.
- **Water Security Initiative: Consequence Management Plan Guidance**, October 2008 (EPA-817-R-08-001) This guidance document includes an example of how public information activities might be planned during each response phase of a contamination incident. See http://water.epa.gov/infrastructure/watersecurity/upload/2008_10_24_watersecurity_guide_interim_cmp_wsi.pdf.
- **Risk Communication in Action: The Risk Communication Workbook**, August 2007 (EPA-625-R-05-003) This workbook provides a better understanding of the elements of successful risk communication to public health officials, local environmental managers and community decision makers. It describes concepts of risk communication based on perceptions, value differences, persuasion, and presentation of data in new ways. See http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=60000I2U.txt.
- **Risk Communication in Action: The Tools of Message Mapping**, August 2007 (EPA-625-R-06-012) – This workbook provides an explanation of how to create and use message maps, which are science-based risk communication tools that enable members of the emergency response and environmental protection communities to quickly and concisely deliver the most pertinent information about an emergency. See http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=60000IOS.txt.
- **Effective Risk and Crisis Communication during Water Security Emergencies: Summary Report of EPA Sponsored Message Mapping Workshops**, March 2007 (EPA-600-R-07-027) – This report summarizes results from three water security risk communication message mapping workshops. It provides information about effective message development and delivery that could be useful to Water Sector organizations as they develop their respective risk communication plans. See http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=60000GH1.txt.
- **Summary Report of the National Water Security Risk Communication Symposium**, November 2005 (EPA-600-C-05-006) – This document summarizes a two-day symposium hosted by EPA about communicating risks to drinking water and wastewater systems on May 20 – 21, 2004, in San Francisco, California. The Symposium provided an opportunity to inform key water security stakeholder groups about crisis risk

27 Please note that this figure illustrates an example of a drinking water communications strategy and would need to be modified appropriately for decontamination efforts at a wastewater or stormwater utility.

communication; a forum to share effective risk communication strategies, best practices, tools, and existing projects; and an opportunity to gather information and advice to support activities in developing and implementing successful risk communication strategies, tools, and plans. Sessions included risk communication during and following a crisis and risk communication in preparation for a potential crisis. See http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100049M.txt.

- **Response Protocol Toolbox: Planning for and Responding to Drinking Water Contamination Threats and Incidents**, April 2004 (EPA 817-D-03-005 and EPA 817-D-03-006) – These modules provide emergency response planning tools that are designed to help the water sector to effectively and appropriately respond to intentional contamination threats and incidents. Module 5 introduces the concept of a comprehensive communications strategy of providing information to the public and details the message, audience, potential vehicles, resources needed and feedback mechanisms. Module 6 discusses each of these elements in more detail. See http://water.epa.gov/infrastructure/watersecurity/upload/2004_05_19_watersecurity_guide_response_module5.pdf and http://water.epa.gov/infrastructure/watersecurity/upload/2004_05_19_watersecurity_guide_response_module6.pdf.

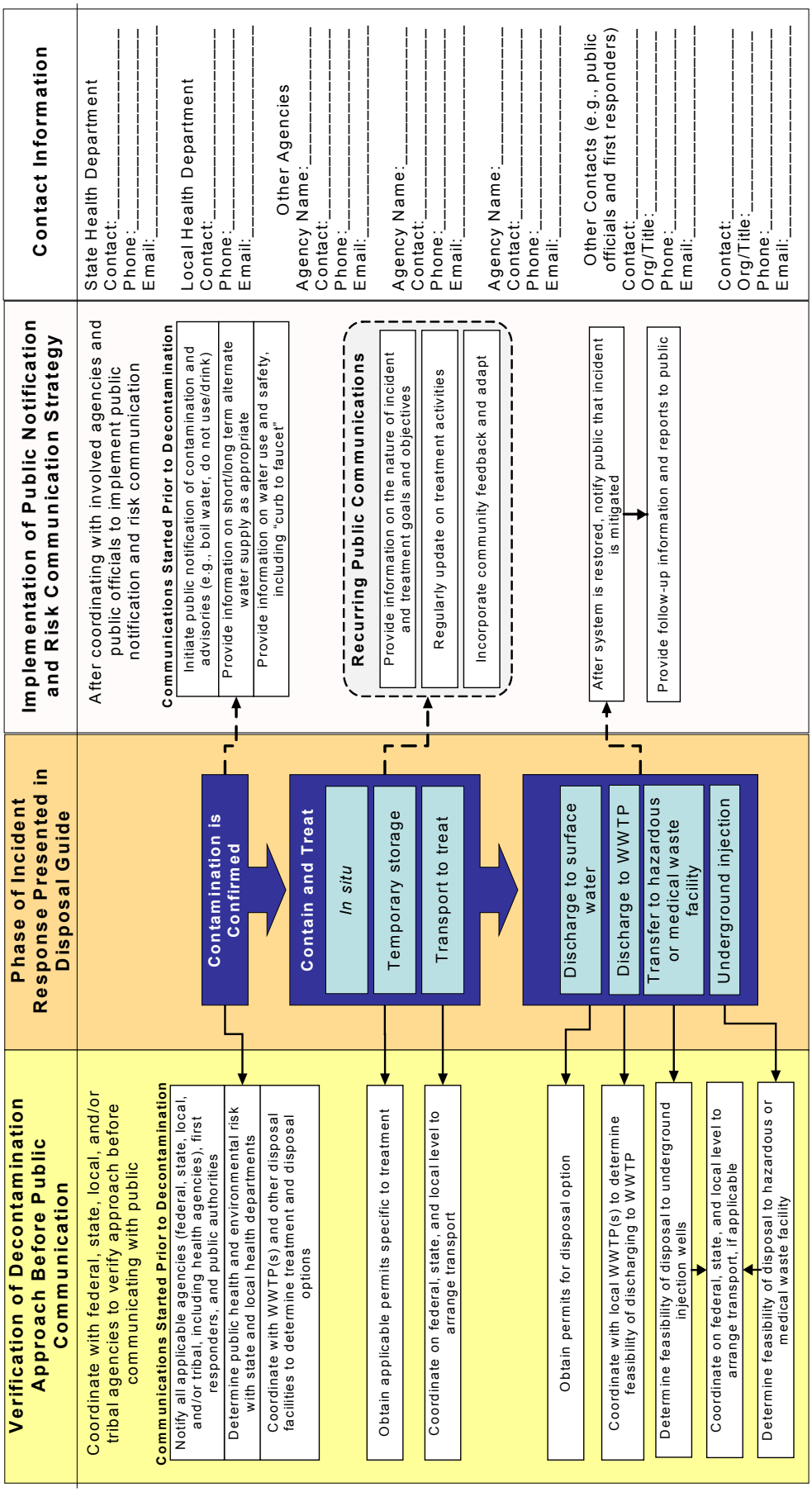


**Figure A-1: Recommended Framework for Developing a Risk Communication Strategy for a Drinking Water Utility Following a Contamination Incident**

# Appendix B: Risk Communication

In some situations, the contaminant may degrade over time in the water, resulting in natural attenuation. The likelihood of natural attenuation depends on the characteristics of the contaminant, such as tendency to hydrolyze; water quality aspects including acidity/alkalinity, temperature, presence of other contaminants; and exposure of contaminated water to environmental stressors such as sunlight, wind, and freeze-thaw cycles. Natural attenuation may require extended holding times and may result in byproducts of toxicological significance, for example from hydrolysis (see Table B-2) or other natural processes. Water that has undergone natural attenuation should be treated and/or disposed in accordance with applicable statutory and regulatory requirements. The likelihood of a contaminant to naturally attenuate should also be considered when choosing and implementing a treatment method. Tables B1 – B3 provide information on potential treatment methods. These tables can be used to help identify which treatment methods may be appropriate in different circumstances.

**Table B-1** provides method descriptions and specific considerations for potential treatment options identified in Tables 3-3 through 3-6 that may be used to treat water contaminated with chemical, biological, or radiological (CBR) agents. This table does not address disposal of treatment residuals.

**Table B-2** lists some of the potential hydrolysis products that may result from the representative contaminants listed in this guide. These products vary in toxicological significance. For example, hydrolysis products of lewisite and VX can have similar, high acute toxicity as the parent compounds. Hydrolysis products with much lower acute toxicity may be present as well; however, all need to be considered in order to protect human health and ensure effective treatment. Many of the example hydrolysis products identified in Table B-2 may have non-lethal human health effects, depending on dose and duration of exposure. Table B-2 is not an exhaustive list. Rather, the entries in the table are designed to illustrate that hydrolysis products may be of concern in certain circumstances, and should be considered when devising a treatment plan. Consult the Water Contaminant Information Tool (WCIT) for more information on other potential hydrolysis products. EPA Cumulative Risk Assessments also provide information on toxicologically significant hydrolysis products for several classes of pesticides (http://www.epa.gov/oppsrrd1/cumulative/).

**Table B-3** provides information on byproducts resulting from several potential treatment methods, along with some treatment process residuals (e.g., treatment chemicals added in excess). The considerations listed in Table B-1 indicate the formation of these byproducts for various treatment processes. Table B-3 provides some specific, illustrative examples for several chemicals. Table B-3 is not an exhaustive list, but is primarily intended to raise awareness of specific types of treatment byproducts beyond what is well known in the water industry regarding regulated “disinfection byproducts” such as trihalomethanes and haloacetic acids. Users are encouraged to obtain updated and more detailed information from EPA’s WCIT. EPA Cumulative Risk Assessments also provide information on toxicologically significant treatment byproducts for several classes of pesticides (http://www.epa.gov/oppsrrd1/cumulative/).

While many natural attenuation, hydrolysis, and treatment products may be treated the same way as the parent contaminant, additional treatment technology may be required to remove such byproducts, as illustrated in Table B-3.

**Table B-1: Description of Potential Treatment Methods for CBR Contaminants**

| Treatment Method | Method Description | Considerations and Notes |
|---|---|---|
| **Activated alumina** | • Adsorption of contaminant is facilitated by the porous nature of activated alumina. | • Residuals may include backwash water, caustic regenerant solution, neutralization water, and rinse water containing high levels of the contaminant. |
| **Activated sludge** | • Microorganisms and air (oxygen) are added to the water to consume organic material.<br>• Radionuclides are consumed with organic material.<br>• Resulting sludge is settled or filtered out of the water. | • Residuals may include contaminated sludge. |
| **Biosorption** | • Metal ions and/or organic compounds are removed by microorganisms.<br>• Microorganisms settle or are filtered out. | • Residuals may include contaminated sludge. |
| **Booms** | • Floating oil is concentrated in thicker surface layers, making recovery easier. | • Recommended for use in holding tanks/storage areas, not within pipes.<br>• Recommended for use in conjunction with additional removal processes. |
| **Chloramination** | • Chlorine (or hypochlorite) and ammonia are combined in water to form monochloramine, which inactivates microorganisms in the water and may also affect some chemical contaminants. | • Treatment chemical mixture may be considered a pesticide and may require special handling.<br>• Disinfection byproducts or liquid residuals may be produced; these byproducts or residuals may result in negative human health effects.<br>• Residuals include chloraminated water.<br>• If off-label use of a registered pesticide, or use of an unregistered pesticide, is contemplated, an exemption from FIFRA (Sec. 18) must be obtained. |

| Treatment Method | Method Description | Considerations and Notes |
|---|---|---|
| **Chlorination** | • Chlorine or hypochlorite is added to water to obtain desired concentration and contact time.<br>• The free chlorine interacts with the contaminant(s) for treatment. | • Residuals include chlorinated water.<br>• Method may result in the production of disinfection byproducts or liquid residuals, such as trihalomethanes (THMs) and haloacetic acids (HAAs), which may themselves result in negative human health effects.<br>• Most vegetative bacteria are susceptible to free chlorine.<br>• Some spore-forming bacteria, such as B. anthracis, and many protozoa, may be more resistant to chlorine. However, it may be possible to use high doses of chlorine (compared to normal treatment) to inactivate resistant organisms.<br>• When using chlorine, increased concentrations and/or contact times may be required for the treatment of chlorine-resistant organisms.<br>• Treatment chemical mixture may be considered a pesticide and may require special handling.<br>• If off-label use of a registered pesticide, or use of an unregistered pesticide, is contemplated, an exemption from FIFRA (Sec.18) must be obtained. |
| **Chlorine dioxide** | • Microorganisms are inactivated through oxidation (by chlorine dioxide or sodium chlorite). | • Chlorite and chlorate ions may be formed, which may require additional processing to mitigate them prior to disposal; however, formation of these ions will be minimized by proper use of chlorine dioxide.<br>• If off-label use of a registered pesticide, or use of an unregistered pesticide, is contemplated, an exemption from FIFRA (Sec.18) must be obtained.<br>• Disinfection byproducts or liquid residuals may be produced; these byproducts and residuals may result in negative human health effects. |
| **Coagulants or flocculants (e.g., alum coagulation)** | • A coagulant is added to the water, causing particles to clump together.<br>• Repulsion forces between contaminant molecules are neutralized, allowing formation of complexes that can be more readily removed from water. | • Method is often used as an initial treatment, prior to filtration or sorbent methods. |
| **Co-precipitation with barium sulfate** | • Radioactive strontium is adsorbed on barium sulfate precipitate, and has been used for modeling of the decontamination process in continuous and semi-continuous stirred tank reactors. | • Through simulations, it has been found that the critical parameter is the mean residence time, and the semi-bath stirred tank reactor is the best configuration. |

| Treatment Method | Method Description | Considerations and Notes |
|---|---|---|
| **Electrodialysis/ reversal (EDR)** | • Ions of elements are extracted by a mercury cathode, creating a mercury mixture that causes a separation of contaminated materials from the waste volume. | • Additional processing is required for mercury mixture. |
| **Filtration** | • Water is passed through a filter and the contaminant particles become trapped on one side of the filter. | • Residuals include sand beds and other spent filters with high concentrations of contaminants.<br>• Filter should be chosen based on physical and chemical properties of the contaminant.<br>• Filters may be fouled quickly, depending on the surface area of the filter and extent of the contamination.<br>• Speed of treatment may be dictated by type of filter employed.<br>• Large-scale filtration may be problematic, in terms of time and cost, for some contaminants. |
| **Hydrogen peroxide** | • Hydrogen peroxide is added to water to obtain desired concentration and contact time in order to treat the contaminant. | • The pH of the water may be decreased by treatment.<br>• Disinfection byproducts or liquid residuals may be produced; these byproducts or residuals may result in negative human health effects. |
| **Hydrous manganese oxide** | • The contamination becomes surrounded by oxygen atoms and is removed through an ion exchange. | • Intraparticle diffusion is the rate-limiting step in the sorption of contaminant to microporous oxides. |
| **Ion exchange (e.g., greensand)** | • Water is passed through a resin containing exchangeable ions (cations, anions, or a mixture of the two).<br>• The ions on the resin are replaced by contaminants since they form stronger bonds. | • Stronger bonds must be formed between the contaminant and resin than the exchangeable ion.<br>• Effectiveness of treatment can be limited by other ions, such as sulfate, calcium and magnesium.<br>• Residuals may include brine, backwash, rinse water, and aged/ineffective resins. |
| **Lime softening** | • Hydrated lime or quicklime is added to the water to precipitate the contaminant. | • Residuals may include backwash, sludge, and aged media.<br>• Corrosivity of the water may be altered by the treatment, and a corrosion-inhibiting material may need to be added to the water.<br>• Disinfection byproducts or liquid residuals may be produced; these byproducts and residuals may themselves result in negative human health effects.<br>• Contaminants' hydrolysis rates can be altered by lime softening (see Appendix B, Table B-3). |

| Treatment Method | Method Description | Considerations and Notes |
|---|---|---|
| **Magnetic polyamine epichlorhydrin resin** | • Magnetic polymer composition is placed in water in the presence of an external magnetic field. | • Residuals may include spent, contaminated resins. |
| **Oil-water separators** | • Water is pumped through a separation tank; hydrophobic contaminants rise to the top or settle to the bottom of the water column, allowing removal of the contaminant from the water. | • Method works well when the contaminant rises to the top or settles to the bottom of the water column. May not be effective if the contaminant is dispersed throughout the water column.<br>• Oil is effectively removed from heavily contaminated waters; may not reduce the oil level to an adequate level for discharge. |
| **Ozone** | • Ozone is infused into water via ozone generators. | • Disinfection byproducts or liquid residuals may be produced; these byproducts and residuals may result in negative human health effects.<br>• Bromate is a regulated byproduct of the ozonation reaction, and is formed regardless of contaminant concentration if the water contains bromide.<br>• Flow should be monitored carefully to ensure sufficient contact time. |
| **Particle separation and Magnetic separation** | • Metal ions and radionuclides are selectively bound on the surface of magnetic and non-magnetic particles.<br>• Particles are filtered or applied to a magnetic field. | • Residuals may include contaminated particles and filters. |
| **Photocatalytic oxidation** | • Organic contaminants are mineralized, converting them into carbon dioxide, water, and the oxidized inorganic anions of any heteroatoms present. | • Disinfection byproducts or liquid residuals may be produced; these byproducts and residuals may result in negative human health effects. |
| **Precipitation** | • Water flow is reduced and/or chemicals are introduced so that contaminants can precipitate.<br>• Precipitant is settled out of the water or is filtered out. | • Residuals may include contaminated precipitants. |

| Treatment Method | Method Description | Considerations and Notes |
|---|---|---|
| **Reverse osmosis** | Water is forced through a membrane with small pores, achieving a pressure-driven membrane separation process.<br>• The contaminant is unable to pass through the pores, separating it from the water. | • Membrane fouling or scaling can be caused by hard water.<br>• Treated water may have decreased pH.<br>• Residuals may include spent/used membranes, and liquid residuals with high concentrations of the contaminant. |
| **Skimmers** | • Floating oil is removed from water by physical separation, suction or absorptive materials. | • Recommended for use in holding tanks/storage areas, not within pipes. |
| **Sorbents (e.g., granular activated carbon [GAC])** | • Insoluble materials or mixtures of materials are used to recover liquids through absorption, adsorption (adherence), or both.<br>• Hydrophobic contaminants are bound to GAC, enabling physical removal from the water. | • Method is often used to remove final traces of oil from water.<br>• Characteristics of sorbent and contaminant should be considered to optimize treatment.<br>• GAC is identified as the best available technology in the National Primary Drinking Water implementation regulation (40 CFR 142.62) for treatment of many synthetic organics, including chlordane and various pesticides.<br>• Residual GAC may be a RCRA hazardous waste or CERCLA hazardous substance. |
| **Supercritical water oxidation** | • Temperature and pressure of the water are raised to be above critical point in order for oxidation to occur. | • Additional treatment methods may be necessary for precipitates formed during supercritical water oxidation.<br>• Disinfection byproducts or liquid residuals may be produced; these byproducts and residuals may result in negative human health effects. |
| **UV** | • Water is passed through UV stream, inactivating microorganisms. | • Photochemical transformation by this process has been observed.<br>• Disinfection byproducts or liquid residuals may be produced; these byproducts and residuals may result in negative human health effects.<br>• Flow should be monitored carefully to ensure sufficient contact time.<br>• Efficacy of treatment may decrease for water with high turbidity or high suspended solids. |

**Table B-2: Potential Hydrolysis Products from Chemical Contaminants***

| Contaminant | Hydrolysis Product |
|---|---|
| BZ | Benzyilic acid |
| | 3-quinuclidinol |
| Carbofuran | Carbofuran phenol |
| Dichlorvos | Dichloroacetaldehyde |
| | Dichloroacetic acid |
| | Dichloroethanol |
| | Dimethyl phosphate |
| | Dimethyl phosphoric acid |
| Dicrotophos | O-desmethyldicrotophos |
| | N,N-dimethylacetoacetamide |
| | Monocrotophos |
| Lewisite | Acetylene |
| | Arsenites |
| | 2-Chlorovinyl arsonous acid |
| | Lewisite oxide |
| Sarin | Diisopropyl methylphosphonic acid |
| | Hydrogen fluoride |
| | Isopropyl methylphosphonic acid |
| | Methylphosphonic acid |
| | Methylphosphonic acid mono(1-methylethyl) ester (IMPA) |
| | Methylphosphonofluoridic acid |
| Tabun | Cyanide compounds |
| | Dimethylamine |
| | Dimethylphosphamide |
| | Dimethylphosphoramidic acid |
| | D-ethyldimethylamide phosphoric acid |
| | Ethyl phosphoric acid |
| | Ethylphosphoryl cyanidate |
| | Phosphoric acid |
| VX | Diisopropyl ethyl mercaptoamine |
| | EA2192 |
| | Ethanol |
| | Ethyl methylphosphonic acid |
| | Methylphosphonic acid |

* Note that this table does not contain all potential hydrolysis products. Consult WCIT for more information on other potential hydrolysis products. EPA Cumulative Risk Assessment provides information on toxicologically significant hydrolysis products for several classes of pesticides (http://www.epa.gov/oppsrrd1/cumulative/).

**Table B-3: Potential Treatment Byproducts and Treatment Process Residuals***

| Treatment Method | Byproducts | Byproduct Notes | Treatment Process Residual | Treatment process for byproducts and residual |
|---|---|---|---|---|
| **Free chlorine** | Oxons, sulfoxides, sulfones<br><br>Regulated disinfection byproducts (DBPs) | Examples include aldicarb sulfoxide, aldicarb sulfone, methyl paraoxon, phorate sulfoxide, etc.<br><br>Include trihalomethanes and haloacetic acids | Free Chlorine | Byproducts – activated carbon, filtration, ozonation, etc.<br><br>Residuals – dechlorination agents, reducing agents, etc.<br><br>Regulated DBPs – formation control, reverse osmosis |
| **Ozone** | Oxons, sulfoxides, sulfones<br><br>Regulated DBPs | Examples similar to free chlorine. All oxidative process may form these byproducts to varying degrees.<br><br>Bromate will be formed if the water contains bromide | | Byproducts – activated carbon, filtration, ozonation, etc.<br><br>Regulated DBPs – formation control, reverse osmosis |
| **Reverse Osmosis** | Hydrolysis products | pH change from process may affect hydrolysis mechanisms and corresponding products; e.g. for organophosphates | Residuals may include spent/used membranes, and liquid residuals with high concentrations of the contaminant. | High concentration of contaminants may cause waste to be subject to additional regulations and/or more difficult to deal with. |

* Note that this table does not contain all potential treatment byproducts or residuals. Additionally, while many byproducts may be treated as described in Table B-1, the treatment technology for the residuals may be different than the technique needed to treat the original contaminant. EPA Cumulative Risk Assessments provide information on toxicologically significant treatment byproducts for several classes of pesticides (http://www.epa.gov/oppsrrd1/cumulative/).

# Appendix C: Sample Disposal Checklist

**Disclaimer:** This sample checklist addresses potential actions to contain, treat, and/or dispose of contaminated water resulting from a CBR incident in a drinking water, wastewater, and/or stormwater system and some of the potentially applicable statutory and regulatory requirements. Utilities, state agencies, and first responders may elect to create a site-specific checklist to ensure all actions are documented and performed appropriately.

## Contamination Incident and Site Background Information

### General Information:

Name(s) of utility or entity affected (if known): _____

Responsible Party (if known): _____

Date and Time of the Incident: _____

Type of Incident (e.g., explosion, vehicle accident, pipeline, intentional): _____

_____

Systems affected (check all that apply):

_____Contamination of drinking water distribution system

_____Contamination of wastewater system

_____Contamination of stormwater collection system

_____Other

Contamination Location: _____

_____Public notification has been implemented or addressed (e.g., radio broadcast, safety zone broadcast to mariners, road closure, etc.)

### Contaminant Information:

Type: _____Biological contaminant(s): _____

_____Toxin contaminant(s): _____

_____Chemical contaminant(s): _____

_____Radiological contaminant(s): _____

_____Other: _____

Details (if applicable): Contaminant Name _____

Viscosity: _____

Solubility: _____

Volatility: _____

Percent Evaporation in: 24 Hours - _____ 48 Hours - _____

Other details: _____

Estimated volume of contaminated water: _____ gals _____ bbls

Release status: _____ Instantaneous _____ Continuous _____ Intermittent

If continuous or intermittent, specify rate of release: _____gals/bbls per hour

Estimated surface area covered (if applicable): _____ acres/sq ft

## Contact Information

| Name | Organization | Role | Phone Number |
|---|---|---|---|
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## Step 1: Evaluating the Potential to Contain Contaminated Water for Treatment

Where is the water contained? (Please note: A hydraulic map of the contaminated water system may facilitate identifying potential locations of contamination within the system to aid containment.)

_____Before the drinking water system _____Within the drinking water system

_____Within the wastewater system _____Temporary storage

_____Within the stormwater system

If stored in temporary storage, what types of container(s) are used (check all that apply)?

_____Drums (size: _____ number: _____)

_____Holding tanks (size: _____ number: _____)

_____Truck tankers (size: _____ number: _____)

_____Railway tanks (size: _____ number: _____)

_____Holding ponds (size: _____ number: _____)

_____Other (_____) (size: _____ number: _____)

## Step 2: Treatment of Water

### Operations Prior to Treatment:

_____Water profile evaluation completed

Notes on water profile:

Turbidity_____ Temperature _____

Alkalinity _____ Hardness_____

Laboratory used (if applicable) _____

Other _____

_____

_____Clearance goals established

_____ Remediation Action Plan developed

_____Clearance sampling and analysis plan developed

Notes on clearance goals and sampling and analysis plan:

_____

_____

_____

Treatment method(s) selected _____

Have samples been collected and monitored for natural attenuation or hydrolysis (if applicable)?

Yes ___ No ___

### Operations after Treatment:

_____Treatment confirmed (i.e., water meets clearance goals)

Notes on analysis after treatment:

Analysis method used _____

Laboratory used (if applicable) _____

If treatment is not confirmed, conduct additional treatment (list methods above).

## Step 3: Assessment of Water after Treatment

### Does the water contain any of the following (check all that apply):

____Warfare agent(s)

____RCRA hazardous waste

____TSCA regulated substance

____Cancelled or suspended pesticide

____Radioactivity (LLRW)

____Mixed waste (LLMW)

In addition to the requirements under the Clean Water Act and the Safe Drinking Water Act, there may be additional requirements that are applicable to the disposal of water with the following characteristics to surface waters or underground injection control wells, depending on the particular characteristics of the contaminated water (check those that apply in this situation):

| Characteristic | Requirements |
|---|---|
| **Warfare agent(s)** | ____Clean Water Act Section 301(f) prohibits discharge of warfare agents to navigable waters |
| **TSCA regulated substance** | ____TSCA disposal requirements<br>Contaminant specific requirements _____<br>_____ |
| **Radioactivity (LLRW)** | ____NRC requirements for storage<br>____NRC requirements for disposal |
| **RCRA hazardous waste** | ____RCRA hazardous waste requirements for transportation<br>____RCRA hazardous waste requirements for storage<br>____RCRA hazardous waste requirements for disposal |
| **Cancelled or suspended pesticide** | ____FIFRA storage requirements or procedures<br>____FIFRA labeling requirements or procedures<br>____FIFRA disposal requirements or procedures<br>Contaminant specific requirements _____<br>_____ |
| **Mixed waste (LLMW)** | ____NRC requirements for storage<br>____NRC requirements for disposal<br>____RCRA hazardous waste requirements for transportation<br>____RCRA hazardous waste requirements for storage<br>____RCRA hazardous waste requirements for disposal |
| **Oil** | ____Clean Water Act Section 311(b) and 40 CFR Part 110 prohibit discharge of oil to navigable waters |

## Step 4: Disposal of Water[28]

### Direct Discharge to Surface Water:

Check once completed/verified.

_____Location of discharge identified

28 May also apply to the disposal of liquid residuals.

_____NPDES and other appropriate permits for discharge obtained

_____Water does not contain any biological, chemical, or radiological warfare agents, High Level Radioactive Waste (HLRW), medical waste, or oil

### Disposal of Water through a WWTP (POTW, FOTW, CWT, or Other):

Check once completed/verified.

_____Water meets federal, state, and local pretreatment program standards (if applicable)

_____No pollutants in the water will pass through the WWTP untreated

_____Water will not cause interferences with WWTP (i.e., inhibition or disruption of WWTP treatment process or operations or sludge process, use, or disposal)

_____WWTP has agreed to accept the water

_____WWTP has issued/revised a permit for the discharge

### Underground Injection:

Check once completed/verified.

_____Underground injection disposal located

_____Well owner(s)/well operator(s) have the appropriate permit(s) and will accept the water

_____Injection meets federal and state UIC requirements including the prohibition of movement of fluid containing any contaminant into underground sources of drinking water (40 CFR 144.12)

### Volume Reduction and Solidification (radiological contaminants only):

Check all that apply.

_____Feasible to solidify the water (at current amount)

_____Feasible to reduce volume of water

### Disposal at a Hazardous or Medical/Infectious Waste Facility (chemical, biological, and toxin contaminants):

Check all that apply.

_____Water qualifies for disposal at a hazardous or medical/infectious waste facility

_____Hazardous or medical/infectious waste facility agrees to accept water

### Public Notifications:

_____Press releases, other communication strategies and/or other public notification requirements have been employed to notify affected public of any public health risks associated with disposal

## Step 5: Storage of Water

### Regulatory Requirements

Check all that apply.

_____Water is considered a RCRA hazardous waste

_____Does storage of water qualify for an exemption from RCRA permitting requirement? (If no, obtain permit; if yes, contact state or regional EPA hazardous waste office to identify actions necessary to maintain the exemption.)

### Storage Parameters:

Check once completed.

_____Storage area and/or containers approved by the authorities such as NRC or EPA (if applicable)

_____Storage containers and facilities labeled appropriately

_____Proper security measures implemented around storage area

### Public Notifications:

_____Press releases or other communication strategies employed to notify affected public of any public health risks

## Step 6: Transportation of Water

### Operational Controls:

Check once completed.

_____Receiving entity (e.g., hazardous waste facility) agreed to accept waste and approved method of transport

_____All required tracking forms, manifests, etc., obtained and filled out

_____All federal, state, and local transportation authorities have approved the method and route of transport

### Public Notifications:

_____Public notification implemented or addressed to facilitate safe transportation of water (e.g., safety zone broadcast to mariners, road closure, and other DOT requirements)

# Appendix D: Resources

Resources for treatment, storage, transportation, and disposal are presented in the following tables:

- **Table D-1**: General Resources
- **Table D-2**: Disposal Resources
- **Table D-3**: Storage Resources
- **Table D-4**: Transport Resources
- **Table D-5**: Information on Disposal of Solids

**Table D-1: General Resources**

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Agency-wide Documents Access and Management System (ADAMS) | | | | • | This database provides access to all public documents published by the NRC since November 1, 1999, as well as bibliographic records for public documents published by the NRC before November 1999. ADAMS is both Web-based and Citrix-based. ADAMS permits full-text searching and enables users to view document images as well as download and print files. See http://www.nrc.gov/reading-rm/adams.html to access the tool. |
| Agency for Toxic Substances and Disease Registry (ATSDR) | • | • | • | | ATSDR provides useful information for substances not found in the EPA WCIT. See http://www.atsdr.cdc.gov/. |
| Biosafety in Microbiological and Biomedical Laboratories 5th edition, December 2009 | | • | • | | This manual explains biosafety procedures for laboratories and provides biosafety level (BSL) definitions. See HHS Publication No. (CDC) 21-1112, http://www.cdc.gov/biosafety/publications/bmbl5/index.htm. |
| CERCLA/Superfund Orientation Manual, October 1992 | • | • | • | • | This document describes the Superfund program. See EPA publication EPA-542-R-92-005, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=10002WV5.txt. |
| Communicating Radiation Risks, September 2007 | | | | • | The guide has been designed as a resource for emergency responders and federal, state, and local officials communicating with the public and the media during a radiological crisis. See EPA-402-F-07-008. See http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=500025HA.txt. |
| Criminal and Epidemiological Investigation Handbook, 2006 | | • | • | | This handbook explains the steps of a criminal investigation following an attack with a biological contaminant (DOJ, FBI, and U.S. Army Soldier Biological Chemical Command). |

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Effective Risk and Crisis Communication during Water Security Emergencies: Summary Report of EPA Sponsored Message Mapping Workshops, March 2007 | • | • | • | • | This report summarizes results from three water security risk communication message mapping workshops. It provides information about effective message development and delivery that could be useful to Water Sector organizations as they develop their respective risk communication plans. See EPA publication EPA-600-R-07-027, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=60000GH1.txt. |
| Guidance on PCBs | • | | | | This website provides a list of guidance documents related to PCB response, removal, and other regulations. See http://www.epa.gov/wastes/hazard/tsd/pcbs/pubs/guidance.htm. |
| Health and Safety Plans (HASPs) | • | • | • | • | An electronic expert software system (developed by EPA and OSHA) is available at: http://www.osha.gov/dep/etools/ehasp/index.html. |
| Incident Waste Decision Support Tool | • | • | • | • | A decision support tool that organizes large amounts of information related to managing waste resulting from incidents of national significance (e.g., contaminated buildings and natural disasters). The tool can be used by individuals (i.e., emergency response authorities and property owners; tribal, state, and local permitting agencies; treatment and disposal managers; and/or planners) responsible for making disposal decisions. See http://www2.ergweb.com/bdrtool (registration required). |
| Joint NRC/EPA Guidance on Testing Requirements for Mixed Radioactive and Hazardous Waste, November 1997 | | | | • | NRC and EPA's joint final guidance on the testing requirements for mixed waste. See Federal Register Notice (62 FR 224. November 20, 1997), https://www.federalregister.gov/articles/1997/11/20/97-30528/joint-nrcepa-guidance-on-testing-requirements-for-mixed-radioactive-and-hazardous-waste. |
| National Primary Drinking Water Regulations | • | • | • | • | SDWA regulations (40 CFR Part 141) set mandatory water quality standards for drinking water contaminants. More information is available at: http://water.epa.gov/drink/drink/contaminants/index.cfm. A list of the standards can be found at http://water.epa.gov/drink/standardriskmanagement.cfm. |
| Oil Spill Response Techniques | • | | | | This website provides information on oil spill response techniques including booms, skimmers, and sorbents. See http://www.epa.gov/OEM/content/learning/oiltech.htm. |
| Planning for Decontamination Wastewater: A Guide for Utilities, 2005 | • | • | • | • | This guide informs wastewater utility personnel of the pre-planning necessary to prevent, detect, respond to and/or recover from the impacts of decontamination wastewater containing CBR substances. See http://www.michigan.gov/documents/deq/deq-wb-wws-2005WWDeconGuide_271352_7.pdf. |
| Radionuclides Compliance Help | | | | • | This document describes the treatment and non-treatment options for radionuclides in water as well as discusses disposal issues. See http://www.epa.gov/ogwdw/radionuclides/pdfs/learn.pdf. |
| RCRA Online | • | | • | | The RCRA Online database is designed to enable users to locate documents, including publications and other outreach materials, which cover a wide range of RCRA issues and topics. See http://www.epa.gov/waste/inforesources/online/index.htm. |

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Response Protocol Toolbox (RPTB): Planning for and Responding to Drinking Water Contamination Threats and Incidents, April 2004 | • | • | • | • | The RPTB is composed of six interrelated modules that focus on different aspects of planning a response to contamination threats and incidents. Remediation and Recovery Guide - Module 6. See EPA publication EPA-817-D-03-006, http://water.epa.gov/infrastructure/watersecurity/upload/2004_05_19_watersecurity_guide_response_module6.pdf. |
| Response Protocol Toolbox: Response Guidelines, August 2004 | • | • | • | • | An action-oriented document to assist drinking water utilities, laboratories, emergency responders, state drinking water programs, technical assistance providers, and public health and law enforcement officials during the management of an ongoing contamination threat or incident. See EPA publication EPA 817-D-04-001, http://water.epa.gov/infrastructure/watersecurity/upload/2004_11_24_rptb_response_guidelines.pdf. |
| Revised Public Notification Handbook, March 2010 | • | • | • | • | This handbook provides guidance to states, public water systems, and the general public regarding how EPA interprets public notification regulations. See EPA's public notification Web page for more details and access to the handbook: http://water.epa.gov/lawsregs/rulesregs/sdwa/publicnotification/upload/PNrevisedPNHandbookMarch2010.pdf; (EPA publication EPA-816-R-09-013). |
| Risk Communication in Action: The Risk Communication Workbook, August 2007 | • | • | • | • | This workbook provides a better understanding of the elements of successful risk communication to public health officials, local environmental managers, and community decision makers. It describes concepts of risk communication based on perceptions, value differences, persuasion and presentation of data in new ways. See EPA publication EPA-625-R-05-003, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=60000I2U.txt |
| Risk Communication in Action: The Tools of Message Mapping, August 2007 | • | • | • | • | This workbook provides an explanation of how to create and use message maps, which are science-based risk communication tools that enable members of the emergency response and environmental protection communities to quickly and concisely deliver the most pertinent information about an emergency. See EPA publication EPA-625-R-06-012, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=60000IOS.txt. |
| Safe Drinking Water Hotline | • | • | • | • | The Safe Drinking Water Hotline provides the general public, regulators, medical and water professionals, academia, and media, with information about drinking water and ground water programs authorized under the Safe Drinking Water Act. Call 1-800-426-4791 for a point of contact for drinking water information. Also see http://water.epa.gov/drink/hotline/index.cfm for more information about the hotline. |

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Sampling Guidance for Unknown Contaminants in Drinking Water, November 2008 | • | • | • | | This document provides comprehensive guidance that integrates recommendations for pathogen, toxin, chemical, and radiochemical sample collection, preservation, and transport procedures to support multiple analytical approaches for the detection and identification of potential contaminants in drinking water. This guidance document can be used to supplement a drinking water utility's emergency response plan by providing detailed recommended sampling procedures for use by utility personnel in response to a potential contamination event. See EPA publication EPA-817-R-08-003, http://water.epa.gov/infrastructure/watersecurity/wla/upload/2008_12_31_watersecurity_pubs_guide_watersecurity_samplingforunknown.pdf. |
| Standardized Analytical Methods for Environmental Restoration Following Homeland Security Events (SAM) | • | • | • | • | This resource identifies analytical methods to be used by laboratories tasked with performing analyses of environmental samples following a homeland security event. See http://www.epa.gov/sam/sam2010_9302010.pdf. Companion documents that discuss related issues (e.g., sampling) can be found at http://www.epa.gov/sam/samcomp.htm. |
| Storage, Treatment, Transportation, and Disposal of Mixed Waste; Final Rule (40 CFR Part 266) | | | | • | This final rule provides guidance on a conditional exemption for LLMW. See http://www.gpo.gov/fdsys/pkg/FR-2001-05-16/pdf/01-11408.pdf. |
| Summary Report of the National Water Security Risk Communication Symposium, November 2005 | • | • | • | • | This document summarizes a 2-day symposium hosted by EPA about communicating risks to drinking and wastewater systems on May 20 21, 2004, in San Francisco, California. The Symposium provided an opportunity to inform key water security stakeholder groups about crisis risk communication; a forum to share effective risk communication strategies, best practices, tools, and existing projects; and an opportunity to gather information and advice to support activities in developing and implementing successful risk communication strategies, tools, and plans. Sessions included risk communication during and following a crisis and risk communication in preparation for a potential crisis. See EPA publication EPA-600-C-05-006, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100049M.txt. |
| Technical Guide 188: U.S. Army Food and Water Vulnerability Assessment Guide, July 2008 | | • | • | | Technical guide for conducting a water vulnerability assessment (U.S. Army Public Health Command [USAPHC]). The July 2008 revision is available for official use by contacting USAPHC at http://www.med.navy.mil/sites/nepmu2/Documents/environmental_health/TG%20188%20Food%20and%20Water%20Vulnerability%20Assessment%20Guide.pdf. |
| Water Contaminant Information Tool (WCIT) | • | • | • | • | A secure, online database that provides information on chemical, biological, and radiological contaminants of concern for water security. Also can be used as a resource for contaminant-specific detailed information on the effectiveness of treatment methods for drinking water and wastewater. WCIT was updated in 2010 to include analytical methods data from the National Environmental Methods Index for Chemical, Biological, and Radiological Methods. See http://www.epa.gov/wcit/ (registration required). |

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Water Laboratory Alliance | • | • | • | • | The Water Laboratory Alliance (WLA) provides the drinking water sector with an integrated nationwide network of laboratories with the analytical capability and capacity to respond to intentional and unintentional drinking water contamination events involving chemical, biological, and radiochemical contaminants. See http://water.epa.gov/infrastructure/watersecurity/wla/index.cfm. |
| Worker Safety Radionuclides Web Cast, 2004 | | | | • | EPA's Office of Ground Water and Drinking Water conducted five on-site Radionuclides Implementation Workshops in the spring of 2007 (http://water.epa.gov/lawsregs/rulesregs/sdwa/radionuclides/training.cfm). The training sessions were intended for state drinking water program and radiation program personnel, but were also open to technical assistance providers and system operators. Although rule requirements were reviewed, the focus of the workshops was on treatment technologies and residual disposal options and regulations. At the training, a presentation (dated 2004) was used, see http://www.epa.gov/safewater/radionuclides/pdfs/webcast/presentations/worker_safety_loren_setlow.pdf. |

**Table D-2: Disposal Resources**

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Guidance Manual for the Control of Wastes Hauled to Publicly Owned Treatment Works, September 1999 | • | • | • | | Provides information for smaller POTWs, generally those without pretreatment programs, on how to develop and implement hauled waste controls. See EPA publication EPA-833-B-98-003, http://water.epa.gov/aboutow/owm/upload/2005_07_14_hwfinal.pdf. |
| Guidance Manual for the Identification of Hazardous Waste Delivered to POTWs by Truck, Rail or Dedicated Pipe, June 1987 | • | | • | | Guidance to EPA regions and states on how to identify POTWs that receive hazardous wastes by truck, rail, or dedicated pipe, and what requirements to impose on those POTWs. See http://www.epa.gov/npdes/pubs/owm0190.pdf. |
| Guide to Discharging CERCLA Aqueous Wastes to Publicly Owned Treatment Works, March 1991 | • | | • | | Describes the process and regulations for discharging CERCLA wastes to POTWs in greater detail. See EPA publication 9330.2-13FS, http://www.epa.gov/superfund/policy/remedy/pdfs/93-30213fs-s.pdf. |
| National Pollutant Discharge Elimination System (NPDES) Program | • | • | • | • | Information about the EPA discharge permit program can be found at http://cfpub.epa.gov/npdes/home.cfm?program_id=45. |
| Radioactive Waste Streams: Waste Classification for Disposal, Congressional Research Service (CRS) Report to Congress, December 2006 | | | | • | Information on the classification of LLRW is found at http://www.fas.org/sgp/crs/misc/RL32163.pdf, (CRS Order Code RL32163). |
| Stabilization/ Solidification Processes for Mixed Waste, June 1996 | | | | • | The document explains how to solidify mixed waste. See EPA publication EPA 402-R-96-014, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P10094M5.txt. |
| A System's Guide to the Identification and Disposal of Hazardous and Non-Hazardous Water Treatment Plant Residuals, August 2006 | • | • | • | • | RCRA hazardous waste regulations are summarized in this document. See EPA publication EPA 816-F-06-011, http://water.epa.gov/drink/info/arsenic/upload/2006_09_14_arsenic_guide_arsenic_disposalhazardous-nonhazardous.pdf . |
| Underground Injection Control (UIC) Program | • | • | • | • | EPA established regulations for UIC pursuant to Section 1421 of SDWA. Those regulations are at 40 CFR Parts 144–148. States may have more stringent requirements. See http://water.epa.gov/type/groundwater/uic/index.cfm for more information about EPA's UIC program. |

**Table D-3: Storage Resources**

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Considerations for Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees, May 2008 | | | | • | The NRC issued this regulatory issue summary (NRC Regulatory Issue Summary 2008-12) to address considerations related to extended interim storage of low-level radioactive waste. See http://www.nrc.gov/reading-rm/doc-collections/gen-comm/reg-issues/2008/ris-08-12.pdf. |
| EPA training module: Introduction to Containers, September 2005 | • | • | • | • | Provides basic requirements that pertain to the management of hazardous waste containers and regulations governing residues of hazardous waste in empty containers. See EPA publication EPA-530-K-05-010, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1008KG6.txt. |
| EPA training module: Introduction to Land Disposal Restrictions, September 2005 | • | • | • | • | Provides an overview of the requirements for RCRA land disposal restrictions. See EPA publication EPA-530-K-05-014, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1009IJ2.txt. |
| Large Quantity Generators (LQG) | • | | • | • | Those generating more than 2,200 lbs hazardous waste or 2.2 lbs acute hazardous waste per calendar month are subject to additional RCRA regulations. To determine if you are a large quantity generator, refer to the EPA chart at: http://www.epa.gov/solidwaste/hazard/generation/summary.htm. |

**Table D-4: Transport Resources**

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Department of Energy (DOE) Transportation Routing Analysis Geographic Information System (TRAGIS) | • | • | • | | The Transportation Routing Analysis Geographic Information System (TRAGIS) model is used to calculate highway, rail, or waterway routes within the U.S. and therefore helps identify a transportation mode and route. |
| Department of Transportation (DOT) Hazardous Materials Information Line | • | • | • | | For answers to questions regarding transportation of hazardous materials, call 800-467-4922. |
| Hazardous Waste Manifest System | • | | • | • | To obtain EPA Uniform Hazardous Waste Manifest Form 8700-22 visit http://www.epa.gov/wastes/hazard/transportation/manifest/pdf/newform.pdf or contact the state hazardous waste office. See http://www.epa.gov/waste/hazard/transportation/manifest/index.htm for more information about the program. |
| National HAZMAT (Hazardous Materials) Route Registry (NHMRR) | • | • | • | | The NHMRR provides access to a national repository of both hazardous materials routes that are either designated for HAZMAT transportation or restricted from use by HAZMAT carriers. See http://www.fmcsa.dot.gov/safety-security/hazmat/national-hazmat-Route.aspx. |
| Nuclear Regulatory Commission (NRC) Transportation Requirements | | | | • | The following website provides access to NRC regulatory guides including those with transportation requirements: http://www.nrc.gov/reading-rm/doc-collections/reg-guides/transportation/rg/. |
| Pipeline and Hazardous Materials Safety Administration (PHMSA) | • | • | • | | PHMSA works to protect the American public and the environment by ensuring the safe and secure movement of hazardous materials to industry and consumers by all transportation modes, including the nation's pipelines. Call 202-366-4535 or see http://phmsa.dot.gov/hazmat/regs/sp-a/special-permits. |
| SafeStat (short for Motor Carrier Safety Status Measurement System) | • | • | • | | SafeStat is an automated, data driven analysis system designed by the Federal Motor Carrier Safety Administration (FMCSA). Combines current and historical carrier-based safety performance information to measure the relative (peer-to-peer) safety fitness of interstate commercial motor carriers and intrastate commercial motor carriers that transport hazardous materials. See http://ai.fmcsa.dot.gov/SMS/. |
| State Manifest Requirements | • | | • | • | This EPA website provides links to the state program websites or contacts for the state hazardous waste manifest program. See http://www.epa.gov/epawaste/hazard/transportation/states.htm. |

**Table D-5: Information on Disposal of Solids**

| Resource | CHEM | BIO | TOXIN | RAD | Description |
|---|---|---|---|---|---|
| Land Disposal Restrictions: Summary of Requirements, August 2001 | | | | • | This document summarizes the requirements of the Land Disposal Restrictions (LDR) program. This document is organized in a question-answer format to provide information about LDR regulations. See EPA publication EPA 530-R-01-007, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1004UMF.txt. |
| Paint Filter Liquid Test (SAM Method 9095B), September 2004 | • | • | • | • | This is a method that is used to determine the presence of free liquids in a representative sample of waste. See EPA publication SW-846, http://www.epa.gov/wastes/hazard/testmethods/sw846/pdfs/9095b.pdf for the method description. |
| Resource Conservation Recovery Act Orientation Manual, 2011 | • | | • | | This manual addresses the management of solid or hazardous waste such as contaminated soils, water, debris, and sludges. See http://www.epa.gov/osw/inforesources/pubs/orientat/. |
| Stabilization/Solidification Processes for Mixed Waste, June 1996 | | | | • | The document explains how to solidify mixed waste. See EPA publication EPA 402-R-96-014, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P10094M5.txt. |
| A System's Guide to the Identification and Disposal of Hazardous and Non-Hazardous Water Treatment Plant Residuals, August 2006 | • | | • | • | This document summarizes the RCRA hazardous waste regulations. See EPA publication EPA 816-F-06-011, http://water.epa.gov/drink/info/arsenic/upload/2006_09_14_arsenic_guide_arsenic_disposalhazardous-nonhazardous.pdf. |

# Appendix E: Summary of Potentially Applicable Laws and Regulations

This appendix provides a summary of the federal laws and regulations potentially applicable to the containment and disposal of large amounts of water contaminated with chemical, biological, or radiological (CBR) contaminants. The full text of all the regulations cited below can be found at the Federal Register website (https://www.federalregister.gov/) or the Code of Federal Regulations (CFR) website (http://www.gpoaccess.gov/cfr/index.html).

State and local governments and other federal agencies may have additional regulations for containment and disposal. Those regulations are not summarized in this document. Contact your state or local government for information and guidance.

## EPA Environmental Requirements

- Clean Water Act (CWA; 33 USC 1251 et seq.)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 USC 9601 et seq.)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA; 7 USC 136 et seq.)
- National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR Part 300)
- Oil Pollution Act (OPA; 33 USC 2701 et seq.)
- Resource Conservation and Recovery Act (RCRA; 42 USC 6901 et seq.)
- Safe Drinking Water Act (SDWA; 42 USC 300f et seq.)
- Storage, Treatment, Transportation, and Disposal of Mixed Wastes, Final Rule, May 2001 (66 FR 95. May 16, 2001)
- Toxic Substance Control Act (TSCA; 15 USC 2601 et seq.)

## Other Federal Requirements

### Transportation Requirements

Hazardous Materials Regulations (HMR; 49 CFR Parts 100–185)

### Atomic Energy Act

Atomic Energy Act of 1954, as Amended (AEA; 42 USC 2011 et seq.)

### Disposal Requirements, Non-EPA

Low Level Radioactive Waste Policy Act (Pub. L. 96–573)

### Safety Requirements

Occupational Safety and Health Act (OSH Act; 29 USC 651 et seq.)

### Federal Emergency Assistance

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act; 42 USC 5212–52076)

# Environmental Requirements

## Clean Water Act (CWA; 33 USC 1251 et seq.)

The Clean Water Act establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The Clean Water Act section 301(f) prohibits the discharge to waters of the United States of any radiological, chemical, or biological warfare agent, as well as any high-level radioactive waste or medical waste. For more information, see http://www.epa.gov/lawsregs/laws/cwa.html.

Under the CWA, EPA has implemented pollution control programs and regulates:

- Direct discharges of liquid waste to surface waters (rivers, lakes, etc.) generally through National Pollutant Discharge Elimination System (NPDES) permits (which are in many cases administered on the state level) (40 CFR Part 122)
- Discharges to publicly owned treatment works (POTW) through the National Pretreatment Standards (40 CFR Part 403)
- Discharges of oil to navigable water under 40 CFR Parts 110 and 112

EPA's CWA regulations prohibit the discharge of certain pollutants to a POTW through the National Pretreatment Standards: Prohibited Discharges (40 CFR 403.5). CBR contaminants can be considered pollutants. Prohibitions include pollutants that may:

- Cause a pass-through or interference with the POTW treatment processes (including the quality of sludge)
- Cause corrosive structural damage to the POTW
- Have a pH lower than 5.0 (i.e., are acidic), unless the POTW is designed to handle such a discharge
- Create a fire or explosion hazard
- Obstruct the flow in the POTW

## Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 USC 9601 et seq.)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) provides broad response authority for cleaning up releases of hazardous substances, pollutants or contaminants, establishes potential liability of persons responsible for releases of hazardous substances at these sites, and established a trust fund to provide for cleanup (e.g., when no responsible party could be identified). CERCLA authorizes both short-term removals (e.g., to address releases or threatened releases in need of prompt response), and long-term remedial response actions (e.g., to address releases or threats of releases of hazardous substances for sites listed on EPA's National Priorities List).

CERCLA provides broad federal response authority that EPA (and consistent with Executive Order 12580, other federal agencies) can use for cleanup. EPA may enter into a cooperative agreement with state and local governments to assist in the cleanup where CERCLA section 104 authority is used to respond to a release of CBR contaminants. CERCLA cleanups are carried out consistent with the NCP and existing Superfund program guidance.

See http://www.epa.gov/lawsregs/laws/cercla.html for more information.

## Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA; 7 USC 136 et seq.)

Products used to treat water contaminated with biological contaminants, such as chlorine, chlorine dioxide, and chloramines may be registered as pesticides under the Federal Insecticide, Fungicide, and Rodenticide

Act (FIFRA), in which case they may used only in accordance with the label or labeling approved by EPA. Under FIFRA, no one may sell or distribute a pesticide unless it is registered by the EPA, or is otherwise exempted from the registration requirement. Registration includes approval by the EPA of the pesticide's label, which must give detailed instructions for its safe and effective use and disposal. Different kinds of exemptions are issued by EPA, depending on the situation and whether the criteria for granting such exemptions are met. For example, EPA issued numerous exemptions permitting the use of registered and unregistered antimicrobial pesticides for inactivating Bacillus anthracis spores after EPA reviewed those products to ensure that they would be effective and not present unreasonable adverse effects to humans or the environment. For more information, see http://www.epa.gov/pesticides/factsheets/health_fs.htm.

A chemical contaminant that is a FIFRA cancelled or suspended pesticide, rinsate containing the pesticide, or any other material used to collect excess or spilled quantities of the pesticide may be subject to additional regulations and/or requirements issued by EPA regarding labeling, transportation, storage, and disposal.

Requirements vary depending on the pesticide, and, therefore, the regional EPA office should be contacted to determine if there are additional requirements and/or procedures for a cancelled or suspended pesticide and to determine if those requirements and/or procedures apply to the contaminated water. For more information on pesticides, please see http://www.epa.gov/pesticides/. For more information about FIFRA and cancellation/suspension of pesticides, please see http://www.epa.gov/oecaagct/lfra.html.

## National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 CFR Part 300)

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) provides a blueprint for preparing for and responding to discharges of oil and releases or threats of release of hazardous substances (or of pollutants and contaminants which may present an imminent and substantial endangerment to the public health and welfare). The NCP establishes the National Response Team (NRT), which consists of 16 federal agencies that are responsible for national response and preparedness planning. The NCP also establishes 13 Regional Response Teams (RRTs).[29,30]

Details regarding planning and preparedness are found in 40 CFR 300.200 to 300.220. In this portion of the NCP, the objective, authority, and scopes of the NCP, Regional Contingency Plans (RCPs), and Area Contingency Plans (ACPs) are defined. The NCP, RCP, and ACP may be consulted during the response to a spill for guidance on cleanup and disposal.

The description and breakdown of responsibilities of a response are found in 40 CFR 300.100 to 300.185. This part of the NCP describes the actions and responsibilities of the On-Scene Coordinator (OSC) and federal agencies, as well as establishes the unified command structure.

Regulations specific to oil spill response are found in 40 CFR 300.300 to 300.335 and regulations for responses to hazardous substances releases are found in 40 CFR 300.400 to 300.525.

## Oil Pollution Act (OPA; 33 USC 2701 et seq.)

The OPA establishes provisions that expand the federal government's ability, and provides the money and resources necessary, to respond to oil spills. The OPA provides new requirements for contingency planning both by government and industry. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) has been expanded in a three-tiered approach: the federal government is required to direct all public and private response efforts for certain types of spill events; Area Committees– composed of federal, state,

29 See http://www.nrt.org/ for more information on the NRT.

30 See http://www.nrt.org/Production/NRT/RRTHome.nsf/AllPages/othr_rrt.htm?OpenDocument for information the RRT responsible for your area.

and local government officials – must develop detailed, location-specific Area Contingency Plans; and owners or operators of vessels and certain facilities that pose a serious threat to the environment must prepare their own Facility Response Plans. For more information, see http://www.epa.gov/oem/content/lawsregs/opaover.htm.

## Resource Conservation and Recovery Act (RCRA; 42 USC 6901 et seq.)

The Resource Conservation and Recovery Act gives EPA the authority to control hazardous waste from "the cradle to the grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also sets forth a framework for the management of non-hazardous solid wastes. For more information, see http://www.epa.gov/lawsregs/laws/rcra.html.

Hazardous waste is defined in 40 CFR 261.3, Definitions of Hazardous Waste. A waste may be considered hazardous if it exhibits certain hazardous properties (characteristics) in 40 CFR 261.21 to 261.24 or if it is listed as a hazardous waste in 40 CFR 261.31 to 261.33, Subpart D – Lists of Hazardous Wastes. Waste streams that are not listed specifically as hazardous wastes may exhibit hazardous characteristics and thus be a RCRA hazardous waste. RCRA identifies four hazardous waste characteristic properties: ignitability, corrosivity, reactivity, or toxicity. Methods used to determine if a waste qualifies as hazardous waste are found in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846).[31] Water produced during treatment that meets the definition of "Hazardous Waste" as described above may be subject to RCRA regulation (Subtitle C, 40 CFR Parts 260 to 299).

Under RCRA, EPA has promulgated regulations for generators of hazardous waste (40 CFR Part 262), hazardous waste treatment facilities (40 CFR Parts 264 and 265), hazardous waste storage facilities (40 CFR Parts 264, 265, and 270), hazardous waste transporters (40 CFR Part 263), and state hazardous waste management plans (40 CFR Part 271).

As described in 40 CFR 264.1(g)(8)(i), RCRA Part 264 regulations do not apply to a person containing or treating waste during immediate response to the following except as provided in paragraph (g)(8)(ii) of the same section:

- A discharge of a hazardous waste[32]
- An imminent and substantial threat of a discharge of hazardous waste
- A discharge of a material that, when discharged, becomes a hazardous waste
- An immediate threat to human health, public safety, property, or the environment, from the known or suspected presence of military munitions, other explosive material, or an explosive device, as determined by an explosive or munitions emergency response specialist as defined in 40 CFR 260.10

## Safe Drinking Water Act (SDWA; 42 USC 300f et seq.)

The Safe Drinking Water Act was established to protect the quality of drinking water in the U.S. This law focuses on all waters actually or potentially designed for drinking use, whether from above ground or underground sources. The Act authorizes EPA to establish national primary drinking water regulations for water for human consumption and requires all owners or operators of public water systems to comply with these standards. For more information, see http://www.epa.gov/lawsregs/laws/sdwa.html or http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm. EPA's regulations are at 40 CFR Part 141. More information about the standards is available at http://water.epa.gov/drink/standardsriskmanagement.cfm. A list of the standards can be found at http://water.epa.gov/drink/contaminants/index.cfm. The National Secondary Drinking Water

31 See http://www.epa.gov/osw/hazard/testmethods/sw846/online/index.htm.

32 Discharge is defined as the accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of hazardous waste into or on any land or water (40 CFR 260.10, Definitions).

Regulations are listed in Part 143 of the SDWA. These regulations control contaminants that primarily affect the aesthetic qualities relating the public acceptance of drinking water. At considerably higher concentrations of these contaminants, health implications may also exist. The secondary regulations are not federally enforceable but are intended as guidelines for states. There are secondary regulations for 15 contaminants. For more information see http://water.epa.gov/drink/contaminants/secondarystandards.cfm.

The SDWA also required EPA to establish regulations for the UIC Program to prevent endangerment of underground sources of drinking water (USDWs). The UIC regulations are at 40 CFR Parts 144–148. UIC programs are administered by EPA or states with primary enforcement responsibility for the program. States may have more stringent requirements. There are six classes of injection wells: Hazardous, Radioactive, Industrial & Municipal Waste Disposal Wells (Class I), Waste disposal wells for oil and gas production (Class II), Solution Mining Wells (Class III), Shallow Hazardous and Radioactive Injection Wells (Class IV; banned in 1984), injection wells not included in Class I, II, III, IV, or VI (Class V), and Geological Sequestration of Carbon Dioxide (Class VI).

**Table E-1** describes the different classes of injection wells and considerations specific to each well class. Refer to EPA's *Technical Program Overview: Underground Injection Control Regulations* for further guidance on the regulations of UIC wells.[33]

33 See http://water.epa.gov/type/groundwater/uic/upload/2004_5_3_uicv_techguide_uic_tech_overview_uic_regs.pdf.

**Table E-1: Classes and Considerations for Underground Injection/Well Disposal[34]**

| Class | Use | Considerations |
|---|---|---|
| I | • Includes deep injection wells used for hazardous waste, radioactive waste and other industrial material<br>• As defined in 40 CFR 144.3, radioactive waste includes any waste which contains radioactive material in concentrations which exceed those listed in 10 CFR 20, Appendix B, Table 2, Column 2<br>• There are approximately 650 Class I injection wells nationwide, of those only about 113 are used for the injection of hazardous waste.<br>• Only 10 states have wells that accept hazardous waste | • Class I hazardous or mixed radioactive waste disposal wells have the most stringent USDW protective requirements<br>• As with all well classes under the UIC program may not conduct any injection activity in a manner that allows the movement of fluid containing any contaminant into USDWs, if the presence of that contaminant may cause a violation of any primary drinking water standard under 40 CFR 142 or may otherwise adversely affect public health (40 CFR 144.12)<br>• Very few Class I facilities are able to accept hazardous waste generated off site<br>• Fluids must be injected below the lowermost formation containing a USDW<br>• Class I wells can be expensive to construct because they are technically complex<br>• No radioactive waste disposal wells are currently in operation |
| II | Includes injection wells used for disposal of fluid brought to the surface in connection with oil and natural gas production, or for enhanced recovery of oil or natural gas, or liquid hydrocarbon storage | Not an option |
| III | Wells which inject to extract minerals | Not an option |
| IV | Shallow wells used to inject hazardous or radioactive waste into or above an underground source of drinking water (USDW) | Class IV wells were banned in 1984 with the exception of wells used to inject contaminated ground water that has been treated and is being reinjected into the same formation from which it was drawn, if such injection is approved by EPA, or a State, pursuant to provisions for a cleanup of releases under CERCLA or RCRA |
| V | • Injection wells not included in Classes I – IV, or VI<br>• Class V wells are located in every state | • As with all well classes under the UIC program may not conduct any injection activity in a manner that allows the movement of fluid containing any contaminant into USDWs, if the presence of that contaminant may cause a violation of any primary drinking water standard under 40 CFR 142 or may otherwise adversely affect public health (40 CFR 144.12) |
| VI | • Wells that are used for geologic sequestration of carbon dioxide beneath the lowermost USDW | • Not an option |

34 For more information on UIC and well disposal classes, please visit http://water.epa.gov/type/groundwater/uic/index.cfm.

## Storage, Treatment, Transportation, and Disposal of Mixed Wastes, Final Rule, May 2001 (66 Federal Register 95 (16 May 2001), pp. 27217-27266)

Following the *Storage, Treatment, Transportation, and Disposal of Mixed Wastes, Final Rule*, low-level mixed waste (LLMW) may be conditionally exempt from RCRA storage, treatment, transportation, and disposal regulations if the waste meets several conditions.[35] Conditionally exempt LLMW is then stored, treated, transported, and disposed as low-level radioactive waste (LLRW).

This exemption is applicable only in RCRA-authorized states that have adopted the exemption provisions. States may also have additional conditions for the exemption. If waste does not qualify for the exemption it is subject to both NRC and RCRA requirements.

**Table E-2** provides a summary of the provisions for the conditional exemption.

35 Refer to http://www.gpo.gov/fdsys/pkg/FR-2001-05-16/pdf/01-11408.pdf for the full text of the final rule.

**Table E-2: Summary of Storage, Treatment, Transportation, and Disposal of Mixed Wastes, Final Rule, May 2001**

| Action | Conditions for Exemption | Notifications | Recordkeeping |
|---|---|---|---|
| Storage | • Waste is generated under a single NRC or Agreement State license<br>• Waste is stored in a tank or container | • Notify RCRA regulatory authority in writing by certified delivery claiming a conditional exemption for the LLMW<br>– Notify within 90 days of when a storage unit is first used to store conditionally exempt LLMW<br>– Include your name, address, RCRA identification number, NRC or NRC Agreement State license number, the waste code(s) and storage unit(s), and a statement that you meet the conditions of this subpart<br>– Check to make sure the notification is signed by the authorized representative. | • Keep the following:<br>– Records required by NRC or NRC Agreement State license<br>– Initial notification records<br>– Return receipts<br>– Reports of failures to meet the exemption conditions<br>– All records supporting any reclaim of an exemption<br>– Certification that facility personnel who manage stored mixed waste are trained in safe management of LLMW<br>– Emergency plan as specified in 40 CFR 266.230(b)<br>• Keep all records for as long as the exemption is claimed and for 3 years thereaft |
| Treatment | • Waste is treated in a tank or container<br>• Waste must be treated to levels that are as low as reasonably achievable (ALARA)<br>• Waste cannot be transported if one wishes to maintain the LLMW exemption | | |
| Transportation | • Comply with NRC or Agreement State regulations and manifest requirements<br>• Waste must be treated to levels that are ALARA<br>• Solid waste must be treated to land disposal restrictions (LDR) treatment standard | • Provide notice to the RCRA regulatory authority claiming the transportation conditional exemption prior to shipment (notice must include the facility name, address, phone number, RCRA ID, and be sent by certified delivery)<br>• Notify those receiving the exempted waste before shipment. Notification includes:<br>– A statement that you have claimed the waste exemption<br>– A statement that the waste meets LDR treatment standards<br>– Facility's name, address, and RCRA ID number<br>– A statement that the waste must be placed in a container according to 40 CFR 266.340 prior to disposal<br>– The manifest number of the shipment that will contain the exempt waste<br>– A certification that all the information provided is true, complete and accurate | |
| Disposal | • Liquids cannot be disposed of at LLRW disposal facilities<br>• Solid waste must be treated to LDR treatment standards and disposed of in containers meeting NRC requirements | | |

### Toxic Substance Control Act (TSCA; 15 USC 2601 et seq.)

The Toxic Substance Control Act (TSCA) provides EPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. TSCA also addresses chemicals specifically including polychlorinated biphenyls (PCBs), asbestos, radon and lead-based paint. For additional information, see http://www.epa.gov/lawsregs/laws/tsca.html. Under TSCA authority, EPA has promulgated regulations to implement pre-market review of any new chemical substance before it is introduced into commerce. Under TSCA, EPA developed regulations for disposal of liquids and solids contaminated with PCBs.

## Transportation Requirements

### Hazardous Materials Regulations (HMR; 49 CFR Parts 100–185)

For information on the Hazardous Materials Regulations and other Department of Transportation (DOT) transport requirements see: http://www.phmsa.dot.gov/hazmat/regs/.

## Safety Requirements

### Occupational Safety and Health Act (OSH Act; 29 USC 651 et seq.)

For information about the Occupational Safety and Health Act and worker health and safety guidance refer to: http://www.osha.gov/.

## Federal Emergency Assistance

### The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act; 42 USC 5121 et seq.)

If state and local resources are overwhelmed during an emergency or major disaster, the Stafford Act provides guidance on how the state can request federal assistance. For information about the Stafford Act and the process for receiving federal assistance during an emergency or major disaster, refer to: https://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=3564.

# Appendix F: References

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