Correcting Common Misperceptions about Natural Source Zone Depletion

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Natural source zone depletion has become a familiar term in NAPL site management, but several misunderstandings persist among site owners, consultants, and regulatory personnel. These common errors include the notion that NSZD is a vague concept lacking in scientific substance, NSZD is simply an opportunistic, surficial repackaging of monitored natural attenuation concepts, and that reported NSZD rates are 'too good to be true' and unrealistically high. In practice, these prevent adoption of NSZD where it might be suitable, and ultimately may lead to spending and use of resources in ways that do not meaningfully reduce NAPL mass, mobility, or risk.

These perceptions will be discussed informally, and the underlying errors or incorrect assumptions will be examined, with the goal of equipping practitioners to respond to and refute misperceptions of NSZD in the future.

NSZD is a "magic dust" or hand-waving phenomenon

Stakeholders may perceive NSZD as a poorly understood or fungible concept with little scientific support. On the contrary, the processes that go into NSZD are well understood and are often relied on in other remediation settings, even by those skeptical of NSZD for petroleum site management. For example, the concept of fermentation and methanogenesis in an organic-carbon-rich environment is a key part of anaerobic digesters and of engineered in-situ treatment (via enhanced reductive dechlorination, for example). Parallels to NSZD in other engineering contexts will be discussed, and the role of NSZD as a science-based tool (rather than a window-dressing or cure-all) will be reinforced through a site example showing how NSZD data can guide overall site decision-making.

NSZD is just another term for MNA

While both NSZD and MNA revolve around natural degradation concepts, there are different mechanisms at their centers. From a regulatory and policy perspective, MNA is a narrowly defined concept for dissolved-phase plumes; the NSZD evaluation framework developed by practitioners and agencies is different, and focuses on source zones. Importantly, NSZD does not solely focus on dissolved-phase attenuation mechanisms, and involves a different set of controls and limiting factors than traditional MNA processes (e.g., incoming terminal electron acceptor flux may not be a limiting factor). The differences between MNA and NSZD, both in policy contexts and in underlying scientific concepts, will be discussed.

The reported rates are too high to be realistic

Rates expressed in L/Ha/yr or gal/ac/yr often seem unrealistically high in the context of previous conceptual site models, and site owners or stakeholders might push back on NSZD rate estimates. In reality, reported rates can often be reconciled with existing site understandings by recognizing that NSZD acts on the entirety of the NAPL body, including residual NAPL, and thus can often influence more mass than, say, familiar engineered NAPL recovery systems. If NAPL mass estimates are used in evaluation of NSZD rates, care should be taken to ensure the estimates are based on realistic assumptions and account for appropriate uncertainty. Additionally, there are some phenomena (such as soil gas flux 'chimney effects') that can lead to high-biased estimates of NSZD, and may have clouded early perceptions of the approach; these issues and their current handling will be discussed.

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