BCOSSA Technical Review Committee Technical Bulletin

Title: Combined Treatment and Dispersal systems

Subject:

Provides a brief general guideline for the application of the SPM V2 to these systems. Not intended to address specific systems.

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Principal authors: Ian Ralston, Michael Payne

Contact: TRC Technical Support line at 1-877-475-2838

Email: trc@bcossa.com

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1. Application of SPM standards

1.1 Introduction

Combined treatment and dispersal systems (CTDS) are defined for the purpose of this bulletin as systems which provide treatment in media or through other process in the same cell or unit that disperses the effluent to the native soil.

The CTDS may also be a system in which the effluent flowing from a treatment unit is dispersed directly to the soil or an integrated dispersal area and does not flow/is not pumped to a separate dispersal area.

These may be proprietary systems, which have been tested to BNQ or NSF standards in terms of effluent quality from a standardized treatment unit or cell. They may also be techniques which are expected or designed to produce effluent of a certain quality and which are designed and applied on a site and project specific basis.

The SPM contemplates two types of CTDS technique, Sand Mounds and Sand Lined Trenches (including above ground sand lined trenches). Based upon the application of rigorous design and installation standards provided in Parts 2 and 3 of the SPM specific loading rates and vertical separation standards are offered in SPM Part 2 for these techniques. SPM Part 2 Site Capability tables also provide guidance on the use of these techniques to address constrained sites.

This bulletin is intended to provide general guidance for the application of the SPM to all CTDS.

Where the CTDS is a proprietary, marketed, system the manufacturer or promoter of the system is encouraged to obtain specific written advice on the application of the SPM through the Technical Review Committee.

1.2 Part 1 standards

1.2.1 Seasonal Dwellings — No Hydro Connection, Isolated Areas (SPM Section 1.2.10)

Certain CTDS may be appropriate for use as Type 2 or Type 3 systems in these situations, if they do not require power and are of a type that is not affected by intermittent use.

1.3 Part 2 standards

1.3.1 Performance model

The SPM is based upon system performance, rather than upon prescription of standards. If a system is applied based upon Type 2 or Type 3 effluent being produced at a certain point in the system this must be monitored. This is the case for all systems, including CTDS.

Thus, (for example) if a CTDS is applied using Type 3 loading rates to soil then at the point of application the effluent quality should be monitored to Type 3 standards (SPM Section 2.4.1) at the minimum intervals specified in SPM Part 3 Section 3.3.

If this monitoring is not provided for in the standardized design of the system then the AP should add this provision and should ensure that the sampling provisions provide an adequate representation of the effluent quality applied.

1.3.1.1 POINT OF APPLICATION

When applying the SPM to a CTDS it is useful to define a **Point of Application**. This is the point at which the system produces effluent at the defined quality level (Type 2 or Type 3). This will be the same point at which monitoring is carried out (as noted above).

This "point" will normally be an elevation in the system, and will be used when considering application of the Vertical and Horizontal separation standards.

In some cases it may be at the base of the system, where the media interfaces with the native soil. In others it may be part way down through the media. Where this is not clear, the manufacturer or promoter should be asked to define this point/elevation.

1.3.2 Daily Design Flow (SPM Section 2.2)

CTDS are expected to be designed using the standard design flows provided in the SPM. This is necessary in order to apply SPM loading rates.

A system from outside of BC may use other design flows and loading rates, these should be converted to SPM design flows and loading rates for application in BC.

1.3.3 Site and Soils Investigation (SPM Section 2.3.2)

CTDS systems, even where the manufacturer defines a standardized method of use for the system, the Authorized Person should still assess the use and site and apply the CTDS on a site specific basis. Site and soils investigation standards should be applied per the SPM as for any system and the system selected, sized and designed based upon this investigation.

1.3.4 Vertical Separation (SPM Section 2.3.3.2)

SPM Table 2-4 (Minimum vertical separation) should be applied for all CTDS systems. SPM Table 2-5 is intended only for use with Sand Mounds and Sand Lined Trenches.

The AP should also consider increases to Vertical Separation as per SPM Section 2.3.3.2.

Since CTDS may include sand or other media which form part of the treatment cell or unit it is necessary in the design to clarify at what point vertical separation is measured from.

The vertical separation should be measured from the Point of Application, the point at which the defined treatment level is achieved. This is also the point at which effluent quality will be monitored.

1.3.4.1 EXAMPLE OF APPLICATION

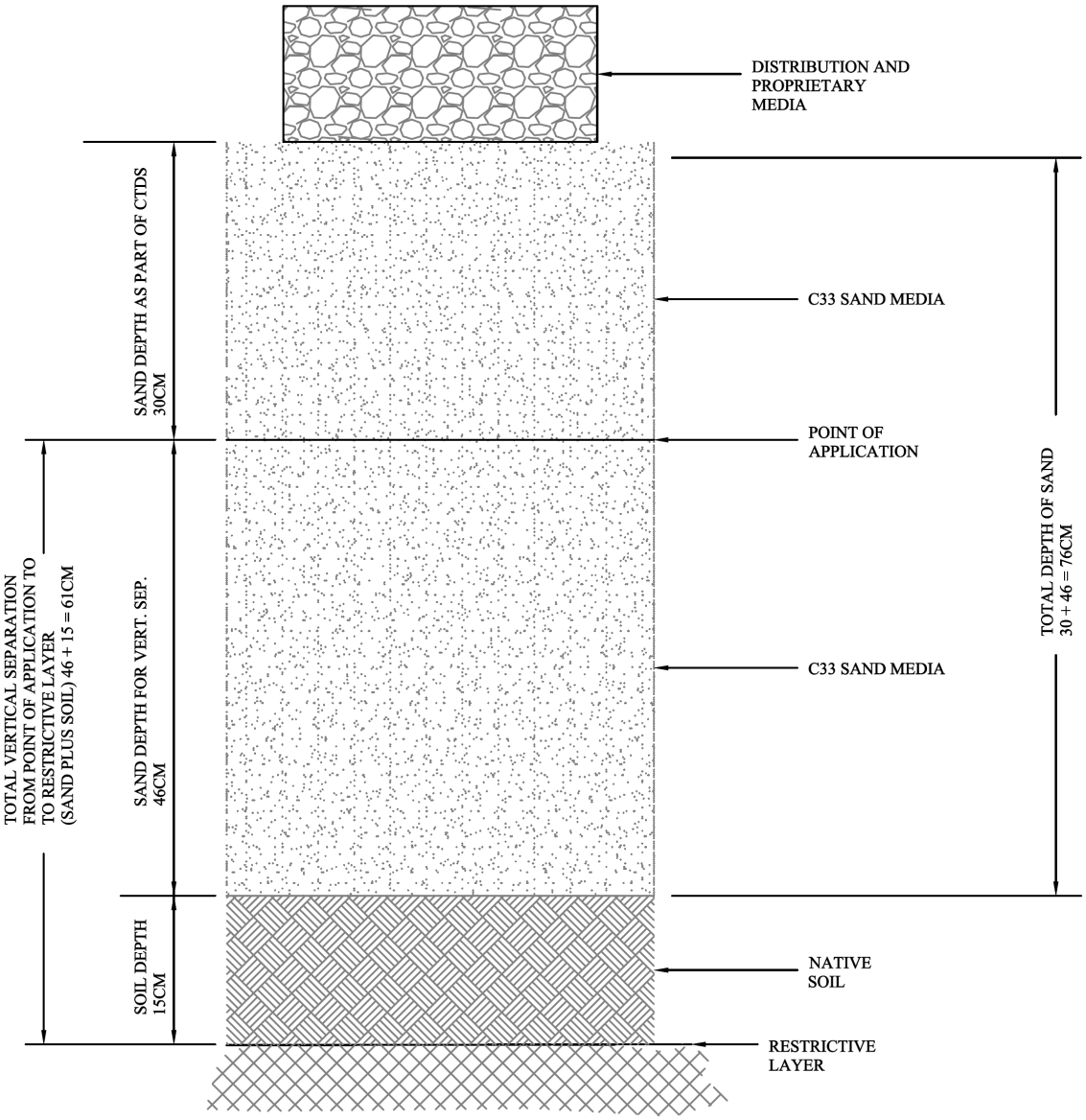
As an example, a site has 15cm of soil. This site requires use of Type 3 effluent and pressure distribution per SPM Table 2-4 and per the site capability tables.

Minimum as constructed vertical separation per SPM Table 2-4 is 61cm. This will require addition of minimum 46cm of C33 sand.

A CTDS is applied based upon Type 3 loading rates and this will be achieved using a treatment cell with pressure distribution, proprietary media and 30cm of sand below the proprietary media.

SPM Table 2-4 vertical separation standards for a Type 3 system must be met below the 30cm of sand. That is, below the Point of Application. Thus total sand depth will be minimum 76cm.

Figure 1 Diagram illustrating example of Point of Application and Vertical Separation



1.3.5 Horizontal separation (SPM Section 2.3.3.3)

SPM Tables 2-6 and 2-7 should be applied for all CTDS. The point at which separation is measured is the edge of the required basal application area (see below), and separation from this point is per the appropriate effluent type for which the system is designed.

1.3.6 Type of distribution (SPM Sections 2.3.3.2, 2.3.3.3 and 2.3.6)

SPM Tables 2-4, 2-6 and 2-7 provide different vertical and horizontal separation standards for gravity versus pressure distribution, this is because poor distribution below gravity systems leads to less effective in—soil treatment of effluent and so gravity systems require a larger vertical and horizontal separation.

This same logic applies to the restriction in use of gravity distribution for highly permeable soils (see Site Capability tables).

CTDS may use gravity or pressure distribution to the treatment system, and it is necessary to consider how well the effluent is distributed at the level of the Point of Application in order to determine whether the system should be treated as a gravity distribution system or pressure distribution in terms of separation.

If the manufacturer or promoter provides clear evidence, *based upon independent testing*, that the effluent is distributed at the level of the Point of Application to a degree equivalent to a pressure distribution system then separation standards are per pressure distribution standards of SPM Tables 2-4, 2-6 and 2-7. In all other cases gravity distribution standards should be used.

1.3.6.1 TYPE 3 EFFLUENT SEPARATION STANDARDS

SPM Tables 2-4, 2-6 and 2-7 require pressure distribution for the application of Type 3 separation standards.

For a Type 3 CTDS system for which gravity distribution separation standards are needed, follow the standards for Type1 or Type 2 gravity distribution.

1.3.7 Hydraulic Loading Rates (HLR) (SPM Section 2.3.4)

In most cases the CTDS will have an established HLR for the proprietary media. This HLR will be set by the manufacturer or promoter and should be set based upon SPM design flow standards.

The system will also have a second HLR, for the basal area where the system applies effluent to the native soil (or to a combination of native soil and sand fill). This basal area is similar to the basal area for a sand mound as described in the SPM.

In most cases the basal area will be at the level of the Point of Application.

For basal area HLR the appropriate SPM HLR from SPM Table 2-8 is to be used.

As an example, if performance is to be monitored at the Point of Application at Type 3 standard, then Type 3 HLR may be used.

1.3.7.1 EFFECTIVE BASAL AREA

The effective basal area is to be determined in a similar fashion to that for a sand mound or sand lined trench, see Section 3.8 of the SPM.

The AP must consider the efficacy of distribution of effluent to the basal area when determining the effective area.

As an example, a system on a sloping site should not consider upslope basal material as part of the effective area.

In general, effluent should not be expected to spread sideways on a sloping site.

On a low slope site (slope ≤1%) effluent will be expected to spread out in all directions from the distribution bed or area. However, the effluent should only be expected to spread in a sand fill mound at a maximum 1v:3h slope. So on a low slope site the effective basal area is to be considered as the area within a 1v:3h slope of the distribution bed or area (within the sand fill mound), and if a fill mound below a system is larger the extra area should not be considered a part of the basal area.

1.3.7.2 BED SYSTEMS

A CTDS may be a bed system, but is not a seepage bed; the reduction in HLR mandated for seepage beds per SPM Section 2.3.4.1 need not be used.

However, bed sizing must address adequate oxygen transport for treatment (see LLR below).

1.3.8 Linear Loading Rates (LLR) (SPM Section 2.3.5)

Linear Loading Rate considerations should be applied per SPM Section 2.3.5 for all CTDS. In order to determine the length of the system, the AP should consider the length (on contour) of the distribution bed, unit or trench at the level of the Point of Application.

As with HLR, the efficacy of effluent distribution should be taken into account.

Note that the maximum LLR values provided at the base of the table are intended to address oxygen transport to the infiltrative surface, and are to be applied per distribution cell.

1.3.9 Site capability tables (SPM Section 2.3.6)

SPM Tables 2-12 and 2-13 provide solutions for onsite systems on sites with constraints.

As the tables deal with specific system types or strategies, it is not possible to provide a comprehensive generic guide for use of CTDS in relation to these tables. This Bulletin can, however, provide guidance in relation to level of treatment and type of distribution.

1.3.9.1 LEVEL OF TREATMENT

Where SPM Table 2-12 offers a solution based upon a Type 2 10/10 or Type 3 effluent, a CTDS that produces this effluent type may be suitable as a solution.

1.3.9.2 TYPE OF DISTRIBUTION

Where SPM Table 2-12 offers a solution which is based upon or includes the use of pressure distribution, then a CTDS that distributes with pressure or equivalent to pressure (see 1.3.6 above) may be suitable as a solution.

Equally, where pressure distribution with timed dosing is cited as a solution or part of a solution, the AP should consider whether the CTDS will provide equivalent low Hydraulic Application Rate distribution.

1.3.9.3 SOIL TYPES

In general, if a CTDS meets the distribution and separation requirements of SPM Table 2-12 for a soil type, then it may be suitable as a solution.

1.4 Part 3 Standards

1.4.1 Monitoring for treatment and discharge (SPM Section 2.4.2)

All CTDS which are intended to meet Type 2 or Type 3 effluent quality, must include, by design, provisions for monitoring of effluent quality at the Point of Application, and be designed to allow inspection of the system.

The maintenance plan for the CTDS must include provisions for monitoring (see below) and assurance of performance.

All CTDS must include, by design, provisions for monitoring of effluent quantity.

1.4.2 Minimum design, installation, maintenance and monitoring standards (SPM Section 3.3)

When an AP is designing and installing a CTDS the standards of Section 3.3 of the SPM must be met or exceeded.

Manufacturers and promoters of CTDS are encouraged to provide APs with adequate documentation and guidance to ensure these standards are met.

The attention of APs is particularly drawn to the need to supply adequate design documentation, including a design rationale and full details of the system.

1.4.2.1 MAINTENANCE AND MONITORING

As with all systems, a CTDS must have a full maintenance plan per Section 3.3.3.4 of the SPM. This includes an operation manual for the system and a monitoring plan.

Monitoring should meet or exceed the minimum standards of SPM Table 3-1.

2. Recommendations for design manual

2.1 Introduction

To assist manufacturers and promoters of CTDS this Bulletin provides the following general recommendations with respect to a design manual for the system.

2.2 General recommendations

We recommend that all proprietary combined treatment and dispersal systems sold in BC that are not covered by the SPM should include a design manual or design guide appropriate to BC. This design manual should be peer reviewed or reviewed by the Technical Review Committee.

The design manual should include, at minimum:

- Reference to effluent quality and distribution testing results for the system for tests undertaken by an independent testing body or professional
- Guidance on siting for the system, and for how the system is fitted to the site.
- Minimum site evaluation standards for the system, meeting or exceeding those of the SPM.
- Sizing and design calculations, addressing site and soil hydraulics. With application of the design guidelines resulting in a system meeting or exceeding the minimum sand and soil HLR and site LLR standards of the SPM.
- Definition of effective basal area for the system
- Clear definition of the level of the Point of Application for the system
- Guidance on appropriate distribution method equivalency for separation and for application of Table 2-12 of the SPM
- Guidance on application of separation standards
- Materials specifications, including for imported granular and fill materials.
- Installation procedures for all parts of the system.
- Monitoring equipment and procedures, with a written plan that includes the point of sampling, sampling method, sampling frequency, and parameters to be measured.
- Maintenance procedures, and minimum standards and frequency for maintenance.

By doing so, this would provide a similar or equivalent degree of peer-review and documentation as provided for those systems provided for under the SPM.