2.1 Evaluating Fill Material

This section is intended to provide general information for property owners to consider when filling a site and it is not an approved alternative design. Property owners interested in pursuing a fill material project will need to get prior approval of their site modification plan. The site modification plan will be part of an application for a septic system permit. It is recommended that the property owner seek assistance from a certified soil scientist in preparing the site modification plan. Fill material typically has great variability, property proposed for fill will require more extensive on-site investigation to determine the existence of restrictive layers.

Weathered Fill

Weathered or natural settling of fill will ~~O~~over time, ~~precipitation and/or irrigation causes compacting of a fill, which may~~ give ~~it~~ fill similar characteristics to that of the natural soils. The annual precipitation cycle causes fill to settle and compact. Idaho has a wide range of precipitation, ranging from about 7 inches to near 80 inches. Differences in annual precipitation affect~~s~~ the rate and amount fill material will settle ~~of~~for compact~~ion~~. Normal settling and compaction will usually take at least 10 years to occur, depending on soil texture, fill depth and precipitation. Fill in low precipitation zones may never become naturally compacted enough to prevent settling in the drain-field area. **Table 2-11** shows the natural settling of fill.

Table 2-11. Natural Settling of Fill over a 10-Year Period

Precipitation Zones			
	7 – 16”	16-24”	> 24”
Soil Class	**Depth of Moisture Penetration and Settling in Inches**		
A	40	60	120
B	30	48	60
C	20	30	40

Supplemental Irrigation

Supplemental spray irrigation water can be used to aid settling where natural precipitation is not adequate. Generally, fill must be adequately saturated by irrigation for a minimum of 5 years to assure natural settling. ~~If fill, other than sand, is loose or if it can be easily dug out by a gloved hand, then adequate settling has not occurred~~. Ideally, potential drain-field sites in fill should be planned 5-7 years in advance. Adequate depth and area should be planned and the site should be leveled prior to beginning the settling period.

Evaluating Fill Material Sites

Judgment in site evaluation will be necessary when layers of different textures occur. If a fill has a continuous horizontal layer of a finer textured soil, the settling should be calculated for the most restrictive soil. As an example, most of a fill is an A soil but a continuous layer of C soil occurs at 20 inches or less in a 7 to 16 inch precipitation zone. The fill in this situation should be

considered a C soil. If the layer occurred at 30 inches then the depth between 30 and 40 inches may lack natural compaction. Understanding field capacity of the soils is critical to determining if the fill material has adequately settled.

Unacceptable Fill Material

Fill material must be free of trash, garbage, solid waste, demolition materials, woody debris (including stumps, branches, sticks, forest slash, mill yard debris), organic material such as manure, grass/lawn clippings, biosolids, sludge, compost, unsuitable soils and large rocks.

Mechanical Compaction Not Authorized

Mechanical compaction of fill soils is not an acceptable substitute to weathered fill. Mechanical compaction has its place in providing buildings with structurally stable level bases, essentially preventing the building from settling. The soil based treatment system of a drainfield, while it too needs a stable base, is easily over compacted resulting in horizontal flow paths and break out (a type of system failure) or greatly reduced long term infiltration and subsequent system failure.

Site Preparation

Prior to placement of any fill, the natural ground surface should be scarified or plowed to a depth of 6 to 8 inches. This will increase stability and avoid the problems associated with a layer of organic material. Include enough area to run compaction and settling tests. This area should not be included in the drainfield area calculations because the test pit excavations will destroy the area for use as a drainfield.

The original soil should not have been compacted prior to the placement of fill. Compaction can easily happen at construction sites if equipment~~,~~ or other types of vehicles have been operated during periods when the site was wet. On sloping areas, preventing compaction is very critical because saturation zones can develop just above the compacted layer, creating stability problems. Loose soils with significant amounts of volcanic ash are particularly susceptible to compaction.

Sites should be avoided where fill has been dumped in piles for a long period and then leveled out. This will cause differential settling. The calculation of settling time will begin after leveling.

Fills of a different texture than the underlying natural soil can have stability problems on slopes if the underlying soil has a finer texture by 2 subgroups and a potentially slower permeability. Deep mixing of the fill with the top 12 inches of the native soil may help alleviate the problem on slopes less than 15%.

~~Demolition material; stumps, trash, large rock, in fill may make the site unsuitable.~~

Accelerated Fill

Accelerated fill may be employed to shorten the time frame for weathered fill with supplemental irrigation. Accelerated fill is a process that mimics the yearly or annual hydrologic cycle of soil weathering. The fill soils are brought up to their field capacity by using an irrigation system to mimic rainfall and then the fill soils are left to dry and settle. Irrigation application methods need to avoid erosion of the fill and formation of rills that allow runoff to occur. A sufficient timeline between irrigation sets needs to be determined based on soil transpiration or soil measurements. Natural weathering of fill material can be enhanced by using supplemental spray irrigation and drying. Depth of fill and fill soil type are key factors in determining the length of time needed for

this type of site modification.

Elements of a Site Modification Plan for an accelerated fill material project include the following:

1. Permit Application Information
   a. Primary and replacement drainfields area in ft^2.
   b. Site map.
   c. Setbacks.
   d. Test pads of sufficient size are calculated. Testing pads are sacrificed by excavation to bottom of fill to determine soil structure/weathering.
   e.
2. Site Evaluation
   a. Topography – elevation, primary wind direction.
   b. Climate – precipitation, evaporation based on the 30 year averages to be part of field capacity analysis and natural weathering for the test period.
   c. Access – equipment access for site ingress and egress.
   d.
3. Soil Characterization
   a. Soil Horizons and Soil Types.
   b. Effective soil depth determination.
   c. Soil structural characteristics.
   d. Percent rock/gravel.
   e. Ash layers.
   f.
4. Site Modification Plan Details
   a. Depth of fill necessary to achieve effective soil depth.
   b. Proposed Soil Type for Fill. Follow TGM particularly on sloped ground. Use information gained in the soil characterization step to determine fill soil type. NOTE: Soil texture changes of greater than 2 subgroups can lead to unstable soil structure and preferential flow pathways for effluent – This would be an unacceptable fill soil type.
   c. Determine Fill Soil Field Capacity. Soil type for the fill will determine the field capacity of the soil. A soil scientist should determine the volume of fill and the corresponding field capacity for the fill. This is critical to determine the amount of water to be applied to the fill material. The effort is to simulate a natural weathering cycle through artificial sprinkler application of water.
   d. Irrigation Water Management Plan. The objective is to apply enough water through the sprinkler system to achieve the field capacity of the fill material. Describe the source of irrigation water, the method of application, the length of application based on calculated sprinkler flows, and the length of the resting period. The application of the supplemental water must be through a metered supply with sprinkler coverage measured and monitored. Irrigation days with high winds and hot temperature (>90°F) are to be avoided as the water from the sprinkler system will drift and evaporate out of the fill material and not achieve field capacity. Installation of soil lysimeters can be used at several depths to measure field capacity and determine when sprinkler application can stop. This

provides certainty that the irrigation system is achieving field capacity. Without lysimeters additional test pad areas are likely to be needed and potentially longer time frames to complete the accelerated fill required. Sprinkler activity is on a month by month basis to achieve the equivalent of a 10 year cycle of soil weathering for a deep fill project. The application period is June, July, August, and September. The water cycle must stop and allow the fill materials to completely dry out to replicate the weathering pattern. Sprinkler activity occurs over two summers and two winters with additional sprinkler activity in year 3 and 4 dependent upon the Test pad results.

e.

5. Submit plans for review.
6. Install fill material as per Site Preparation section and any additional conditions identified in the plan review.
7. Monitoring
   a. Monitoring sprinkler application rate to confirm calculated time for the sprinkler set. Monitor sprinkler coverage to be sure no areas are left dry. Ensure overlap of sprinkler coverage.
   b. Monitor lysimeters to confirm field capacity has been met.
   c. Fill Material Monitoring. Test holes are first excavated with a soil auger to determine soil stability. Test holes that collapse when the soil auger is removed – fail and the fill is not ready for further tests. Refill hole and tag or mark the spot as sacrificed. Do not test in this location again. Repeat test hole soil auger determination until test hole remains open and does not collapse.
   d.
8. Fill Material Suitability Tests. Excavate test hole with back hoe after the soil auger stability tests are successful.
   a. Test hole excavation needs to be done very carefully – Collapse of the test hole is likely in deep fill materials or with inadequate sprinkling. Follow safety protocols for excavation of septic tank. Be cautious of cave in and side wall collapse. Observe the soil structure. Look for massive collapses, or sections of side wall collapse– this is a failure. Refill test hole and tag or mark the spot as sacrificed. Do not test in this location again. Additional sprinkling over the entire area is needed. Minor side wall collapse may be acceptable as this can easily occur with poor excavation technique. Observation of the excavation is critical to be able to determine if partial soil collapse was a result of the mechanical disturbance by the backhoe. U shaped trenches are indicators of unstable soil side walls and the need for additional weathering.
   b. Use a geology pick to look for penetration on side walls. Follow test hole safety protocols. One way to check for compaction is to run a knife or geology pick point vertically on the face of a pit. Depth of penetration should be about 1/2 to 1" into the soil. Changes in resistance to the movement of this sharp object across the soil horizon is an indication of compaction. Very distinct platy structure or high bulk density is also an indication of compaction. Field Soil densitometers tests should be run and lab bulk density tests should be collected and analyzed. Compare results to normal soil values for the soil type.

c. If fill, other than sand, is loose or if it can be easily dug out by a gloved hand, then adequate settling has not occurred.

9. Fill is ready to install a septic system into when the pick test, soil densitometer and soil bulk density test show normal soil compaction.

~~Fills of a different texture than the underlying natural soil can have stability problems on slopes if the underlying soil has a finer texture by 2 subgroups and a potentially slower permeability. Deep mixing of the fill with the top 12 inches of the native soil may help alleviate the problem on slopes less than 15%.~~

~~Demolition material; stumps, trash, large rock, in fill may make the site unsuitable.~~

~~If the fill is thin, less than 24 inches, the system may be in the natural soil. Guidelines for cap and fill systems will apply. Because of their greater variability, fills will require more extensive on-site investigation to determine the existence of restrictive layers, inclusion of stumps, demolition materials, etc.~~

~~This section is intended to provide general information for property owners to consider when filling a site and it is not an approved alternative design.~~

Exceptions

1. Capping Fill Trench

If the fill is thin, less than 24 inches, then the base of the drainfield system may be in the natural soil. Guidelines for capping ~~and~~ fill systems will apply. ~~Because of their greater variability, fills will require more extensive on-site investigation to determine the existence of restrictive layers, inclusion of stumps, demolition materials, etc.~~

2. Sand Mounds

Sites that require 12 inches or less of fill to meet the effective soil depths for sand mounds may be prepared in the fall with system installation occurring in the late spring/summer of the next year.