

# Aggregate Operators Best Management Practices Handbook

## **PART II**

### *Chapter 5 - 3: Planning Modules*

#### **STOCKPILING MODULE - SM**

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## STOCKPILING MODULE - SM

### ***Common Concerns: Stockpiling***

Stockpiles take up a lot of land. At small operations, the stockpile might represent half of the total land base. In tight urban areas, stockpiles may be the most significant visual feature of an aggregate operation and their placement or concealment requires careful consideration. Because of their large footprint, stockpile sites can also generate a large portion of an operation's stormwater, requiring appropriate management attention.

Handling and storage are major cost elements of both extraction and processing. Accordingly, there should be a plan for each aggregate operation showing how and where materials and products will be handled and stored.

### **Image SM - 1: Stockpiles of aggregate.**



Photo courtesy of Devon County Minerals Local Plan, UK.

A stockpiling plan will help to ensure quality control by keeping finished product from becoming unintentionally blended, segregated or contaminated. When stockpiles are well placed between extraction, processing and loading facilities, hauling distances are minimized, saving time, fuel and machinery maintenance. Stockpiling planning will also organize placement of overburden, topsoil and by-products, helping to avoid double handling of low-value materials.

### ***Basic Stockpiling: What and Where?***

Stockpiles can be constructed using front-end loaders, trucks or conveyor systems. The types of stockpiles and stockpiling procedures will depend upon the available land and equipment, the flow characteristics of the material, the climate and length of the processing season, quantity of material and range of products.

Table SM-2 compares various commonly stockpiled materials for storage and handling options.

**Table SM - 2: Aggregate products and storage options.**

| Material                    | Flow Constraints |       |          | Handling Equipment |          | Bulk Storage and Stockpiling Options |         |        |     |      |
|-----------------------------|------------------|-------|----------|--------------------|----------|--------------------------------------|---------|--------|-----|------|
|                             | Flow Char.       | Fines | Moisture | Front-end Loader   | Conveyor | Cone                                 | Layered | Corral | Bin | Berm |
| <b>Pitrun</b>               | fair             | high  | mod      | ②                  | ②        | ②                                    | ②       |        |     |      |
| <b>Topsoil</b>              | poor             | high  | mod      | ②                  |          | ②                                    | ②       |        |     | ②    |
| <b>Overburden</b>           | poor             | high  | high     | ②                  |          | ②                                    | ②       |        |     | ②    |
| <b>Clay</b>                 | poor             | high  | high     | ②                  | ②        | ②                                    | ②       |        |     | ②    |
| <b>Gravel</b>               | good             | low   | low      | ②                  | ②        | ②                                    | ②       | ②      | ②   |      |
| <b>Sand</b>                 | good             | mod   | high     | ②                  | ②        | ②                                    | ②       | ②      | ②   |      |
| <b>Sand and gravel</b>      | poor             | mod   | mod      | ②                  | ②        | ②                                    | ②       | ②      |     |      |
| <b>Coarse rock</b>          | mod              | low   | low      | ②                  |          | ②                                    | ②       |        |     |      |
| <b>Crushed aggregate</b>    | good             | mod   | low      | ②                  | ②        | ②                                    |         | ②      | ②   |      |
| <b>Washed aggregate</b>     | good             | low   | mod      | ②                  | ②        | ②                                    |         | ②      | ②   |      |
| <b>Blended aggregate</b>    | good             | low   | mod      | ②                  | ②        | ②                                    |         | ②      | ②   |      |
| <b>Riprap</b>               | poor             | none  | low      | ②                  |          | ②                                    | ②       |        |     |      |
| <b>Reject material pile</b> | poor             | mixed | low      | ②                  |          | ②                                    | ②       |        |     | ②    |
| <b>Woody debris</b>         | poor             | high  | high     | ②                  |          | ②                                    | ②       |        |     |      |

**General Stockpiling Guidelines**

- Sites for stockpiles should be clean and level prior to storing materials.
- Aggregates should not be removed from stockpiles within 0.3 metre (1 foot) of the ground until final cleanup/removal of the stockpile.
- Layering can help to minimize moisture absorption in stockpiles. Tarps can also be used for products that need to be kept dry.
- Stockpiles can be located to function as sight and sound barriers.

Table SM-3 outlines the major considerations, options and applicable BMPs for stockpiles.

**Table SM - 3: Stockpiling issues, significance, notes and suggested BMPs.**

| Issue  | Significance   | Notes   | Suggested BMPs   |
|--|--|---|--|
| <b>Segregation</b> - the unintentional and undesirable separation of aggregate into size fractions | <ul style="list-style-type: none"> <li>depends upon type and height of stockpile, drop height, handling equipment and procedures</li> </ul>                          | <ul style="list-style-type: none"> <li>segregation can be triggered by any movement and/or vibration</li> <li>avoid end-dumping or dozing over the sides of piles</li> <li>fix improperly placed or malfunctioning conveyors</li> <li>segregated material can be re-blended by dozing stockpiles and dead surge areas</li> <li>frozen crust can increase segregation and decrease product quality</li> </ul>  | <ul style="list-style-type: none"> <li><a href="#">Drop Height</a></li> </ul>  |
| <b>Degradation</b> - the breaking of aggregate pieces into smaller size fractions                  | <ul style="list-style-type: none"> <li>occurs if the aggregate is falling far enough to break on impact or if machinery is driven on top of it</li> </ul>            | <ul style="list-style-type: none"> <li>avoid excessive machine time on top of aggregate</li> </ul>  | <ul style="list-style-type: none"> <li><a href="#">Drop Height</a></li> </ul>  |
| <b>Location/Space</b>  | <ul style="list-style-type: none"> <li>depends upon available land</li> </ul>  | <ul style="list-style-type: none"> <li>keep stockpile sizes to a minimum, as the material in stockpiles represents an investment in inventory</li> <li>provide room for loaders and trucks to manoeuvre</li> <li>locate to reduce noise escaping the site</li> <li>consider prevailing wind patterns</li> <li>allow sufficient distance from fences and property boundaries to prevent overflow or spillage</li> <li>avoid proximity to utilities, whose underground structures may be damaged by ground deflection from the weight of the stockpiles</li> <li>avoid locating stockpiles under overhead wires where equipment may contact the wires</li> <li>provide sufficient area for both stockpiles and operations, such as:               <ul style="list-style-type: none"> <li>subsequent crushing and processing</li> <li>Sub-contracting</li> <li>mixing plant</li> <li>weigh scales</li> <li>parking and mobile buildings</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li><a href="#">Material Corrals</a></li> </ul>   |
| <b>Drainage</b>  | <ul style="list-style-type: none"> <li>wet handling areas due to collected rainwater increase costs</li> </ul>   | <ul style="list-style-type: none"> <li>use high, dry and well drained ground</li> <li>avoid ponding</li> <li>stockpiles may compact the ground, decreasing local infiltration rates</li> <li>compact material with high fines to reduce water absorption</li> </ul>   | <ul style="list-style-type: none"> <li><a href="#">Ditches</a></li> <li><a href="#">SEC Module</a></li> <li><a href="#">Settling Pond</a></li> </ul> |
| <b>Safety</b>  | <ul style="list-style-type: none"> <li>depends upon size and whether automatic reclaim systems are installed</li> <li>frozen ground can also be dangerous</li> </ul> | <ul style="list-style-type: none"> <li>avoid creating hazardous slopes, or stabilize</li> <li>prevent inadvertent and unauthorized access</li> <li>keep stockpile back from perimeter and fences to avoid entry breaches</li> <li>prevent access to top of stockpile (i.e. remove access ramp)</li> <li>falling frozen chunks/crusts can be very dangerous</li> </ul>   | <ul style="list-style-type: none"> <li><a href="#">Fences</a></li> <li><a href="#">Signage</a></li> </ul>  |
| <b>Accessibility/Orientation</b>   | <ul style="list-style-type: none"> <li>depends upon traffic flow from and to stockpiling area</li> </ul>   | <ul style="list-style-type: none"> <li>provide for year round accessibility</li> <li>for multiple vehicle access types (e.g., haul trucks and highway trucks), consider separate access roads to avoid traffic conflicts</li> <li>design for safe, orderly and efficient access</li> <li>ensure optimum utilization of space for efficient existing or anticipated removal and processing operations</li> <li>provide for adequate separation from the various operations</li> <li>limit height to avoid loading out faces from becoming too high</li> </ul>  |  |
| <b>Ground Stability</b>  | <ul style="list-style-type: none"> <li>generally only a concern in low, wet areas</li> <li>frozen ground can also be unstable</li> </ul>                             | <ul style="list-style-type: none"> <li>stockpile areas should be on stable ground during all weather conditions</li> <li>stockpiles should not be adjacent to unstable ground, either up or down slope</li> </ul>   |  |
| <b>Proximal Activities</b>   | <ul style="list-style-type: none"> <li>depends upon proximity to non-industrial neighbours</li> </ul>  | <ul style="list-style-type: none"> <li>avoid locating stockpiling areas adjacent to public or residential areas</li> <li>stockpiles can be a major source of dust</li> <li>place stockpiles so that the prevailing wind will not create adverse dust effects on sensitive areas</li> <li>consider placing buffers on the downwind side of stockpiles</li> <li>can be used for noise and visual screens from other activities on site</li> </ul>   | <ul style="list-style-type: none"> <li><a href="#">Water Spray</a></li> </ul>  |