

## TECHNICAL MEMORANDUM

**DATE:** December 14, 2012

**TO:** Bob Schwarz, PE, Oregon Department of Environmental Quality

**FROM:** Chris Martin, PE, Task Order Manager, Hart Crowser, Inc.

**RE:** **Landfill Cap Inspection**  
**Santosh Landfill Site**  
15563-03/Task 3

**CC:** Steve Campbell, DEQ  
Tim Spencer, DEQ

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## INTRODUCTION AND PURPOSE

The purpose of this technical memorandum is to document observations made during the geotechnical inspection of the engineered landfill cap at the Santosh Landfill site near Scappoose, Oregon. The Santosh Landfill was a privately owned landfill, operated from the early 1970s until the early 1980s. During operation, the landfill was the primary municipal landfill for Columbia County, accepting both municipal and industrial wastes. In the summer and fall of 2008, a low-permeable cap was constructed over the landfill to address surface ponding and leachate seep issues.

On October 9, 2012, Bob Schwarz from the Oregon Department of Environmental Quality (DEQ) and two Hart Crowser engineers (Chris Martin and Greg Landau) visited the Santosh Landfill to observe if any geotechnical irregularities had formed since the construction of the engineered landfill cap. The side slopes of the landfill berms were checked for signs of instability or failure, while the cap of the landfill was checked for significant surface depressions and tension cracks. As part of the inspection, the condition of the stormwater drainage and methane venting was inspected for damage to the extent possible.

Bob Schwarz and Chris Martin were involved in the design and oversight of the landfill cap during its construction in 2008. Both are familiar with the site features and original condition of the landfill cap. Greg Landau is a geotechnical engineer who provided geotechnical expertise to observations made during the inspection.



## **OBSERVATIONS**

Observers walked along the bottom and around the top of the landfill berm to look for signs of slope instability or failure. Based on observations made during the site visit, the slope appears to be in generally similar condition to that at the end of construction (Photographs 1 and 2). Areas of slope failure were present along the northern boundary of the landfill (Figure 1, and Photograph 2). These failures were present in 2008 prior to the construction of the landfill cap and appear to have remained stable since that time. No evidence of recent slope failures was observed during the visit, although dense brush prevented a complete observation of the entire slope.

The surface of the landfill cap was inspected for significant surface depressions and tension cracks by the team. The cap was inspected by walking the perimeter and slowly driving through the middle of the landfill. No depressions or tension cracks were observed during the site inspection (Photographs 3 and 4).

Linear cracks on the top of the berm along segments of the northern boundary of the landfill were observed (Figure 1, and Photographs 5 and 6). The cracks run parallel to the landfill boundary approximately two feet back from the top of the berm. These cracks are located where the original construction silt fence was partially buried, and were first observed during removal of the silt fence. A probe indicated that the cracks are up to two feet deep in some areas which is deeper than the silt fence would have been buried. The cracks do not directly indicate an unstable condition in the cap, but they provide a potential for surface water runoff to accumulate at the top of the slope. This could cause the cracks to get wider and deeper, and could therefore create a problem in the future.

The condition of the drainage system was observed by opening stormwater cleanouts installed on the surface of the landfill to check for sediment accumulation within the conveyance piping. Observers also walked along the open drainage ditch and checked the drainage outfalls for blockage. No signs of failure or blockage within the drainage system were observed during the site inspection (Photographs 7 and 8).

Observation of the methane venting system included checking surface vents for damage and a loss of filter medium. Vents were inspected while the team walked along the landfill cap and while slowly driving across the cap. Only the bark filter medium and sample ports can be observed from the surface. From our inspection of the methane vents, they appear to be in good condition with no damage observed (Photograph 9).



## RECOMMENDATIONS

If a segment of the linear crack along the northern edge of the landfill cap is observed by field staff during future inspections, it should be filled in with a low permeability material such as clayey soil or bentonite and compacted to the extent practical at that time. Since the inspection, staff from the DEQ and Hart Crowser have visited the site and filled portions of the crack with dry bentonite granules and bentonite slurry although the entire length of the crack could not be observed at that time (Photograph 10). Since the landfill is constructed within a wetland area and water levels can submerge a large portion of the landfill slope, periodic inspections of the slope toe should be conducted after periods of high water.

The inspection log provided in Appendix C of the Operations and Maintenance (O&M) Plan (Hart Crowser, 2009) should be filled out by field staff during each visit. A copy of the inspection log is attached to this memo. Photo documentation should also be a part of site inspections, noting general conditions and problem areas. The locations of the existing slope failures and surface cracks should be noted on a map and any changes in conditions should be noted on the inspection log. Any maintenance requirements identified during the site visit should also be noted in the log (e.g., filling a length of surface crack).

### Attachments:

Figure 1 – Site Plan

Photograph Log

Table C-1 from O&M plan

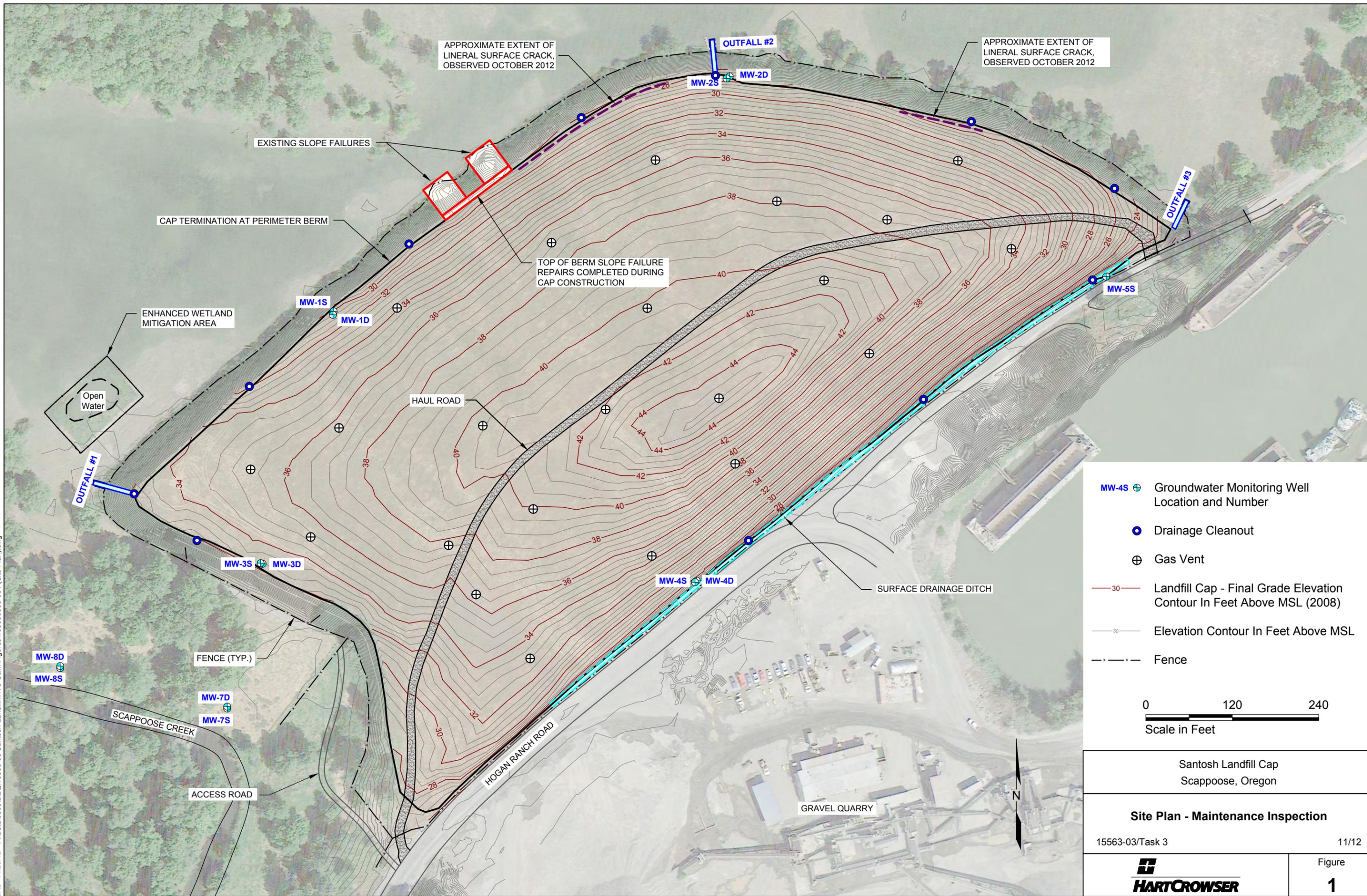
Sheet 2 of 3 for inspections in 2012 and 2013

Sheet 3 of 3 for inspections in 2014 and later

### Reference:

Hart Crowser, 2009. *Operations and Maintenance Plan, Santosh Landfill Cap, Scappoose, Oregon*.  
July 31, 2009.

JAB 11/29/12 F:\Data\Jobs\DEQ\15563-03 Santosh Landfill\TK 3 O&M\Figures\155630303-001 (Site Plan).dwg



- MW-4S ⊕ Groundwater Monitoring Well Location and Number
- Drainage Cleanout
- ⊕ Gas Vent
- 30— Landfill Cap - Final Grade Elevation Contour In Feet Above MSL (2008)
- 30— Elevation Contour In Feet Above MSL
- x-x-x- Fence

0 120 240  
Scale in Feet

Santosh Landfill Cap Scappoose, Oregon	
<b>Site Plan - Maintenance Inspection</b>	
15563-03/Task 3	11/12
 <b>HARTCROWSER</b>	Figure <b>1</b>



Photograph 1 – Typical slope on northern boundary of landfill berm.  
Photograph taken facing west.



Photograph 2 – Typical slope on northern boundary of landfill berm showing  
existing slope failure. Photograph taken facing east.



Photograph 3 – Typical landfill surface, no depressions observed. Photograph taken facing northeast.



Photograph 4 – Typical landfill surface with haul road to the right. No depressions observed. Photograph taken facing north.



Photograph 5 – Linear surface crack observed along northern landfill boundary.



Photograph 6 – Checking soil conditions and the depth of the linear crack using a foundation probe. Photograph taken facing northeast.



Photograph 7 – Minor sediment accumulation observed within stormwater drainage conveyance system. Photograph taken looking down stormwater drainage system cleanout.



Photograph 8 – Minor accumulation of debris observed at stormwater drainage outfalls. Photograph taken facing south.



Photograph 9 – Typical methane vent as seen from the surface of the landfill.  
Photograph taken facing east.



Photograph 10 – Section of linear crack along northern boundary of the landfill with bentonite slurry added. Photograph taken facing east.

**Table C-1 - Landfill Cap Maintenance Log  
Santosh Landfill  
Scappoose, Oregon**

CAP INSPECTION AND MAINTENANCE (Years 2 through 5; 2010 - 2013)	Inspection/ Repairs	Date	Maintenance Required?	Notes
<b>1 Landfill Cap Inspection and Maintenance</b>				
a. Soil Cover Inspection	Semi-annually			
b. Landfill Berms and Slope Repair Inspection	Semi-annually			
c. Site Access Road Inspection	Semi-annually			
d. Drainage Ditch Area Inspection	Semi-annually			
e. Perimeter Fence and Security Gates Inspection	Quarterly			
f. Site Monitoring Well Inspection	Semi-annually			
<b>2 Methane Gas Vent Monitoring and Maintenance</b>				
a. Mulch Biofilter Inspection	Semi-annually			
b. Methane Vent Sampling and Reporting	Annually			
c. Surface Mulch Sampling and Reporting	Annually			
d. Addition or Replacement of Mulch Biofilter	As-needed			
<b>3 Conveyance and Discharge Pipe Inspection and Maintenance</b>				
a. Drainage Cleanout Inspection	Semi-annually			
b. Drainage Cleanout Maintenance	As-needed			
c. Outfall Inspection	Semi-annually			
d. Outfall Cleanout	As-needed			
<b>4 Seep Repair Area Inspection and Maintenance</b>				
a. GCL, Vegetation, and perimeter Armoring Inspection	Quarterly			
b. GCL, Vegetation, and Perimeter Armoring Maintenance	As-needed			
c. Fence Inspection	Quarterly			
d. Fence Maintenance	As-needed			

**Table C-1 - Landfill Cap Maintenance Log**  
**Santosh Landfill**  
**Scappoose, Oregon**

CAP INSPECTION AND MAINTENANCE (Years 6+; 2014 and beyond)	Inspection/ Repairs	Date	Maintenance Required?	Notes
<b>1 Landfill Cap Inspection and Maintenance</b>				
a. Soil Cover Inspection	Semi-annually			
b. Landfill Berms and Slope Repair Inspection	Semi-annually			
c. Site Access Road Inspection	Semi-annually			
d. Drainage Ditch Area Inspection	Semi-annually			
e. Perimeter Fence and Security Gates Inspection	Quarterly			
f. Site Monitoring Well Inspection	Quarterly			
<b>2 Methane Gas Vent Monitoring and Maintenance</b>				
a. Mulch Biofilter Inspection	Semi-annually			
b. Methane Vent Sampling and Reporting	Annually			
c. Surface Mulch Sampling and Reporting	Annually			
d. Addition or Replacement of Mulch Biofilter	As-needed			
<b>3 Conveyance and Discharge Pipe Inspection and Maintenance</b>				
a. Drainage Cleanout Inspection	Semi-annually			
b. Drainage Cleanout Maintenance	As-needed			
c. Outfall Inspection	Semi-annually			
d. Outfall Cleanout	As-needed			
<b>4 Seep Repair Area Inspection and Maintenance</b>				
a. GCL, Vegetation, and perimeter Armoring Inspection	Quarterly			
b. GCL, Vegetation, and Perimeter Armoring Maintenance	As-needed			
c. Fence Inspection	Quarterly			
d. Fence Maintenance	As-needed			