

## V-3 Dispersion BMP expanded commentary

### Expansion on text submitted in Excel worksheet

#### Summary

Dispersion should be allowed solely for non-pollution-generating surface runoff. For PGIS and PGPS dispersion should only follow water quality treatment, not ever precede it. Dispersion should not be allowed on properties with known soil or groundwater contamination including but not limited to federal Superfund sites or state cleanup sites under the Model Toxics Cleanup Act (MTCA), and any areas mapped as within the Asarco plume arsenic deposition area. At least because of allowable arsenic concentration allowed, Ecology should reconsider the advisability allowing biosolids for post-construction soil amendment (BMP T5.13) in any case where that area or any portion may be used for dispersion or any infiltrative BMPs.

#### Discussion

It is already abundantly clear from ocean pollution that dilution is not a viable long term strategy, yet dilution is the basis for dispersion BMPs. From runoff from truly non-pollution-generating surfaces that are not subject to aerial deposition of toxic or otherwise unhealthy (pathogens) pollutants, dispersion isn't a problem. For those areas that are subject to aerial deposition despite not being categorized as pollution-generating, and for regulatory PGIS and PGPS, that is a problem. For pollutants that don't break down, e.g., metals, or have extraordinarily long half-lives, i.e., 'forever'/persistent chemicals, e.g., PCBs and PFAS, dispersion is fundamentally simply 'kicking the can down the road', as these pollutants will build up in actual (more on that below) dispersion areas, can build up to toxic levels in soils, and break through<sup>1</sup> or travel directly to groundwater, and/or eventually run off to surface waters. Whether it takes 10 or 100 years for pollutants to build up in soil to a degree that it no longer holds sequesters them adequately – and noting that there's an inherent gradation to release, it's not 'on' or 'off' – it's still kicking the can down the road, and eventually vast amounts of soil that have been used as filter media will have to be relocated, and in some cases may have to be disposed of at hazardous waste landfills.

Those observations are about dispersion on soils that saturate fairly readily so dispersion of pollutants over a broad soil sorption area actually occurs, and the soils can actually sequester pollutants to one degree or another for some amount of time, before amount of lateral release or vertical breakthrough becomes unacceptable.

Dispersion is fundamentally short-circuited in highly infiltrative soils; i.e., dispersion is proportional to the impermeability of the target soil; pollutants will not disperse on highly infiltrative soils which yield direct discharge to groundwater to one degree or another. The amount of pollutant that partitions to vadose zone and then to surface water or to deeper groundwater depends on surface and subsurface soil strata permeability and proximity to surface water. The general stormwater manual 'rule' is that discharges to ground within  $\frac{1}{4}$  (one quarter) mile of a surface water body are considered to be discharged to that body. As is the case on many other topics, it depends. To start with, the proximity aspect only makes sense if the surface waterbody is hydraulically connected and downgradient of the infiltrative BMP or facility, and the  $\frac{1}{4}$  mile aspect depends on soil/subsoil types.

The more nuanced view is that proportion of dispersion vs infiltration and risk to surface water vs groundwater is a function of multiple factors, and there is some complexity to interactions between the

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<sup>1</sup> Whatever amount is sequestered to some degree or another in soils, some may progressively break through to groundwater as buildup occurs and/or soil conditions change, e.g., pollutants are not retained as well by saturated soils as with unsaturated, and runoff from pavement salting for ice control can mobilize some pollutants.

factors. A better way of conditioning infiltration – whether direct or unintended but actual via dispersion to highly infiltrative soils – would be language along the lines of, e.g., for metals:

*For industrial, commercial, and high density residential runoff, metals treatment is required for dispersion or infiltration to ground when the discharge is within ¼ mile of a surface waterbody that has or is designated as an aquatic life use, unless there is no direct hydrologic connection to surface water, as determined and documented by a licensed hydrogeologist.*

and for phosphorus:

*For discharge:*

- *in a sensitive lake basin, or*
- *or within ¼ mile of any surface waterbody of the state that is designated as phosphorus-impaired by the state's Water Quality Assessment 303(d)/305(b), or*
- *or within ¼ mile of any surface waterbody of the state that is designated as impaired for dissolved oxygen by the state's Water Quality Assessment 303(d)/305(b), and the impairment has been documented as caused by phosphorus, then:*

*phosphorus treatment is required for dispersion or infiltration to ground when the discharge is within ¼ mile of a surface waterbody that has or is designated as impaired, unless there is no direct hydrologic connection to surface water, as determined and documented by a licensed hydrogeologist.*

That still does not resolve the '¼ mile distance' aspect with regard to variable soil/subsoil permeability, and for heavy metals assumes protection is needed for surface waters and doesn't speak to groundwater protection. With silt to sandy loam, ¼ mile *might* be the 'sweet spot' with regard to protecting surface waters; but in advance outwash gravel ¼ mile to a down gradient surface water may not be distant enough, and is as previously noted, is not protective of groundwater. No solution regarding distance is offered at this point – just food for thought and future consideration.

Revisiting the groundwater quality aspect itself, conventional thought<sup>2</sup> seems to be that when GWQS or drinking WQS are not exceeded, there's no problem. While that's true most – or maybe even all – of the time for copper and zinc<sup>3</sup>, when there's no groundwater to surface water connection, there are other pollutants to consider.

#### **Case in point: arsenic**

Given a WA state total arsenic GWQS of 0.05 µg/L, infiltration whether direct or via functionally infiltrative 'dispersion', may carry water with substantially higher concentration. Benefits of compost notwithstanding, there is some evidence that compost and compost-containing bioretention media can be such a source (Davis and McIntyre 2016, McIntyre et al. 2020); that increased organic carbon in soil from application of green waste compost mulch may result increased arsenic mobilization in arsenic contaminated soils (Clemente et al. 2010; Hartley et al. 2009; Hartley et al. 2010); and there is also limited evidence that bioretention can mobilize geogenic arsenic (Patterson 2020). Mobilization of arsenic from contaminated soils would be of particular concern in the Asarco plume affected area and any other contaminated soil areas. It may be necessary to consider that neither dispersion over nor infiltration through soils should be allowed anywhere in that plume area or any other arsenic

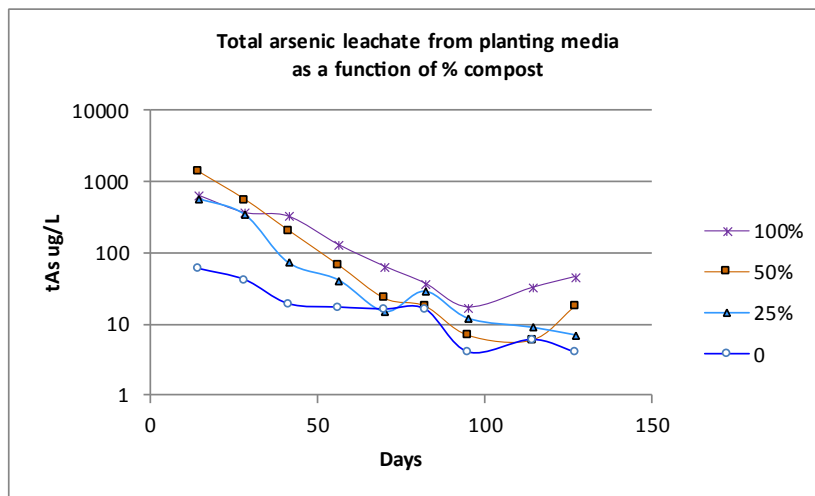
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<sup>2</sup> Based on more than a few papers not cited here, but can be produced, and anecdotally – heard in many meetings.

<sup>3</sup> These are measured in most stormwater studies and routine monitoring because they are the two indicator heavy metals listed in Ecology's and deemed-equivalent stormwater manuals. For cost-control, studies and monitoring limit what they measure beyond indicator pollutants.

contaminated soils; and that even in regulatorily non-contaminated soils, compost mulch and/or amendment may be detrimental either as an arsenic source itself, and/or by increasing geogenic arsenic mobility.

There is unfortunately a large historical void regarding arsenic risk assessment in relation to stormwater and LID. Aside from (Davis and McIntyre 2016) and (McIntyre et al. 2020) vis a vis green waste compost, one study with regard to infiltrative media (Sawhney et al. 1996) found a strong relation between arsenic in leachate and proportion of biosolids compost with growth medium consisting of peat, perlite, and sand in a 50:30:20 ratio. Biosolids compost was proportionally 0, 25, 50, and 100 percent vis-à-vis growth medium 100, 75, 50, and 0 percent respectively. Average arsenic in compost was 25.6 +/- 1.9 mg/kg but within range at 75% compost and well within range at lower %; it is also well within the allowed biosolids maxima<sup>4</sup> of 41 mg/kg for cumulative loading and the allowed ceiling of 75 mg/kg. The plot is from paper's data.



Having noted some evidence of arsenic risk from both green waste and biosolids compost, we need to consider other pollutants with regard to the advisability allowing biosolids for post-construction soil amendment (BMP T5.13) in any case where that area or any portion may be used for dispersion or any infiltrative BMPs. US EPA OIG (2018)<sup>5</sup> "identified 352 pollutants in biosolids but cannot yet consider these pollutants for further regulation due to either a lack of data or risk assessment tools. Pollutants found in biosolids can include pharmaceuticals, steroids and flame retardants" (US EPA OIG 2018). EPA's response to that and the OIG<sup>6</sup>, and OIG's reply to that is limited to messaging about the safety of biosolids; that there is a large number of chemicals for which biosolids have not been assessed for risk remains a concern. With regard to human health and pathogen protection, WAC 173-308-170 stipulates only two indicator pathogens for testing<sup>7</sup>. For any of the listed reduction methods that rely upon heat, there are "new pathogens (hepatitis A virus and adenovirus) with heat-resisting capabilities that have been detected in biosolids since the enactment of the Part 503 Rule<sup>8</sup> in 1993" (Popoola et al. 2023). Precaution recommends further restriction on where biosolids can be applied.

<sup>4</sup> WAC 173-308

<sup>5</sup> <https://www.epaoig.gov/reports/audit/epa-unable-assess-impact-hundreds-unregulated-pollutants-land-applied-biosolids-human>

<sup>6</sup> Office of the Inspector General

<sup>7</sup> Fecal coliform or *Salmonella sp.* bacteria density

<sup>8</sup> Identical concern for WAC 173-308-170 pathogen reduction.

Last, as a bit of an aside, something to consider specific to arsenic and WQ treatment: while arsenic is classified as a heavy metal regulatorily, it is more correctly classified as a metalloid, and chemically is more similar to phosphorus than to true metals. That means potentially shifting focus from metals treatment to the best available phosphorus treatment where arsenic is known to be an issue, and suggests that the HPBSM polishing layer may be a good candidate for that.

## References

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