Connecticut
Department of Energy &
Environmental Protection

Balancing Efficiency and Environment: Proposed Revisions to Connecticut's SSDS Nitrogen Management

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Purpose: This document summarizes the proposed statutory and regulatory changes from Stuart Fairbanks – Thank you for getting thoughts on paper- (Section 1), outlines the key challenges within that proposal (Section 2), and provides additional recommendations from CT DEEP's Permitting and Enforcement Division to be evaluated by the Nitrogen and Environment Subcommittee (Section 3).

Disclaimer: *The following reflects outcomes from technical sessions and does not represent official CT DEEP recommendations, as the material has not undergone formal review*

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Section 1 - Summary of Proposed Statutory and Regulatory Changes

The core of the proposal is a shift in regulatory authority and methodology for Subsurface Sewage Disposal Systems (SSDS) to promote efficiency and better account for Nitrogen (N) discharge . The recommendations are largely centered on giving the Department of Public Health (DPH) greater authority and replacing the current arbitrary threshold with a science-based standard.

1. Reallocation of Regulatory Authority

- The proposal advocates for eliminating the current arbitrary 7,500 GPD per property threshold that triggers the Department of Energy and Environmental Protection (DEEP) review.
- **New DPH Jurisdiction:** All SSDS up to 10,000 GPD would fall under DPH jurisdiction. This aligns with the 2025 DPH revision proposal.
- **Rationale:** The current threshold is arbitrary and does not correlate with environmental impact; two adjacent 7,500 GPD systems have the same impact as one 15,000 GPD system. The current system encourages the subdivision of land to avoid DEEP review.

2. Shift to Science-Based Nitrogen Regulation

- The proposal moves away from a simple flow threshold to a system based on N assessment and discharge limits tied to land area.
- **Mandatory N Assessment:** N assessment would be required for any individual SSDS exceeding 7,500 GPD and/or for the total discharge to one property exceeding 7,500 GPD. This prevents developers from skirting N regulations by installing multiple smaller systems on a single large property.
- **Dilution Model Refinement:** When N assessment is required, the model must incorporate site-specific infiltrative surface coefficients and credit for dilution provided by stormwater infiltration within the contributing watershed.
- **GPD per Acre Limit:** Regardless of the dilution model, allowable discharge would be capped at approximately 1,635 Gal/Acre. This limit is based on converting the 2025 DPH proposed N model to a gallons/acre figure.
- **Targeted Regulation:** Identify N sensitive areas of the State where more stringent N discharge regulations would apply.

3. Design and Funding Modifications

- **Increased Separation:** For SSDS exceeding 7,500 GPD, the bottom elevation must be 3 feet (36 inches) above the seasonal high water table. This increases separation to decrease the chance of fully saturated conditions.
- **Application Fees:** Fees for DPH applications above 5,000 GPD would be per gallon, similar to DEEP applications. This provides funding for increased applications and potential training.

Section 2 - Concerns with the Proposal

While the proposal aims to streamline the process and introduce science-based N regulation, several challenges must be addressed, particularly regarding environmental protection and the viability of the proposed N model.

1. Environmental Protection and Dilution Reliance

- The primary challenge lies in the continued reliance on dilution as the core mechanism for N removal in the proposed model.
- **The Dilution Model Risk:** Most N models used for non-pretreated septic effluent rely on infiltration of rainwater for dilution. However, this model does not account for the lack of natural denitrification in many coastal or highly permeable soils, which is a key finding in recent environmental studies (not explicitly in the provided text, but assumed based on the context of the working group). Relying on dilution without guaranteed N treatment (Advanced Treatment) may lead to acceptable regulatory outcomes but unacceptable environmental impacts in N-sensitive areas.
- **Inadequate Separation for N Removal:** While the proposal increases the separation to 36 inches for large systems, this is primarily intended to avoid saturation. This separation height may be insufficient to guarantee the necessary *aerobic* soil conditions and *residence time* needed for nitrification and denitrification, especially in areas with seasonally fluctuating water tables. There are other benefits, but we are focused on N here.

2. Jurisdiction and Expertise Concerns

- Delegating authority for large systems to DPH raises questions regarding capacity and scope.
- **Substantive Recommendation:** The proposal states that delegating authority to DPH is "probably the most substantive recommendation proposed to date. However, handling discharges up to 10,000 GPD, especially those requiring complex N assessments and multi-system designs, historically falls under DEEP due to the scale and potential environmental impact.
- **AT System Expertise:** Although the proposal acknowledges that "multi-family or commercial systems requiring Nitrogen reduction pretreatment AT would still be permitted by DEEP", the DPH would be reviewing systems up to 10,000 GPD that may require similar levels of technical scrutiny regarding complex hydrogeology and N modeling that have traditionally been handled by DEEP.

  DPH would need to develop and adopt a new "standardized" set of technical standards for these systems, with little site-specific variable inclusion.

3. Defining and Enforcing N Sensitive Areas

- The proposal to identify and apply more stringent regulations in N sensitive areas is critical, but enforcement details are lacking.
- **Map Development:** The creation of an accurate and legally defensible map of N sensitive areas is a major undertaking.

- **Regulatory Mechanism:** The proposal does not detail the "additional, more stringent Nitrogen discharge compliance regulations" that would apply in these areas. For example, will these areas mandate Advanced Treatment AT with a performance standard (e.g.,<10 mg/L regardless of the 1,635 Gal/Acre limit, or simply require a more conservative application of the dilution model?

4. Financial and Administrative Details

- **Fee Sufficiency:** While application fees per gallon for large systems are proposed to fund potential increases in DPH applications and training, there is no guarantee this funding will be sufficient to support the necessary technical expertise and increased administrative load associated with reviewing complex N models and enforcing N discharge limits.
- **Design Complexity:** The proposal relies on utilizing "existing or revised DPH Technical Standards". However, the shift to a GPD/acre model tied to N dilution and the need for site-specific coefficients introduces a level of hydrogeological complexity significantly greater than the current prescriptive flow standards, potentially creating new bottlenecks for applicants.

Section 2.1 – Continued - Summary of Comments and Challenges to Proposed SSDS Regulatory Changes (some comments may be duplicative)

The core proposal aims to eliminate the arbitrary 7,500 GPD per property threshold for regulatory jurisdiction and replace it with a flow-per-acre limit and a greater role for DPH. While the goal of efficiency and science-based regulation is supported, the comments identify significant flaws that, if unaddressed, could lead to unacceptable environmental compromise and administrative chaos.

1. The Core Challenge: Circumvention and Arbitrary Boundaries

The central flaw identified by reviewers is the proposal's inability to prevent regulatory avoidance ("gerrymandering") and its failure to account for cumulative impact.

- **Gerrymandering Risk:** The proposal seeks to eliminate the current incentive for subdivision but introduces a new loophole: relying on a flow-per-acre threshold without accounting for neighboring flows. Reviewers ask if cumulative flow from adjacent properties (A, B, and C) would trigger scrutiny, fearing that people could still 'gerrymander' their way out of DEEP jurisdiction.
- **Property Line Irrelevance:** While the proposal correctly states that a property line has "no bearing on environmental impact" , the new system still lacks clarity on how regulators would define a total contributing area across property lines to determine jurisdiction.
- **Lack of Clarity:** There is an overall consensus that the proposal lacks sufficient information to draw definitive conclusions about its efficacy, particularly regarding the predicted efficiency gains and cost reductions.

2. Scientific Defensibility of the Nitrogen Model

The reliance on a simple GPD/acre conversion and the proposed Nitrogen assessment model is critiqued as insufficient and potentially outdated, particularly for larger flow systems.

- **Simplicity and Constraint Failure:** The GPD/acre standard is dismissed as "a little too simplistic". It would only work on sites that "have no constraints, and these basically don't exist anymore". Relying solely on this standard can be problematic on heavily constrained sites (wetlands, shallow soils, outcropping ledge) where usable land is limited and treatment performance may be compromised.
- **Outdated Methodology:** The proposal's reference to the DPH's "Simplified Nitrogen Assessment" is flagged as "not particularly conservative and relies on outdated methodology". The model must be clarified as being based on the more rigorous DEEP nitrogen model or an equivalent scientifically defensible standard.
- **Impact of Large Flows:** Reviewers assert that the current threshold and proposed DPH jurisdiction are too lenient for large systems. Systems with design flows greater than 5,000 GPD exert a "meaningful and quantifiable impact on the surrounding environment," an impact that is "even more pronounced at flows of 7,500 gpd or 10,000 gpd".

3. Critical Design Standards and Funding Flaws

Comments highlight necessary modifications to design standards, particularly concerning the *vadose zone*, and point out flaws in the fee structure.

- **The Vadose Zone Challenge:** The proposal for increased separation to 36 inches for systems over 7,500 GPD is noted. However, this separation must be maintained consistently because the unsaturated soil beneath the system is critical to treatment, providing "hydraulic capacity and renovative processes". Processes like nitrification and bacterial removal occur within this zone, and the current design may not fully account for this.
- **Inadequate Fee Structure:** The proposal to implement per-gallon fees similar to DEEP applications is criticized because current domestic sewage fees are flat rate, not per-gallon. Furthermore, providing DPH with a sufficient funding stream to hire and train the technical staff required to review complex models—which the new regulations will require—is essential.

4. Implementation and Environmental Protection

A key missing piece is the mechanism for protecting highly sensitive environments.

- **Defining Sensitive Areas:** The proposal is commended for recognizing the need to identify "Nitrogen sensitive areas of the State". However, the critical question remains: How will these areas be identified and implemented, and what happens when an area is deemed so sensitive that "no systems will be approved?". The proposal must specify whether these areas will mandate performance-based Advanced Treatment or simply rely on a more conservative—but potentially still inadequate—dilution model.

Section 3 - Recommended Regulatory Updates and Scientifically Defensible Standards

Disclaimer: *The following reflects outcomes from technical sessions and does not represent official CT DEEP recommendations, as the material has not undergone formal review.*

The proposed regulatory updates should focus on implementing a differentiated, performance-based structure for Subsurface Sewage Disposal Systems (SSDS) that prioritizes nitrogen (N) removal in sensitive areas and incorporates flexibility for land use where public health is not compromised.

1. Differentiated Regulatory Zones and Performance Standards

The core recommendation is to move away from a universal, one-size-fits-all approach by establishing distinct zones with varying performance requirements.

Regulatory Zone	Design Requirements	Scientific/Policy Rationale
Zone 1: Sensitive[1]/Coastal Areas	**Mandatory Advanced Treatment - N** Require systems certified to a strict performance standard (e.g., N <10 mg/L). Total Dissolved -N for all new or replacement systems, irrespective of size.	Addresses the fundamental failure of dilution in coastal soils that lack natural N attenuation. This is the only way to achieve TMDL compliance.
Zone 2: Standard/Inland Areas	**Risk-Based Flow:** Utilize the existing 7,500 gpd threshold but allow larger flows (e.g., up to 10,000 GPD) under DPH jurisdiction if a defensible N risk assessment is performed.	Streamlines efficient development while maintaining health standards in areas where natural dilution may be acceptable.

1 The term “sensitive” refers to any area that may present unique challenges, such as high groundwater, ledge, areas with steep slopes, mounding, and/or wetlands

2. Streamlining Land Use Flexibility (Reserve Area Reduction)

The current requirement for a full, redundant reserve area significantly constrains land available for housing and infrastructure, particularly on smaller lots. This requirement can be reviewed and potentially reduced under specific, controlled conditions.

Proposed Regulatory Update	Scientific/Policy Rationale
A. Contingent Reserve Area Reduction: Evaluate reducing the required reserve area to 50 % of the design area, or eliminating it entirely, only when the system is placed under a mandatory long-term maintenance contract enforced by a Responsible Management Entity (RME).	The primary purpose of the reserve area is system failure redundancy. An RME contract, which guarantees routine inspection, maintenance, and a capital reserve for prompt repair, significantly lowers the risk of catastrophic, prolonged failure, justifying a reduction in required reserve area.
B. Reserve Area for AT Systems: Fully eliminate the reserve area requirement for Mandatory AT Systems within the N-Sensitive Zone, provided they are under a continuous RME contract with performance bond.	AT systems typically fail mechanically (e.g., pump, blower) which are easily and rapidly repairable by an RME, making the large, permanent soil-based reserve area unnecessary.

3. Prescriptive Depth of Separation Standards

The separation distance between the leach field and the limiting layer (water table or restrictive materials like ledge) is crucial for both pathogen destruction and nutrient removal. The required depth must be strictly maintained and differentiated based on the limiting layer.

Limiting Layer	Minimum Required Separation Depth	Scientific Rationale
Ledge/Rock/Impervious Material	4 feet (48 inches)	This traditional depth maintains structural stability and ensures adequate soil mass above solid rock to complete treatment before the effluent is potentially channeled or concentrated laterally.
Seasonal High Water Table (SHWT)	3 feet (36 inches)	This depth is the minimum necessary to maintain an aerobic soil zone essential for sufficient N transformation (ammonification/nitrification) and effective pathogen destruction. This specific depth maintains the minimum treatment time required to meet public health goals.
N -Sensitive Area SHWT (Override)	4 feet 48 inches or greater (BFE +SLR compliant)	While 3 feet is the minimum for *bacteria*, 4 feet (or the height necessary to stay above projected SLR provides a greater hydraulic safety margin, which is crucial where soil is highly permeable and the water table is rising.

Section 3.1 - A Unified Strategy for SSDS Reform: Pivoting to Performance-Based Nitrogen Management

A cohesive and structured rationale for reforming Connecticut's Subsurface Sewage Disposal System (SSDS) regulations. It pivots the focus from arbitrary flow limits to performance-based management of nitrogen in environmentally sensitive areas, detailing the necessary solutions and implementation roadmap.

1. The Regulatory Problem: The Status Quo

The current regulatory framework is fundamentally flawed, guaranteeing environmental non-compliance and exacerbating housing constraints.

1.1. Scientific and Quantitative Failure

- The Status Quo assumes that coastal land removes the same nitrogen load as inland, but this premise is highly debated should be revisited.
- Every conventional septic system (CSS) injects ~45.7 lbs. of N per year into the aquifer.
- This pollution is virtually guaranteed to reach the Long Island Sound and its embayments, driving seasonal hypoxia.

1.2. Climate and Regulatory Inadequacy

- **Climate Threat:** Sea-Level Rise (SLR) is actively eliminating the minimum ~4.0 ft. safety buffer required for soil treatment, making current systems physically unreliable and vulnerable to inundation.
- **Housing Constraint:** The restrictive 7,500 GPD/acre rule is an arbitrary limitation on flow that simultaneously fails to protect the environment while hindering efficient, dense housing development.

2. The Scientifically Defensible Solution:

The only solution that meets both environmental compliance and housing goals is the mandatory adoption of geographically appropriate Advanced Treatment Systems ATS coupled with strict hydraulic standards**.**

2.1. The Performance Mandate and N Reduction

- **The goal for reform must be a quantitative performance target:**
- **The 86 % N-Reduction Mandate:** By moving from the CSS load ~45.7 lb/yr to an ATS load ~6.4 lb/yr, the system achieves the necessary ~ 86 % reduction target required for Total Maximum Daily Load (TMDL) compliance.
- **Low N as the Standard:** This requires systems certified to a strict performance standard of <10mg/L N.

2.2. The Housing Unlock and Hydraulic Constraint

- **The Housing Unlock:** By regulating pollution load instead of flow volume (GPD), the regulatory structure can eliminate the restrictive 7,500 GPD/acre rule. This trades low environmental

performance for high housing density, allowing for significant potential increases in housing capacity.

- **Critical Hydraulic Constraint:** This flexibility is contingent on the treated wastewater remaining subsurface. If the effluent is allowed to surface, it is legally considered a point source discharge and would require an individual NPDES permit (as affirmed by the *Maui Case*), creating a massive new regulatory liability.
- Controlled Hydraulic Flows + Disinfection + Low N = More Units on Less Land.

3. Implementation Roadmap: Overcoming Roadblocks

Implementing mandatory ATS – in geographic locations requires overcoming three critical, interconnected roadblocks related to cost, maintenance, and administrative capacity.

Roadblock 1: The Financial Cost

- **Challenge**: ATS systems have an additional initial installation cost that can amount to as much as 20,000 or more, creating a significant economic barrier for home and business owners.
- **Action (Dedicated Funding Stream):** The public must invest to protect the public resource. We must champion the establishment of a funded program—modeled on grants, tax credits, or low-interest loan programs used in neighboring states such as New York and Massachusetts—to shift the cost burden from an immediate upfront fee to a sustainable, low-interest repayment. This crucial step is currently under evaluation by the CT Academy of Scientists and Engineers (CASE).

Roadblock 2: Maintenance and Oversight

- **Challenge:** ATS systems are mechanical and require continuous, mandatory maintenance to guarantee the performance. Homeowner negligence will lead to system failure.
- **Action (Mandatory RME Contracts):** Investigate the establishment of a Responsible Management Entity Utility District. This RME would enforce a mandatory long-term service contract for all systems approved under the N model. The RME would collect a small annual fee to ensure mandatory annual inspections, guaranteeing the N performance forever.

Roadblock 3: Administrative Capacity and Training

- **Challenge:** The shift to performance-based N regulation requires specialized technical expertise from DPH, which current fee structures and training levels may not support.
- **Action (Funding and Training):** Use the proposed per-gallon application fee on all large systems (e.g., above 5,000 GPD) to establish a dedicated fund for DPH training, technical hiring, and auditing of RME performance. This provides the necessary resources to ensure the integrity and sustainability of the entire regulatory system.