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Protecting Water Quality in Virginia: Recommendations to Combat Sea Level Rise and Increased Storm Events



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Virginia Coastal Policy Center
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About the Author



Madhavi Kulkarni is a third-year student at William & Mary Law School. Madhavi serves as Editor-in-Chief of Volume 44 of the William & Mary Environmental Law and Policy Review. She has previously interned with the Eastern Environmental Law Center and the Environmental Enforcement section of the New Jersey Office of the Attorney General. She graduated from Rutgers University in 2017 with a B.A. in Economics. In fall 2020, Madhavi will clerk for the Honorable Nesle Rodriguez in the New Jersey Superior Court system.

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About the Virginia Coastal Policy Center

The Virginia Coastal Policy Center (VCPC) at the College of William & Mary Law School provides science-based legal and policy analysis of ecological issues affecting the state's coastal resources, by offering education and advice to a host of Virginia's decision-makers, from government officials and legal scholars to non-profit and business leaders.

With two nationally prominent science partners – the Virginia Institute of Marine Science and Virginia Sea Grant – VCPC works with scientists, local and state political figures, community leaders, the military, and others to integrate the latest science with legal and policy analysis to solve coastal resource management issues. VCPC activities are inherently interdisciplinary, drawing on scientific, economic, public policy, sociological, and other expertise from within the University and across the country. With access to internationally recognized scientists at VIMS, to Sea Grant's national network of legal and science scholars, and to elected and appointed officials across the nation, VCPC engages in a host of information exchanges and collaborative partnerships.

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if you have comments,
questions, or suggestions.

VCPC grounds its pedagogical goals in the law school's philosophy of the citizen lawyer. VCPC students' highly diverse interactions beyond the borders of the legal community provide the framework for their efforts in solving the complex coastal resource management issues that currently face Virginia and the nation.

VCPC is especially grateful to the Virginia Environmental Endowment for providing generous funding to support our work as well as to establish the clinic in fall 2012.

I. BACKGROUND: IMPACTS OF SEA LEVEL RISE AND STORM EVENTS

Sea level rise and storm events have plagued coastal communities in the United States for several decades. In particular, sea level in Norfolk, Virginia, has risen about 1.45 feet since it was first recorded in 1938¹ and, by 2050, Norfolk is expected to experience the highest level of relative sea level rise among major coastal regions on the United States East Coast.² The Hampton Roads region experiences monthly “sunny-day flooding” of roads and communities.³ This is caused by ocean pressure due to sea level rise and higher tides, which can push seawater into drainage pipes and cause flooding.⁴ Sea level is estimated to rise by over 20 inches in the Hampton Roads region by 2050.⁵

Increased and more frequent storm events place an additional burden on communities already afflicted by the negative effects of sea level rise. Not only do sea level rise and increased storm events present risks of flooding and temporary and permanent inundation—which can affect infrastructure—these events also affect water quality.⁶ Stormwater can carry a slew of harmful pollutants, such as pesticides, fertilizers, vehicle discharges, garbage, chemicals, and even human waste.⁷ A study conducted in 2017 during the King Tide flooding event found that floodwater that receded from the high tide contained particulate carbon and nitrogen, total suspended solids,

¹ Larry P. Atkinson et al., *Sea Level Rise and Flooding Risk in Virginia*, 5 SEA GRANT L. & POL’Y J. 3, 6 (2013), https://digitalcommons.odu.edu/cgi/viewcontent.cgi?article=1116&context=ccpo_pubs.

² *Compare Report Card Values*, VA. INST. MARINE SCI., <https://www.vims.edu/research/products/slrc/compare/index.php> (last visited June 15, 2020).

³ NOAH SACHS & DAVID FLORES, CTR. FOR PROGRESSIVE REFORM, TOXIC FLOODWATERS: THE THREAT OF CLIMATE-DRIVEN CHEMICAL DISASTER IN VIRGINIA’S JAMES RIVER WATERSHED 8 (Mar. 2019), <https://cpr-assets.s3.amazonaws.com/documents/VAToxicFloodwaters.pdf>.

⁴ WILLIAM SWEET ET AL., NAT’L OCEANIC AND ATMOSPHERIC ADMIN., 2018 STATE OF U.S. HIGH TIDE FLOODING WITH A 2019 OUTLOOK 10 (June 2019), https://tidesandcurrents.noaa.gov/publications/Techrpt_090_2018_State_of_US_HighTideFlooding_with_a_2019_Outlook_Final.pdf; *Virginia’s Sea Level Is Rising*, SEALEVELRISE.ORG, <https://sealevelrise.org/states/virginia/> (last visited June 15, 2020).

⁵ *Sea-level report cards: 2019 data adds to trend in acceleration*, VA. INST. MARINE SCI. (Jan. 30, 2020), https://www.vims.edu/newsandevents/topstories/2020/slrc_2019.php.

⁶ CLAIRE WELTY ET AL., COMM. ON REDUCING STORMWATER DISCHARGE CONTRIBUTIONS TO WATER POLLUTION, NAT’L RESEARCH COUNCIL OF THE NAT’L ACADS., URBAN STORMWATER MANAGEMENT IN THE UNITED STATES 3 (2009); INST. FOR ENVTL. NEGOTIATION, UNIV. OF VA., SEA LEVEL RISE IN HAMPTON ROADS: FINDINGS FROM THE VIRGINIA BEACH LISTENING SESSIONS 20 (2011), <https://ien.arch.virginia.edu/sites/ien.virginia.edu/files/SLR%20HamptonRoads%20Final%20July2011.pdf> (in addition to water quality, sea level rise can affect stormwater outflows, flooding during storms and inundation, erosion, traffic, property values, insurance coverage, business health, and wildlife habitat/migration patterns); GEORGE VAN HOUTVEN ET AL., VA. COASTAL POLICY CTR., COSTS OF DOING NOTHING: ECONOMIC CONSEQUENCES OF NOT ADAPTING TO SEA LEVEL RISE IN THE HAMPTON ROADS REGION ES-2, 3-1–3-3 (Nov. 2016), <https://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/reports/Costs%20of%20Doing%20Nothing%20Cover%20and%20Final%20Report.pdf> (explaining that the increased likelihood of more damaging storm surges due to sea level rise increases residential property damage substantially).

⁷ WELTY ET AL., *supra* note 6, at 1, 4; Sarah Vogel song, *Why stormwater poses an increasing challenge for Virginia*, VA. MERCURY (Jan. 22, 2020), <https://www.virginiamercury.com/2020/01/22/why-stormwater-poses-an-increasing-challenge-for-virginia/>.

ammonium, nitrite, nitrate, urea, and phosphate concentrations.⁸ Stormwater is typically treated by stormwater best management practices (“BMP”) before being discharged, but excessive storm events can overpower these facilities and directly release contaminated stormwater into a body of water.⁹ Sea level rise and coastal storm hazards can also pose a significant threat to water quality by inundating coal ash buried in unlined pits¹⁰ and wastes stored in landfills.¹¹ And, an increase in storm events increases the threat of pollution from animal waste – either because the storage system containing the waste is vulnerable to flooding or because of the timing of the waste application in relation to the storm event.¹²

Pursuant to the federal Clean Water Act (“CWA”),¹³ the Environmental Protection Agency (“EPA”) requires states to submit biannual Water Quality Assessment Reports to evaluate the condition of waters within the states.¹⁴ This report satisfies the requirements of sections 305(b) and 303(d) of the CWA and the Virginia Water Quality Monitoring, Information and Restoration Act.¹⁵ In furtherance of this purpose, the Virginia Department of Environmental Quality (“DEQ”) created the Water Quality Monitoring Strategy (the “Strategy”) and submitted this to the EPA for review in 1999.¹⁶ The purpose of this Strategy is to answer the following questions: (1) “what is the overall quality of waters in the State?”, (2) “to what extent is water quality changing over

⁸ Alfonso Macias-Tapia et al., *Water Quality Impacts from Tidal Flooding in the Southern Chesapeake Bay*, 15 COLLEGE SCIS. POSTERS (2019), https://digitalcommons.odu.edu/sciences_achievement/15/.

⁹ See generally Michelle A. Hummel et al., *Sea Level Rise Impacts on Wastewater Treatment Systems Along the U.S. Coasts*, 6 EARTH’S FUTURE 622 (2018), <https://agupubs.onlinelibrary.wiley.com/doi/10.1002/2017EF000805>.

¹⁰ For example, as of 2017, an estimated 2.1 million tons of buried coal ash at the Chesapeake Energy Center in Chesapeake, Virginia, are highly vulnerable. See generally ROBERT S. YOUNG, ET AL., PROGRAM FOR THE STUDY OF DEVELOPED SHORELINES, W. CAROLINA UNIV., COASTAL HAZARD AND SEA-LEVEL RISE VULNERABILITY ASSESSMENT (Jan. 2017), https://www.southernenvironment.org/uploads/words_docs/Chesapeake_Energy_Center_Final_Vulnerability_Assessment1.pdf.

¹¹ Older landfills often are unlined. Additionally, sea level rise increases the risk of contaminants or pollutants leaching through landfill liners since saltwater can permeate through clay liners that are impervious to fresh water, may affect waste buoyancy control, and increases the likelihood of standing pools of brackish water. OZGE KAPLAN ET AL., OFFICE OF RESEARCH & DEV., U.S. ENVTL. PROT. AGENCY, VULNERABILITY OF WASTE INFRASTRUCTURE TO CLIMATE INDUCED IMPACTS IN COASTAL COMMUNITIES 30 (July 2019), https://www.epa.gov/sites/production/files/2019-11/documents/vulnerability_of_waste_infrastructure_to_climate_induced_impacts_in_coastal_communities.pdf.

¹² *Spraying Animal Waste is Bad, and Worse Before a Hurricane*, S. ENVTL. L. CTR. (Sept. 16, 2019), <https://www.southernenvironment.org/news-and-press/news-feed/spraying-animal-waste-is-bad-and-worse-before-a-hurricane>.

¹³ 33 U.S.C. §§ 1313, 1315 (2012).

¹⁴ *Waters Assessed as Impaired due to Nutrient-Related Causes*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/nutrient-policy-data/waters-assessed-impaired-due-nutrient-related-causes> (last updated Feb. 19, 2020).

¹⁵ *Final 2018 305(b)/303(d) Water Quality Assessment Integrated Report Executive Summary*, VA. DEP’T OF ENVTL. QUALITY, [https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2018305\(b\)303\(d\)IntegratedReport.aspx](https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2018305(b)303(d)IntegratedReport.aspx) (last visited June 15, 2020); *Identifying and Listing Impaired Waters under the Clean Water Act*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/tmdl/identifying-and-listing-impaired-waters-under-clean-water-act> (last updated Sept. 7, 2018).

¹⁶ VA. DEP’T OF ENVTL. QUALITY, WATER QUALITY MONITORING SYSTEM: INTRODUCTION AND PURPOSE 8 (2013), https://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityMonitoring/WQMStrategy_ChI_Introduction.pdf.

time?”, (3) “what are the problem areas and the areas needing protection?”, (4) “what level of protection is needed?”, and (5) “how effective are the established clean water programs?”¹⁷ Since 2000, DEQ has assessed the quality of state waters through data generated from the collection and analysis of ambient surface water samples, pursuant to the Strategy.¹⁸ An annual Monitoring Plan presents the planned water quality monitoring procedures for the upcoming calendar year to advance the objectives of the Strategy.¹⁹

In 2018, DEQ’s biannual report found that 15 percent of rivers, 81 percent of lakes, and 75 percent of estuaries in the state are impaired, meaning that they contain more of a pollutant than is allowed by state and federal water quality criteria and/or may not support a designated use of a surface water (such as aquatic life or wildlife habitat, fish consumption, shell fishing, recreation, or public water supply).²⁰ These waters are found to have some combination of excess nutrients, suspended solids, bacteria, metals, pesticides, herbicides, toxic organic compounds, and/or a number of other contaminants.²¹ Low dissolved oxygen levels can also cause degradation of benthic, or bottom-dwelling, communities in lakes and estuarine waters.²² The percent of impaired waters in the state dwarfs the 6 percent of rivers, 15 percent of lakes, and 11 percent of estuaries that were found to be non-impaired.²³ Nearly all of Virginia’s watersheds have impaired segments, with the greatest numbers of impairments in basins along the coast.²⁴

Impairment of Virginia waters is tied to coastal storm hazards and sea level rise because excess floodwaters are contaminated by flood-exposed industrial and residential facilities, and these toxic floodwaters flow into the state’s water bodies. In Virginia, thousands of industrial facilities can potentially be subjected to the effects of stormwater flooding, hurricane storm surge, and sea level rise, in turn affecting water quality.²⁵ Failing or unmaintained septic systems also pose a major threat to the quality of Virginia waters that increases with recurrent inundation by flood waters.²⁶ A combination of changes to law and policy and investment in infrastructure are essential to combating the effects of coastal storm hazards and sea level rise on water quality in

¹⁷ *Id.* at 9.

¹⁸ *Id.* at 8.

¹⁹ *Annual Water Quality Monitoring Plan*, VA. DEP’T OF ENVTL. QUALITY, <https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityMonitoring/AnnualWaterQualityMonitoringPlan.aspx> (last visited June 15, 2020).

²⁰ VA. DEP’T OF ENVTL. QUALITY, *supra* note 15 (Executive Summary, pgs. i-ii). Note that 78% of rivers were not assessed “due to the addition of many new headwaters streams in the mapped coverage,” and 3% of lakes and 14% of estuaries were also not assessed due to an increase in stream mileage that has so far not been assessed due to limits on resources. *Id.* at ii. Therefore, the listed percentage of impaired waterways is likely not indicative of the total amount of impaired waterways.

²¹ *Id.* at i.

²² *Id.* at v.

²³ *Id.* at ii.

²⁴ *Distribution of Impaired Waters in Virginia’s Watershed*, VA. DEP’T OF ENVTL. QUALITY (May 7, 2019), https://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityAssessments/IntegratedReport/2018/maps/Impairment_Distribution_2018.pdf.

²⁵ SACHS & FLORES, *supra* note 3, at 3.

²⁶ *The Problem of Failing Septic Systems*, RIVERS & COAST (Ctr. for Coastal Res. Mgmt., Va. Inst. of Marine Sci.), Summer 2019, at 1, <https://scholarworks.wm.edu/cgi/viewcontent.cgi?article=3004&context=reports>.

Virginia while simultaneously protecting the state’s most vulnerable populations against the negative effects of reduced water quality.

II. EXISTING REGULATION OF FACILITIES THAT ARE AFFECTED BY SEA LEVEL RISE AND INCREASED STORM EVENTS

A. Industrial Facilities

Federal regulation of underground storage tanks consists of technical and financial responsibility requirements, as well as a system to approve state regulatory programs for underground storage tanks.²⁷ These regulations outline design requirements to protect against corrosion, prevent spills and accidental overfills, and ensure proper installation of the tank.²⁸ The regulations also contain operating requirements for underground storage tanks, including appropriate filling practices, owner and operator training, leak detection procedures, and reporting requirements.²⁹ These requirements apply to underground storage tanks that contain petroleum products and hazardous substances as defined under the Comprehensive Environmental Response, Compensation, and Liability Act (“CERCLA”), excluding hazardous wastes,³⁰ and that have 10 percent or more of their volume underground.³¹ Importantly, septic tanks and stormwater and wastewater collection systems are exempt from federal regulation of underground storage tanks.³² Virginia law imposes many of the same requirements as federal law for underground storage tanks—spill containment provisions, overfill devices to alert of overfills of the tank, corrosion protection, release detection, and financial responsibility.³³

In contrast, aboveground storage tanks are not nearly as well regulated by the federal or state governments. Under the federal system, aboveground storage tanks are loosely regulated

²⁷ *Learn About Underground Storage Tanks (USTs)*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ust/learn-about-underground-storage-tanks-usts#reqs> (last updated Dec. 30, 2019).

²⁸ DEF. LOGISTICS AGENCY, ENERGY ENVIRONMENTAL GUIDE FOR FUEL FACILITIES, CHAPTER 3: UNDERGROUND STORAGE TANKS 3-2–3-3 (Mar. 2019), https://www.dla.mil/Portals/104/Documents/Energy/Publications/Environmental%20Guide%20for%20Fuel%20Facilities/Chapter3_UndergroundStorageTanks_Mar2019.pdf?ver=2019-04-17-084150-067.

²⁹ *Id.* at 3-4–3-6.

³⁰ For purposes of differentiating from hazardous substances more generally, hazardous waste is defined as “a solid waste or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (a) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.” 42 U.S.C. § 6903(5) (2014).

³¹ 40 C.F.R. § 280.12 (2012); DEF. LOGISTICS AGENCY, *supra* note 28.

³² *Learn About Underground Storage Tanks (USTs)*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ust/learn-about-underground-storage-tanks-usts#reqs> (last updated Dec. 30, 2019).

³³ *Underground Storage Tanks*, VA. DEP’T OF ENVTL. QUALITY, <https://www.deq.virginia.gov/Programs/LandProtectionRevitalization/PetroleumProgram/StorageTanks/UndergroundStorageTanks.aspx> (last visited June 15, 2020).

through a patchwork of regulations of other activities.³⁴ Specifically, aboveground storage tanks need to satisfy Spill Prevention, Control, and Countermeasure (“SPCC”) and Facility Response Plan (“FRP”) rules.³⁵ The goal of SPCC regulations is to “prevent oil from reaching navigable waters and adjoining shorelines, and to contain discharges of oil.”³⁶ Additionally, “facilities that could reasonably be expected to cause ‘substantial harm’ to the environment by discharging oil into or on navigable waters are required to prepare and submit Facility Response Plans,” and “facilities that could cause ‘significant and substantial harm’ are required to have their plans approved by an EPA Regional Administrator.”³⁷ These regulations apply to aboveground storage tank facilities that either have an aggregate aboveground oil storage capacity of at least 1,320 gallons or, if parts of the facility are underground, the completely buried oil storage capacity of the facility is 42,000 gallons or more, as long as the following three conditions are satisfied: (1) the facility is non-transportation related, (2) the facility is engaged in “drilling, producing, gathering, storing, processing, refining, transferring, distributing, using or consuming oil,” and (3) the facility is “reasonably . . . expected to discharge oil in quantities that may be harmful . . . [to] the navigable waters of the United States or adjoining shorelines.”³⁸

In Virginia, regulation of aboveground storage tanks is also limited to oil and petroleum storage.³⁹ Registration and notification requirements are imposed on facilities with an aggregate aboveground oil storage capacity of at least 1,320 gallons, while pollution prevention and oil discharge contingency plan requirements do not attach until facilities have a capacity of at least 25,000 gallons.⁴⁰ These requirements are more lax than the federal regulations, which require that even facilities with the lower capacity of 1,320 gallons submit Facility Response Plans if the facility could reasonably be expected to cause substantial harm by discharging oil.⁴¹ Additionally, Virginia does not regulate aboveground tanks that store hazardous wastes listed or identified under the federal Resources Conservation and Recovery Act (“RCRA”),⁴² and regulation of oil storage is subject to a myriad of exceptions, including limits based on volume and the exclusion of liquid petroleum gases.⁴³

³⁴ See *Aboveground Storage Tanks*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/ust/aboveground-storage-tanks> (last updated Aug. 29, 2016); see generally DEF. LOGISTICS AGENCY, *supra* note 28.

³⁵ *Oil Spills Prevention and Preparedness Regulations*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations> (last updated Apr. 1, 2020); see 40 C.F.R. § 112 (2011).

³⁶ *Overview of the Spill Prevention, Control, and Countermeasure (SPCC) Regulation*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations/overview-spill-prevention-control-and> (last updated Apr. 4, 2018); see 40 C.F.R. § 112.1 (2011).

³⁷ *Facility Response Plan (FRP) Applicability*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations/facility-response-plan-frp-applicability> (last updated Apr. 4, 2018); see 40 C.F.R. § 112.20 (2011) for criteria to find that a facility could cause “substantial harm” or “significant and substantial harm”.

³⁸ 40 C.F.R. § 112.1.

³⁹ See 9 VA. ADMIN. CODE § 25-91-20 (2015).

⁴⁰ *Id.*

⁴¹ 40 C.F.R. § 112.20.

⁴² 40 C.F.R. §§ 261.31-.33 (2012); 9 VA. ADMIN. CODE § 25-91-30 (2015).

⁴³ For example, an aboveground storage tank with a storage capacity of 660 gallons or less of oil is not subject to regulation. 9 VA. ADMIN. CODE § 25-91-30. Aboveground storage tanks that store propane gas, butane gas, or other liquid petroleum gases, as well as those that store nonpetroleum hydrocarbon-based animal and vegetable oils are also exempt from regulation. *Id.*

B. Agricultural Facilities

Agricultural facilities also often enjoy exceptions to permitting and reporting requirements. Pursuant to the CWA,⁴⁴ which established the “basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters”⁴⁵ and requires the acquisition of permits before dredged or fill material from point sources may be discharged into the navigable waters of the United States,⁴⁶ DEQ issues Virginia Pollutant Discharge Elimination System (“VPDES”) permits to point source dischargers of pollutants within the state.⁴⁷ Among other activities, this permit covers discharges of domestic sewage, pesticides, petroleum, stormwater associated with industrial activity, car washes and commercial laundries, and nutrients and sediments to the Chesapeake Bay,⁴⁸ but not agricultural facilities except in certain instances. Importantly, as of 2011, Virginia does not issue *general* VPDES permits for animal feeding operations (“AFOs”)—facilities where animals have been, are, or will be confined and fed for a total of 45 days or more over a 12-month period—that discharge waste from point sources.⁴⁹ Instead, DEQ decided to begin issuing *individual* VPDES permits for qualifying CAFOs.⁵⁰ Individual permits “reflect site-specific conditions of a single discharger . . . based on information submitted by that discharger in a permit application and is unique to that discharger,” while general permits “cover multiple dischargers with similar operations and types of discharges based on the permit writer’s professional knowledge of those types of activities and discharges.”⁵¹ As of April 2020, DEQ has issued eleven individual VPDES permits to concentrated animal feeding operations (“CAFO”).⁵² A CAFO is any AFO that reaches a minimum threshold for the

⁴⁴ 33 U.S.C §§ 1251–1387 (2011).

⁴⁵ *Summary of the Clean Water Act*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/laws-regulations/summary-clean-water-act> (last updated Mar. 11, 2019).

⁴⁶ *Clean Water Act (CWA) Compliance Monitoring*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/compliance/clean-water-act-cwa-compliance-monitoring> (last updated Apr. 7, 2020).

⁴⁷ VA. DEP’T OF ENVTL. QUALITY, VPDES PERMIT MANUAL: VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM 1 (2014), <https://www.deq.virginia.gov/Portals/0/DEQ/Water/PollutionDischargeElimination/VPDESPermitManual.pdf>.

⁴⁸ *VPDES Permits, Fees, and Regulations*, VA. DEP’T OF ENVTL. QUALITY, <https://www.deq.virginia.gov/Programs/Water/PermittingCompliance/PollutionDischargeElimination/PermitsFees.a.spx> (last visited June 15, 2020).

⁴⁹ U.S. ENVTL. PROT. AGENCY, VIRGINIA ANIMAL AGRICULTURE PROGRAM ASSESSMENT 50 (Feb. 2015), https://www.epa.gov/sites/production/files/2015-07/documents/virginia_animal_agriculture_program_assessment_final_2.pdf.

⁵⁰ *Id.*

⁵¹ *NPDES Permit Basics*, U.S. ENVTL. PROT. AGENCY, <https://www.epa.gov/npdes/npdes-permit-basics> (last updated July 12, 2019).

⁵² See VA. DEP’T OF ENVTL. QUALITY, ACTIVE ANIMAL WASTE PERMITS AS OF APRIL 3, 2020 (on file with author) [HEREINAFTER “ACTIVE PERMITS”].

number of animals at an operation⁵³ or has been designated as a CAFO by the appropriate federal or state permitting authority.⁵⁴

Because VPDES permits must only be issued to facilities that discharge pollutants through point sources, CAFOs that manage their waste so they do not generate a point source discharge are not required to obtain these permits.⁵⁵ Instead, CAFOs that generate nonpoint discharges of waste, and many AFOs in Virginia, are required to obtain a general permit under Virginia Pollution Abatement (“VPA”) regulations.⁵⁶ A VPA permit is required for “any person who prepares biosolids or applies biosolids to the land,” “biosolids applied to the land,” and “land where biosolids [are] applied.”⁵⁷ DEQ issues two different types of general permits under the VPA permitting program: (1) general permits for AFOs and animal waste management and (2) general permits for poultry waste management. General permits for AFOs and animal waste management are issued for the pollution management activities of AFOs with 300 or more animal units that use a liquid manure collection and storage system not covered under the VPDES permitting system and also govern animal waste management.⁵⁸ This general permit became effective on November 16, 2014, and is set to expire on November 15, 2024.⁵⁹ Among other requirements, this general VPA permit sets standards for monitoring soil, groundwater, and waste; designing and operating liquid manure and storage facilities; implementing nutrient management plans (“NMP”); transferring waste; applying waste to the land; retaining records of monitoring activities; and reporting any noncompliance with the VPA general permit to DEQ.⁶⁰ While owners of regulated AFOs must comply with all of these requirements, animal waste end-users are not required to obtain these permits.⁶¹ Instead, they are only required to comply with certain technical requirements outlined in VPA regulations, including maintaining records of the transfer and land application of animal waste⁶² and complying with certain storage and land application requirements.⁶³

⁵³ For example, an AFO is defined as a “Large CAFO” if the facility confines, among other animals, 700 mature dairy cows; 2,500 swine each weighing 55 pounds or more; 55,000 turkeys; or 30,000 laying hens or broilers, if the AFO uses a liquid manure handling system. An AFO is defined as a “Medium CAFO” if the facility confines, among other animals, 200 to 699 dairy cows; 750 to 2,499 swine each weighing 55 pounds or more; 16,500 to 54,999 turkeys; or 9,000 to 29,999 laying hens or broilers, if the AFO uses a liquid manure handling system. 40 C.F.R. § 122.23(b) (2012); 9 VA. ADMIN. CODE § 25-31-10 (2016).

⁵⁴ See 40 C.F.R. § 122.23(c) (2011).

⁵⁵ NEIL ZAHRADKA, VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM (VPDES) PERMITS FOR CAFOs: DUTY TO APPLY AND PERMITTED DISCHARGES 15 (Sept. 27, 2018), <https://www.acwa-us.org/wp-content/uploads/2018/10/Neil-Zahradka-Duty-to-Apply-and-VA-Program-2018-CAFO-Roundtable.pdf>.

⁵⁶ “This general permit regulation governs the pollutant management activities at animal feeding operations having 300 or more animal units utilizing a liquid manure collection and storage system not covered by a Virginia Pollutant Discharge Elimination System (VPDES) permit and animal waste utilized or stored by animal waste end-users.” 9 VA. ADMIN. CODE § 25-192-20 (2014).

⁵⁷ *Id.* § 25-32-303 (2013).

⁵⁸ *Id.* § 25-192-20.

⁵⁹ *Id.* § 25-192-70 (2014).

⁶⁰ *Id.*

⁶¹ *Id.* § 25-192-25 (2014).

⁶² *Id.* § 25-192-80 (2014).

⁶³ *Id.* § 25-192-90 (2014).

General permits for poultry waste management govern the management of poultry waste at confined poultry feeding operations not covered under the VPDES permitting system, as well as poultry waste used or stored by poultry waste end-users.⁶⁴ This general permit applies to “owners of confined poultry feeding operations having 200 or more animal units” and became effective on December 1, 2010 and is set to expire on November 30, 2020.⁶⁵ This general VPA permit sets out requirements very similar to those of the general VPA permit for AFOs and animal waste management.⁶⁶ Poultry waste end-users and brokers are not required to obtain this VPA permit so long as they comply with certain technical requirements⁶⁷ concerning storage, land application, tracking, and accounting.⁶⁸

The Virginia State Water Control Board (the “Board”) may enforce the provisions of the VPDES and VPA permits in a number of ways, including by “issuing directives in accordance with the law;” “issuing special orders in accordance with the law;” “issuing emergency special orders in accordance with the law;” “seeking injunction, mandamus or other appropriate remedy as authorized by the law;” and/or “seeking civil penalties under the law.”⁶⁹ The Board encourages citizen participation in its enforcement efforts.⁷⁰

For small AFOs that are not covered by VPDES or VPA permits, however, inspection and enforcement measures are much less established. Small AFOs are farms that fall under the minimum threshold of animals required for a VPA permit—300 animal units of livestock or 200 animal units of poultry.⁷¹ Pursuant to Virginia’s Chesapeake Bay Total Maximum Daily Load (“TMDL”) Phase I Watershed Implementation Plan (“WIP”), DEQ and the Virginia Department of Agriculture and Consumer Services (“VDACS”) have collaborated to establish a strategy addressing water quality issues at small AFOs.⁷² The purpose of the Small Animal Feeding Operations Evaluation and Assessment Strategy (the “Small AFO Strategy”) is “to establish procedures that will [be] use[d] to identify, evaluate and assess Small AFOs for any risks/impacts to water quality that the operation may generate and to address the identified risks/impacts.”⁷³ As of 2015, an estimated 823 unpermitted farms in Virginia were eligible for the Small AFO Strategy,

⁶⁴ *Id.* § 25-630-20 (2010).

⁶⁵ *Id.* § 25-630-50 (2010).

⁶⁶ *See id.*

⁶⁷ *Id.* § 25-630-25 (2010).

⁶⁸ *Id.* § 25-630-60 (2010); *id.* § 25-630-70 (2010); *id.* § 25-630-80 (2010).

⁶⁹ 9 VA. ADMIN. CODE § 25-32-280 (1996) (VPA permit enforcement); *id.* § 25-31-910 (1996) (VPDES permit enforcement).

⁷⁰ “The board will investigate citizen complaints and provide written response to all signed, written complaints from citizens concerning matters within the board’s purview.” 9 VA. ADMIN. CODE § 25-32-280 (VPA permit enforcement); *id.* § 25-31-910 (VPDES permit enforcement).

⁷¹ U.S. ENVTL. PROT. AGENCY, *supra* note 49, at 65.

⁷² *Id.*; see VA. DEP’T OF ENVTL. QUALITY, COMMONWEALTH OF VIRGINIA, CHESAPEAKE BAY TMDL PHASE I WATERSHED IMPLEMENTATION PLAN: REVISION OF THE CHESAPEAKE BAY NUTRIENT AND SEDIMENT REDUCTION TRIBUTARY STRATEGY 66 (Nov. 29, 2010),

<https://www.deq.virginia.gov/Portals/0/DEQ/Water/TMDL/Baywip/vatmdlwipphase1.pdf>.

⁷³ U.S. ENVTL. PROT. AGENCY, *supra* note 49, at 65.

though an unknown number of additional small AFOs housing livestock, horses, and other non-traditional or exotic animals may also exist.⁷⁴

Farmers are encouraged to fill out a 21-question self-assessment checklist⁷⁵ to “determine if their operation is an AFO and if water quality risks or impacts are present.”⁷⁶ If DEQ or VDACS determines that a facility is an AFO and water quality risks or impacts may be present, the agencies may conduct an on-site assessment to document “how animal waste is handled and stored, the presence of storm water conveyances, the proximity of the production area to surface waters, whether animals have access to surface waters in the production area, and whether the operation implements any nutrient management practices for land application of animal wastes.”⁷⁷ If DEQ and VDACS determine that water quality risks or impacts exist at a small AFO, they may recommend corrective action.⁷⁸ Importantly, the on-site inspection is completely voluntary, the small AFO owner suffers no consequences for refusing to allow access to the property,⁷⁹ and most corrective action is also voluntary.⁸⁰ Additionally, because most inspection resources are allocated for permitted facilities, the Small AFO Strategy is not intended to be a program that constantly monitors and inspects smaller farms; rather, it is meant to deal with farms where issues have been identified, often through self-identification or citizen complaints.⁸¹

C. Septic Systems

Although septic tanks are exempt from federal regulation of underground storage tanks, the Virginia Department of Health (“VDH”) regulates septic systems and “provides policy, procedures, guidance, training, technical assistance, and grant and administrative support” to assist

⁷⁴ *Id.* at 67.

⁷⁵ TRI-CTY./CITY SOIL & WATER CONSERVATION DIST., VIRGINIA SMALL ANIMAL FEEDING OPERATIONS SELF ASSESSMENT CHECKLIST (Mar. 2013), <http://tccswcd.org/wp-content/uploads/2013/04/Self-Assessment-Checklist-for-Virginia-Small-Animal-Feeding-Operations.pdf>.

⁷⁶ U.S. ENVTL. PROT. AGENCY, *supra* note 49, at 65.

⁷⁷ *Id.* at 65-66.

⁷⁸ These corrective actions may include any of the following:

- Voluntary Approach: the owner or operator agrees to implement appropriate measures to address the water quality risk or impact, and a letter between the owner or operator and DEQ will document the changes to be made.
- Agricultural Stewardship Act (“ASA”) Plan: the operation is investigated using the ASA program and may be required to develop and implement an ASA Plan.
- VPA Animal Waste Permit: DEQ determines that the facility requires VPA permit coverage.
- Designation under the VPDES CAFO Program: DEQ designates the AFO as a significant contributor of pollutants thereby considering the operation a Small CAFO and requiring the owner/operator to apply for the VPDES CAFO permit.

Id. at 66.

⁷⁹ *Id.*; TRI-CTY./CITY SOIL & WATER CONSERVATION DIST., *supra* note 75.

⁸⁰ U.S. ENVTL. PROT. AGENCY, *supra* note 49, at 66.

⁸¹ DEQ does regularly engage with the VDACS Agricultural Stewardship Program to respond to issues arising through complaints against unpermitted farms. Interview with Neil Zahradka, Manager, Office of Land Application Programs, Va. Dep’t of Env’tl. Quality (Apr. 3, 2020).

with building and maintaining these systems.⁸² Virginia regulations require a permit for the construction of any sewage disposal system, including septic tanks.⁸³ For a septic system serving a single residence, an application must be submitted to the district or local health department,⁸⁴ after which an on-site inspection will be conducted and the state health commissioner will issue a construction permit for the septic system.⁸⁵ Construction may then begin in compliance with the conditions of the permit; if there is a failure to comply with the permit or “facts become known which reveal that a potential health hazard would be created or that the ground water resources may be adversely affected by allowing the proposed sewage disposal system to be installed or completed,” the commissioner may revoke the permit.⁸⁶

During and after installation, a licensed professional engineer or onsite soil evaluator must inspect and approve the system⁸⁷ before the commissioner issues an operation permit.⁸⁸ Virginia law also lays out requirements for septic tank design, including tank capacity and dimensions, in and out piping structure, top access and water tightness, as well as tank construction and placement.⁸⁹ The owner of the permit is responsible for maintaining, repairing, or replacing a failing septic system.⁹⁰ Evidence of septic system failure includes “the presence of raw or partially treated sewage on the ground’s surface or in adjacent ditches or waterways or exposure to insects, animals or humans” and system failure may also be indicated by “pollution of the groundwater or backup of sewage into plumbing fixtures.”⁹¹ Additionally, any onsite sewage treatment system within the Chesapeake Bay Preservation Area⁹² that is not subject to a VPDES permit must (1) be pumped-out at least once every five years or have a plastic filter installed and maintained in the septic outflow pipe in order to ensure normal use of the septic system, or (2) submit documentation to prove that the tank does not need to have the effluent pumped out.⁹³

⁸² *About Us*, DIV. OF ONSITE SEWAGE & WATER SERVS., ENVTL. ENG’G, & MARINA PROGRAMS, VA. DEP’T OF HEALTH, <http://www.vdh.virginia.gov/environmental-health/onsite-sewage-water-services-updated/division-of-onsite-sewage-water-services-environmental-engineering-and-marina-programs/> (last visited Apr. 16, 2020).

⁸³ 12 VA. ADMIN. CODE § 5-610-240 (1988).

⁸⁴ *Id.* § 5-610-250 (2000).

⁸⁵ *Id.* § 5-610-280 (2000).

⁸⁶ *Id.* § 5-610-300 (2000).

⁸⁷ *Id.* § 5-610-320 (2012); *id.* § 5-610-330 (2012).

⁸⁸ 12 VA. ADMIN. CODE § 5-610-340 (2000).

⁸⁹ *Id.* § 5-610-815 (2000).

⁹⁰ *Id.*

⁹¹ *Id.* § 5-610-350 (1988).

⁹² A Chesapeake Bay Preservation Area (“CBPA”) is any land designated as such under the Chesapeake Bay Preservation Act and the Chesapeake Bay Preservation Area Designation and Management regulations. A CBPA consists of a Resource Protection Area (“lands adjacent to water bodies with perennial flow that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may result in significant degradation to the quality of state waters”) and a Resource Management Area, land in a CBPA not designated as a Resource Protection Area. 9 VA. ADMIN. CODE § 25-830-40 (2015). Localities determine what land to designate a CBPA. For an illustration of the City of Chesapeake’s CBPAs, see *Chesapeake Bay Preservation Area*, CITY OF CHESAPEAKE, VA., http://www.cityofchesapeake.net/Assets/documents/departments/planning/Maps/plan_dev/CBPA-areas.pdf (last updated Nov. 20, 2010).

⁹³ 9 VA. ADMIN. CODE § 25-830-130 (2014).

III. RECOMMENDATIONS

A. Law and Policy

The Virginia legislature should bolster laws and regulations that will help protect water quality in the state at all times, but particularly in the face of increasing sea level rise and recurrent flooding. The legislature also should appropriate additional resources for regulatory agencies to enable increased inspection and enforcement of current laws, specifically in the most vulnerable localities.

1. Aboveground Chemical Storage Facilities

Currently in Virginia, regulatory programs exist for underground chemical storage and aboveground petroleum storage. However, aboveground chemical storage facilities, of any size, remain unregulated following an unsuccessful attempt in the 2020 Virginia General Assembly Session to pass a bill regulating aboveground storage tanks containing hazardous substances.⁹⁴ West Virginia adopted regulations for aboveground chemical storage tanks following a 2014 accident at the Freedom Industries chemical storage facility near Charleston.⁹⁵ Thousands of gallons of chemicals used for cleaning coal leaked into the river from an aboveground storage tank, leaving about 300,000 nearby residents without access to safe drinking water.⁹⁶ In response, West Virginia has since adopted regulations addressing aboveground storage tanks and currently regulates nearly 42,000 such tanks.⁹⁷

Virginia should not wait for a similar major accident to occur within the state to enact such regulations, but in any case, an incident has already occurred. In July 2017, there was a release of Termix 5301, a chemical surfactant that is added to herbicides and pesticides, at Crop Production Services in Cloverdale, Virginia.⁹⁸ A small puncture in the tank caused the spill of 165 gallons of the chemical, killing hundreds of fish and contaminating a tributary of Tinker Creek.⁹⁹ Though no drinking water wells were found to be contaminated,¹⁰⁰ this may not have been the case if the wells

⁹⁴ A hazardous substance is defined as “(i) any substance defined in § 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, (ii) any extremely hazardous substance, and (iii) any substance determined by the Board pursuant to § 62.1-44.34:30 [part of the bill] to be a hazardous substance” but does *not* include oil. *SB 626 Hazardous Substance Aboveground Storage Tank Fund*; created, VA.’S LEGIS. INFO. SYS., <https://lis.virginia.gov/cgi-bin/legp604.exe?201+sum+SB626> (last updated Feb. 4, 2020) (showing that the bill was continued to 2021 in the Senate Committee on Agriculture, Conservation and Natural Resources); *HB 1192 Hazardous Substance Aboveground Storage Tank Fund*; created, VA.’S LEGIS. INFO. SYS., <https://lis.virginia.gov/cgi-bin/legp604.exe?201+cab+HC10124HB1192+BREFC> (last updated Feb. 4, 2020) (showing that the bill was continued to 2021 in the House Committee for Courts of Justice).

⁹⁵ SACHS & FLORES, *supra* note 3, at 24.

⁹⁶ *Id.*

⁹⁷ *Id.*

⁹⁸ *Tinker Creek Fish Kill*, VA. DEP’T OF ENVTL. QUALITY, <https://www.deq.virginia.gov/ConnectWithDEQ/EnvironmentalInformation/TinkerCreekfiskill.aspx> (last visited Mar. 30, 2020).

⁹⁹ *Id.*

¹⁰⁰ *Id.*

were located closer to the source of the spill. In the absence of federal law on chemical tank spill prevention, Virginia must address this issue. In fact, in a November 2016 report co-authored by DEQ, VDH, and the Virginia Department of Emergency Management, the agencies themselves recommended a more comprehensive chemical storage program:

A key step in the development of a more comprehensive chemical storage program in Virginia would include the framework for inventorying and registering a defined universe of chemical storage facilities and inventory of materials in Virginia. This registration and inventory in advance of any other regulatory activity would provide necessary information for the identified agencies to utilize such information within existing programs, planning, and response efforts.¹⁰¹

Some important requirements to include in such aboveground storage tank regulations are to register all regulated tanks with DEQ, develop maintenance and operation procedures, and create emergency spill response plans. It is also important to make an inventory of these tanks publicly available and to determine siting and design standards when the tanks are located in the floodplain.

Public knowledge of harmful discharges also is essential. The Virginia legislature recently passed a bill expanding a requirement for DEQ to provide public notice of the discharge of deleterious substances into state waters if DEQ determines that the discharge may impair state waters or if VDH determines that the discharge may endanger public health.¹⁰² The legislature recognizes that it is critical to inform the public about events that may pose a danger to human health or safety. While an inventory of aboveground tanks may not be as imminently important as the notification following a deleterious discharge, it is important for Virginians to have information about the location and containments of aboveground storage tanks to be able to make informed decisions about the risks involved with living in close proximity to and siting other facilities near these tanks.

2. Agricultural Facilities

Expanding regulation of AFOs in Virginia is also paramount to safeguard the state's water quality in the face of sea level rise and recurrent flooding. Two 1,000-year storm events occurred in North Carolina, in 2016 and 2018, releasing "millions of gallons of animal waste into floodwaters, streams and rivers in coastal North Carolina."¹⁰³ Application of animal waste before or after a major storm "also increases the risk of polluting waterways and downstream

¹⁰¹ VA. DEP'T OF ENVTL. QUALITY, VA. DEP'T OF EMERGENCY MGMT., & VA. DEP'T OF HEALTH, CHEMICAL STORAGE IN THE COMMONWEALTH: AN EVALUATION OF EXISTING STATUTORY AND REGULATORY TOOLS 27 (Nov. 2016), <https://rga.lis.virginia.gov/Published/2016/RD532/PDF>.

¹⁰² 2020 Va. Acts 1182 (effective July 1, 2020), <https://lis.virginia.gov/cgi-bin/legp604.exe?201+sum+HB1205Trash/Debris>. In addition to newspapers, DEQ now must notify television and radio stations as well and must disseminate the notice via official social media accounts and email notification lists. *Id.*

¹⁰³ *Pollution from Industrial Animal Operations*, S. ENVTL. L. CTR., <https://www.southernenvironment.org/cases-and-projects/pollution-from-industrial-animal-operations> (last visited April 29, 2020).

communities.”¹⁰⁴ Following the Second Circuit’s decision in *Waterkeeper Alliance, Inc. v. United States EPA*, regulation of CAFOs under the VPDES permitting program is restricted to those facilities that actually have point source discharges of pollutants.¹⁰⁵ Only eleven of the 1,121 permitted facilities in the state are regulated by VPDES individual permits,¹⁰⁶ which means that Virginia relies much more heavily on VPA permitting than VPDES permitting. There are a number of ways in which VPA regulations can be expanded to better protect Virginia water quality.

First, regulations of end-users of animal waste should be strengthened. A survey of nutrient management plans (NMPs) and inspection records of regulated facilities in the Shenandoah Valley showed that poultry farm operators sold or exported 86 percent of the waste that was produced on those farms.¹⁰⁷ Based on the 2012 Census of Agriculture, it was found that NMPs for factory farms only covered 12.5 percent of the total crop and pastureland in the Shenandoah Valley and a mere 3.6 percent of the total land had phosphorous limitations.¹⁰⁸ Under VPA regulations, end-users of animal waste are required to limit the rate, amount, and location of application of manure.¹⁰⁹ However, only poultry waste end-users and brokers who receive five or more tons of poultry waste in any 365-day period and apply this waste to the land are mandated to have NMPs.¹¹⁰ Other end-users and brokers are not required to have NMPs;¹¹¹ instead, brokers must only provide waste analysis information and a fact sheet with the transferred waste¹¹² and end-users must provide receipt of the waste.¹¹³ This, coupled with the fact that DEQ does not regularly inspect these facilities (inspections of end-users and brokers are only conducted pursuant to a third party complaint),¹¹⁴ makes it very difficult to ensure that these facilities are abiding by VPA regulations. As of April 2020, poultry farms make up the largest proportion of permitted AFOs, with 960 out of a total of 1,121 permitted farms in Virginia having a VPA poultry waste management general permit.¹¹⁵ Extrapolating from the study done in the Shenandoah Valley that found that 86 percent of the waste produced across poultry farms in Virginia is sold or exported to end-users, a large portion of users are left under-regulated by the VPA permitting regulations. Because Virginia does not inspect animal waste end-users unless they receive a complaint, there is not sufficient data available on whether or not end-users who should have an NMP actually have one, and even if they do have one, whether they are adhering to those NMPs.

¹⁰⁴ *Spraying Animal Waste is Bad, and Worse Before a Hurricane*, *supra* note 12.

¹⁰⁵ The Second Circuit held that the EPA had exceeded its statutory authority under the Clean Water Act by requiring all CAFOs, whether or not they discharged pollutants, to obtain NPDES permits. The court held that the EPA’s jurisdiction under the Clean Water Act was limited to regulating and controlling actual discharges, not potential discharges or point sources themselves. 399 F.3d 486, 504-06 (2d Cir. 2005).

¹⁰⁶ *See* ACTIVE PERMITS, *supra* note 52.

¹⁰⁷ ERIC SCHAEFFER ET AL., ENVTL. INTEGRITY PROJECT, WATER POLLUTION FROM LIVESTOCK IN THE SHENANDOAH VALLEY 19 (2017), <https://www.environmentalintegrity.org/wp-content/uploads/2017/02/Shenandoah-Report.pdf>.

¹⁰⁸ *Id.* at 23.

¹⁰⁹ *Id.* at 20.

¹¹⁰ *See* 9 VA. ADMIN. CODE § 25-630-80.

¹¹¹ SCHAEFFER ET AL., *supra* note 107, at 20.

¹¹² 9 VA. ADMIN. CODE § 25-630-60.

¹¹³ *Id.* § 25-630-70.

¹¹⁴ SCHAEFFER ET AL., *supra* note 107, at 21.

¹¹⁵ *See* ACTIVE PERMITS, *supra* note 52.

Ideally, DEQ would require all poultry waste end-users and brokers to obtain VPA poultry waste management general permits. In 2009, when DEQ first introduced the regulations applying to end-users and brokers that currently exist, the agency believed that the existing regulations were sufficiently protective of water quality,¹¹⁶ but because sea level rise and recurrent flooding have rapidly proved to be threats to water quality, it would be prudent for the agency to reexamine these regulations. To reduce these risks, regulation of animal waste end-users and small farms that are exempt from VPDES and of VPA permitting requirements should be strengthened.

Consistent enforcement of end-user regulations, rather than inspections done only after receiving a third-party complaint, would also help DEQ identify non-compliant end-users. However, the agency simply does not have the resources to regularly inspect all of these end-users.¹¹⁷ A more realistic recommendation may be to require all end-users to submit NMPs, regardless of how much waste they import. While this will be an uphill regulatory battle, this requirement strikes a balance by still providing poultry waste end-users some leeway in their use of the waste while also providing some level of assurance that the storage and land application of waste is being conducted in a way that is protective of Virginia waterways. This same requirement should extend to end-users of animal waste that is exported out of facilities subject to VPA AFO general permits.

Finally, DEQ and VDACS should increase the use of the Small AFO Strategy and consider making certain requirements under the strategy mandatory rather than voluntary. Because the agencies are cognizably restricted by the amount of resources they have available, a low- to no-cost, but significant, way in which this Strategy can be better utilized is to make the self-assessment checklist mandatory for all small farms. This requirement does not add significant burden to either the agencies or the farms themselves, but it increases the amount of data on small farm operations significantly. DEQ and VDACS can then, based on the responses to the checklist, prioritize which farms should be inspected.

3. Septic Systems

Coastal storm hazards and sea level rise also pose a major threat to the sustainability of septic systems in Virginia coastal communities. While Virginia requires a permit for all sewage handling and disposal,¹¹⁸ much can be done to improve standards for septic system construction to

¹¹⁶ In 2009, in response to comments by supporters of amendments to the VPA general permit regulations for poultry waste management who advocated for stronger regulations (e.g., a 200 foot buffer between poultry waste storage sites and water bodies rather than a 100 foot buffer, a total ban of land application of poultry waste in the watersheds of state waters, a reduction of the minimum amount of waste that must be transferred to an end-user in order to trigger regulation), DEQ pushed back because it believed that the proposed regulations (in other words, the current regulations) were adequate to protect water quality in the state. Agricultural lobbyists and individual farmers also spoke heavily in opposition to these regulations. See EXEMPT ACTION FINAL REGULATION AGENCY BACKGROUND DOCUMENT, VA. REGULATORY TOWNHALL 3-15 (Sept. 22, 2009), https://townhall.virginia.gov/L/GetFile.cfm?File=103%5C2525%5C5307%5CAgencyStatement_DEQ_5307_v1.pdf.

¹¹⁷ Interview with Neil Zahradka, *supra* note 81.

¹¹⁸ 12 VA. ADMIN. CODE § 5-610-240.

prevent septic failure and make these systems more resilient to sea level rise and increased storm hazards. Septic systems can fail in two ways: hydrologic failure, which occurs when wastewater comes up to ground level or plumbing is backed up (this failure is immediately apparent), and treatment failure, which occurs when the vertical section of soil underneath the drain field is over-saturated and the wastewater moves too quickly through the soil and therefore remains untreated or undertreated by the time it reaches the groundwater (this failure is much harder to detect).¹¹⁹ Treatment failure is the major concern with sea level rise and increased storm events since sea level rise raises groundwater levels and saturates soil under the septic drain field that was previously unsaturated.¹²⁰

To reduce septic failure, the Virginia General Assembly should improve inspection, enforcement, and disclosure standards. First, they should rely on projected high-water marks based on predictive sea level rise data, not historic data, when enacting regulations. Second, regulations should improve and increase inspections. There are currently no requirements for buyers or sellers of properties with septic systems to engage in any sort of inspection.¹²¹ Inspections should be made mandatory during any transaction that occurs concerning such properties. This not only increases the number of inspections, but it also ensures that buyers of properties with septic systems are put on notice of any potential issues with the system. Finally, upgrades to tanks or installation of a community treatment system on higher ground in particularly vulnerable areas should be made a priority. These efforts can be funded through a combination of local and state funding to assist with upgrades and maintenance of individual systems, as well as fees imposed on users of community treatment systems. Federal and state agencies currently offer funding options that could be used to pay for installing new or making upgrades to existing septic systems. The United States Department of Agriculture's ("USDA") Water & Waste Disposal Loan & Grant Program provides state and local governments with funding for, among other things, sanitary sewage and solid waste disposal.¹²² The funds may be used to finance the construction or improvement of sewage and solid waste systems in towns with populations of 10,000 or less.¹²³ DEQ and VDH also provide funding sources.¹²⁴ For example, between July 2017 and June 2018, DEQ used funding granted to states under Section 319(h) of the federal CWA to finance pump outs of septic systems, repair and replace failing septic systems, and remove straight pipes.¹²⁵ DEQ serviced at

¹¹⁹ MIAMI-DADE CTY. DEP'T OF REGULATORY & ECON. RES., MIAMI-DADE CTY. WATER & SEWER DEP'T, & FLA. DEP'T OF HEALTH IN MIAMI-DADE CTY. (DR. SAMIR ELMIR), SEPTIC SYSTEMS VULNERABLE TO SEA LEVEL RISE 13 (Nov. 2018) <https://www.miamidade.gov/green/library/vulnerability-septic-systems-sea-level-rise.pdf>

¹²⁰ *Id.* at 11-12.

¹²¹ *What You Should Know When Buying a House With an Onsite System*, VA. DEP'T OF HEALTH, <http://www.vdh.virginia.gov/environmental-health/what-i-should-know-when-buying-a-house-with-an-onsite-system/> (last visited June 15, 2020).

¹²² RURAL DEV., U.S. DEP'T AGRIC., WATER & WASTE DISPOSAL LOAN & GRANT PROGRAM 1, https://www.rd.usda.gov/sites/default/files/fact-sheet/508_RD_FS_RUS_WEPDirect.pdf (last updated Dec. 2019).

¹²³ *Id.*

¹²⁴ For a more comprehensive list of available funding options, see Jamie Huffman et al., *Onsite Sewage Systems: Background, Framework, and Solutions*, WM. & MARY VA. COASTAL POLICY CTR. (Fall 2018), <https://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/reports/onsitesewage.final2.pdf>.

¹²⁵ VA. DEP'T OF ENVTL. QUALITY, DEQ HIGHLIGHTS SEPTIC MAINTENANCE PROGRAMS DURING SEPTICSMART WEEK 1, <https://www.deq.virginia.gov/Portals/0/DEQ/Water/NonpointSource/DEQ%20SepticSmart%20Week.pdf> (last visited June 15, 2020).

least 551 homes and used \$333,533 in federal grant money.¹²⁶ While funding methods do exist, they will very likely not be sufficient as rising sea levels and more frequent storm events threaten an increasing number of septic systems.

Virginia should focus its efforts on gathering as much data as possible on where septic systems are failing, particularly in more rural communities where the houses are older and are more likely to have septic systems,¹²⁷ to evaluate the vulnerability of these systems to sea level rise and analyze the risk to water quality.

B. Infrastructure: Stormwater Collection/Treatment Facilities

Increased amounts of stormwater and sea level rise will continue to pose significant hardships for low-lying coastal Virginia communities.¹²⁸ Therefore, in addition to improved regulation to protect water bodies from toxic floodwaters, it is essential to also invest in improved infrastructure to store and treat increasing amounts of stormwater to reduce the amount of toxic floodwater overall. Typically in coastal Virginia, precipitation events, high tides, and storm surge leads to water runoff that overpowers the capacity of stormwater drainage systems.¹²⁹ Creating systems that can handle excess water “during high tides or heavy rainfalls reduces street flooding and pollution.”¹³⁰ These systems should be able to store excess water until sewers have the capacity to handle this water.¹³¹ The Neighborhood Resilient Design project in Norfolk, Virginia, concerned such systems. The project team and funding partners¹³² surveyed residents, collected data, and used predictive modeling to develop a strategy for adapting to and mitigating flooding.¹³³ Some of the adaptation tools that were proposed for this project include the following:

- Using pervious pavers for parking areas on streets combined with an understreet cistern that would allow water to percolate slowly into the ground after flooding.
- Installing rain gardens and bio-retention along streets and in yards.

¹²⁶ *Id.*

¹²⁷ *Caring for Septic Systems*, OLD HOUSE ONLINE, <https://www.oldhouseonline.com/repairs-and-how-to/caring-for-septic-systems> (last updated Jan. 16, 2019).

¹²⁸ See ADAM TERANDO ET AL., U.S. GLOB. CHANGE RESEARCH PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT, VOLUME II: IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES 758-59 (D.R. Reidmiller et al. eds., 2018), https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf; *Sea Level Rise Viewer Tool*, OFF. FOR COASTAL MGMT., NAT’L OCEANIC & ATMOSPHERIC ADMIN., <https://coast.noaa.gov/digitalcoast/tools/slr.html> (last visited June 15, 2020).

¹²⁹ MOLLY MITCHELL ET AL., VA. INST. OF MARINE SCI., RECURRENT FLOODING STUDY FOR TIDEWATER VIRGINIA 4 (Jan. 2013), http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf.

¹³⁰ *Adaptation Stories: Water Storage and Management*, ADAPTVA, <https://vims-wm.maps.arcgis.com/apps/MapJournal/index.html?appid=c7c7bc614f1441349aba0346c14f0fec> (last visited June 15, 2020).

¹³¹ *Id.*

¹³² Students and faculty from the Hampton University Architecture Department and Old Dominion University Civil and Environmental Engineering Department, Wetlands Watch, Hampton Roads Green Building Council, Virginia Chapter of the American Institute of Architects’ Emerging Leaders in Architecture, City of Norfolk, Virginia SeaGrant, U.S. Department of Housing and Urban Development (HUD). *Id.*

¹³³ *Id.*

- Disconnecting downspouts and feeding them into rain gardens or front yard cisterns.
- Installing backflow preventers for storm sewers.
- Creating a living shoreline to address the community's concerns about erosion and a lack of public access along the Elizabeth River.¹³⁴

The project also sought to engage the public; this serves to “improve community connections.”¹³⁵ This is important not only because the project can benefit from the data and experience gathered from community members, but it also brings residents of the locality together through a sense of civic engagement in resilience efforts.

Not only should Virginia communities seek to make existing infrastructure more resilient, but they should also account for increased storm events in planning for the future. A study analyzing historic and projected rainfall frequency in the Virginia Beach area found that precipitation has increased by 3 to 7 percent per decade.¹³⁶ Based on these calculations, the authors recommend that Virginia Beach use a projected precipitation increase of 20 percent over the next 40 years for city planning purposes.¹³⁷ Planning committees must be cognizant of these rapid changes in climate so that they make appropriate investments for future infrastructure.

IV. CONCLUSION

Virginia communities, specifically coastal communities, are susceptible to a myriad of negative effects from sea level rise and increased severe storm events. These events can compromise state water quality by inundating industrial and agricultural facilities and septic systems, resulting in contaminated water flowing into water bodies. Though the state regulates industrial facilities, agricultural facilities, and septic systems, none of these regulations were written with sea level rise and increasing storm events in mind. Therefore, changes in law and policy, as well as infrastructure are necessary to address these increasing threats. Virginia should regulate aboveground chemical storage tanks in much the same way aboveground oil and petroleum storage tanks are regulated. Additionally, small agricultural facilities that fall under the minimum threshold for regulation under the VPDES and VPA permitting programs should be required to fill out the self-assessment checklist. Finally, septic systems and stormwater collection and treatment facilities should also be upgraded to accommodate increasing sea levels and flooding triggered by storm events. While these efforts will not eliminate these threats, they can greatly improve Virginia’s resilience and help to protect the quality of state waters.

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ DMITRY SMIRNOV, DEWBERRY, ANALYSIS OF HISTORICAL AND FUTURE HEAVY PRECIPITATION iv (Mar. 26, 2018), https://www.hrpdcva.gov/uploads/docs/5A_Attachment_AnalysisofHistoricalandFutureHeavyPrecipitation_Finalrev_20180326.pdf.

¹³⁷ *Id.*