Riverside County Landfills

CORE Assessment

FINAL REPORT

March 26, 2012

Prepared for:

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1 INTRODUCTION

As a result of the current economic recession, the waste tonnage received at Riverside County's landfills has decreased an average of **26%** from its high in 2005.

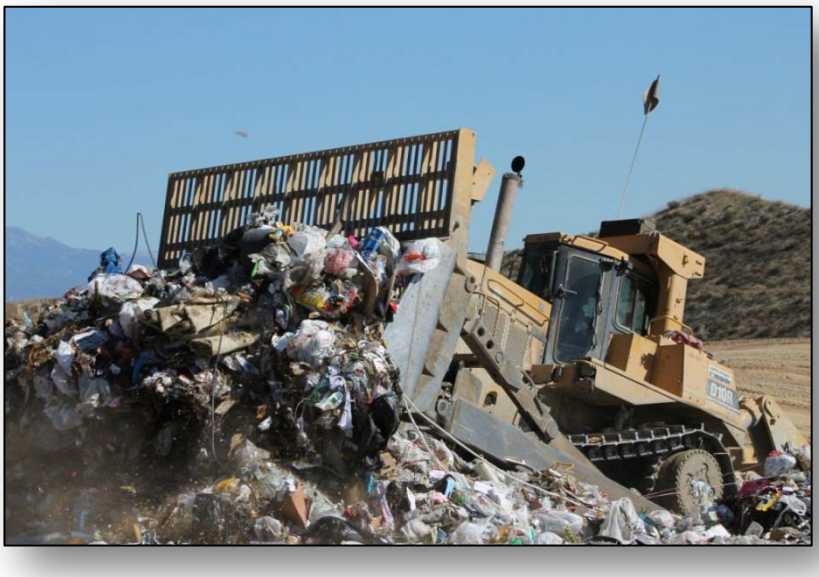
In October, 2011, we, Blue Ridge Services, began an operations review of three landfills in Riverside County: Blythe, Badlands and Lamb Canyon. In soliciting for this work, the County's stated goal was to: *"…reduce costs, maximize landfill life, and improve the overall efficiency of the landfill system. "*

Our understanding of landfill operations comes from 3 ½ decades of work in the heavy construction and landfill industry – and experience of working on hundreds of landfill projects across the Country and abroad. In California alone, we've provided operational consulting at landfills in at least 34 counties. We have performed detailed operational studies at more than 50 landfills in the past 5 years alone.

We've been hired as landfill operational efficiency experts by scores of municipal and private landfill owners/operators. Our list of private clients includes: Waste Management, Republic Services, Waste Connections and, Recology (formerly Norcal Waste Systems) …as well as many smaller companies.

And based on that history, we've found that all landfills have room for improvement – every single one. And so our approach when evaluating these operations was to look for opportunities to cut costs and improve efficiency.

During the evaluation, we closely examined key aspects of the operation. Most of the focus was on the waste handling operation – as that is where the bulk of the resources and money are spent at the landfills. It should be noted that the focus of the assessment was to look for inefficiencies, and some were found. The following report identifies areas or specific activities where improvements can be made. And in doing so, it addresses a wide range of operational issues – many of which are inter-related. Thus, in order to properly understand individual findings, it is necessary for the reader to see how each one fits into the whole. So, we strongly recommend that the entire report be read before taking a position based on a single issue.



Finally, despite the areas within the operation where we identified room for improvement*, – which was in fact what we were looking for* – it should also be noted that there were many more things being done correctly and efficiently. It is with pleasure that we present this report in that context.

2 APPROACH

To perform this work, we gathered information and visited all three facilities. We observed and videoed the operation of each landfill, spoke with various staff, and took hundreds of photographs. We then conducted numerous efficiency analyses, performed computer modeling, presented preliminary findings to County staff and finally, prepared this report to present our findings and recommendations.

Various analyses of this data were then conducted including the following:

1. Developed estimated hourly machine "Owning and Operating" costs
2. Determined equipment utilization for all machines at each landfill
3. Performed various "Process Studies" to measure performance and efficiency
    a. Time-Motion Studies to measure basic productivity of various tasks
    b. Activity Sampling – to determine overall work efficiency
    c. Value Stream Mapping – to identify and communicate core activities and non-value added tasks
4. Compared these operations to other similar landfills in the region
    a. Number of machines
    b. Types of machines
    c. Inbound tonnage
5. Evaluated inbound tonnage to develop basis of daily work load
6. Prepared production analyses for selected activities
    a. Comparison based on empirical performance standards (from prior experience)
    b. Comparison based on ideal – From Caterpillar performance estimate
    c. Comparison to other facilities

As we began work on this project we focused our attention first, on understanding the characteristics – even the personality – of each individual landfill. We've learned that while all landfills are unique, they share many similarities in regard to efficiency …and inefficiency. For example, in our experience, all landfills use too much cover soil …and all landfills have inherent inefficiencies in regard to machine utilization.

This was our expectation coming into this project: That we'd find areas within the operations that could be improved – and we did. But we also found that many of the recommendations we would normally make for improving the operation – were already being implemented.

The range of things we examine during an operational review may shift, depending on how sophisticated a given landfill is. In some instances, we'll work hard to communicate even the most basic concepts of waste compaction or the great value of airspace. However, during this review, we were able to quickly affirm that foundational issues were being handled efficiently …and then focus on a more in-depth level of review. As an example, because the landfill team already recognized the value of optimizing tarp usage, we were able to focus on fine-tuning that part of the operation – rather than spending time convincing the landfill team to consider some form of ADC.

3 EXECUTIVE SUMMARY

All of the landfills present a positive first impression. It is obvious that considerable thought and effort has gone into the designing and planning of the landfills. Badlands and Lamb Canyon both need to have more attention dedicated to the scraper haul roads and routes but otherwise were in good condition. At all landfills, there were examples of excellence.

For example, the deck grading at the Blythe landfill is perhaps as smooth and uniform as any landfill we've seen. This is only partly due to the dry climate, slow decomposition and associated lack of related differential settlement – and more a result of the excellent grading and machine operating capabilities of the manager of that landfill.

Similarly, with the exception of portable fencing at the face, the litter control fence network at Badlands and Lamb Canyon – as well as the performance of the cleanup crew is very good.

Based on our experience and understanding of the industry standard we've determined that the three Riverside County landfills are operating at a high level of efficiency – especially when compared to other similar municipal landfills. These findings are based on a comprehensive review of the following:

- Industry comparison
- Inbound tonnage
- Equipment
- Waste Handling
- Planning
- Staffing
- Safety
- Environmental Controls
- Scale Booth Operations
- Regulatory Compliance

Our findings – described throughout this report – show three landfills that are efficient, compliant and well-run. We found many indications that this trend toward lean efficiency has been happening for some time …and continues today.

So again: while it is true that every landfill has room for improvement, we found that these three landfills were already taking steps to *make* improvement. For example, in our experience we've found – generally – that the use of tarps as a form of ADC makes sense for most landfills – including these landfills. We were encouraged to find that Riverside County's landfill staff was already conducting various studies on the use of tarps prior to this project – and had in fact ordered several new tarps for each landfill prior to our beginning the study.

Additionally we found at these landfills – as we have with other landfills during this recessionary time – that there are too many machines (i.e., scrapers) …or the machine(s) being used are too large (i.e., the D10 at Badlands). But these findings are not a result of poor choices today, but are in fact left over from when inbound tonnage was much higher and more/larger machines were justified. This is affirmed by the fact that the average machine is approximately 10 ½ years old.

The following report presents a detailed discussion of our findings and recommendations.

4 FIRST IMPRESSION

All of the landfills present a positive first impression. The entrance areas were very clean and organized. Customer access roads, drainage facilities, litter control systems and overall site maintenance are typical of other landfills in the industry and appeared to be well within compliance with regulatory and industry standard.

At all landfills, there were examples of excellence.

For example, the deck grading at the Blythe landfill is perhaps as smooth and uniform as any landfill we've seen. This is only partly due to the dry climate, slow decomposition and associated lack of related differential settlement – and more a result of the excellent grading and machine operating capabilities of the manager of that landfill.

Similarly, with the exception of portable fencing at the face, the litter control fence network at Badlands and Lamb Canyon – as well as the performance of the cleanup crew appeared to be very good.

Clearly, there has been much thought and effort put into landfill planning and routine maintenance.

In our experience, even the most efficiently operated landfills will have room for improvement; during our landfill site visits we made the following observations.

The Badlands and Lamb Canyon sites had areas that the surface grading appeared to be rough. In our opinion the practice of un-delineated scraper travel across the deck is the primary cause of this rough grading. We also noticed that some of the scraper haul roads are too steep and have inadequate visibility for safe travel.

Also, there are some areas (i.e., at Blythe) where erosion repair is necessary.

Overall, it is our opinion that the landfills are maintaining a good balance between meeting minimum operational standards and minimizing operating costs. This is affirmed by the LEA inspection reports that generally show consistent improvement

5 INDUSTRY COMPARISON

As part of our review, we compared the existing landfills to other similar landfills we have worked with. We've been hired as landfill operational efficiency experts by scores of municipal and private landfill owners/operators. Our list of private clients includes: Waste Management, Republic Services, Waste Connections and, Recology (formerly Norcal Waste Systems) …as well as many smaller companies.

Our firm has worked on hundreds of landfill projects and conducted operational studies at facilities ranging in size from 4 to 20,000 tons per day. We've performed detailed operational studies at more than 50 landfills in the past 5 years alone.

We've also worked for a host of municipal clients across the Country and abroad. In California alone, we've provided operational consulting at landfills in at least 34 counties.

The operations of the active Riverside County Landfills were compared to other similar landfills. These comparisons included number of machines, size of machines, and other simple, operational benchmarks. We understand that every landfill is unique, yet there is still much to be learned from this type of comparison. The results of our comparisons are presented later in this report.

6 LEA INSPECTIONS AND REGULATORY COMPLIANCE

As part of our assessment, we reviewed the periodic inspection reports from the Local Enforcement Agency (LEA). We found that since 2007, the number of Notices of Violation (NOV) and Areas of Concern (AOC) related to operational issues are decreasing. At Badlands and Lamb Canyon, landfill gas appears to be an increasing issue, but we consider this to be more of a landfill gas control system – rather than one of day-to-day operations.

So, in terms of operational performance, all of the landfills are performing better than they were 5 years ago. This affirms our findings that the landfill management team is improving performance, despite decreases in waste tonnage – and waste revenue.

In order to provide an understanding of how each landfill is performing, the inspection results of the three facilities are presented separately.

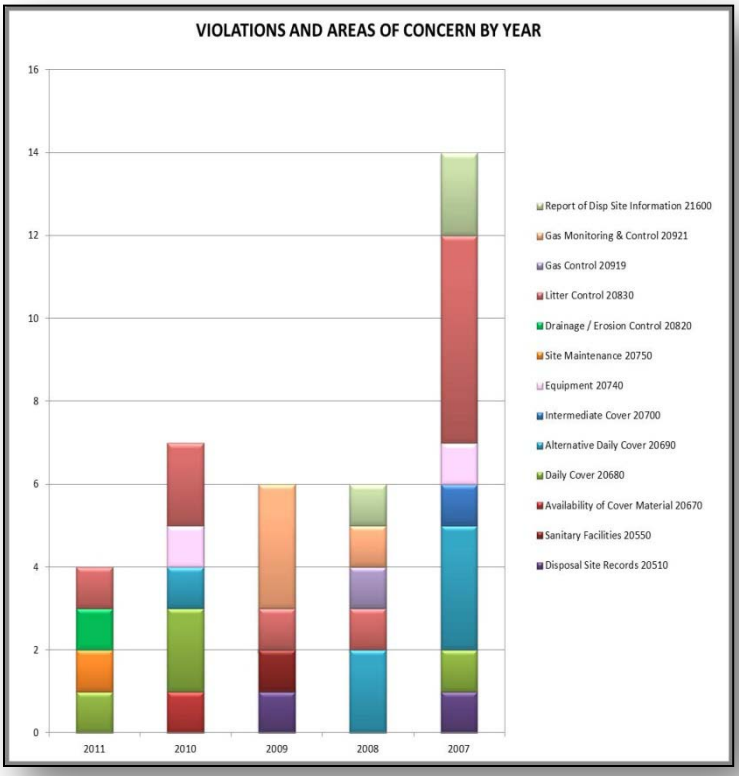
6.1 *BLYTHE INSPECTION HISTORY*

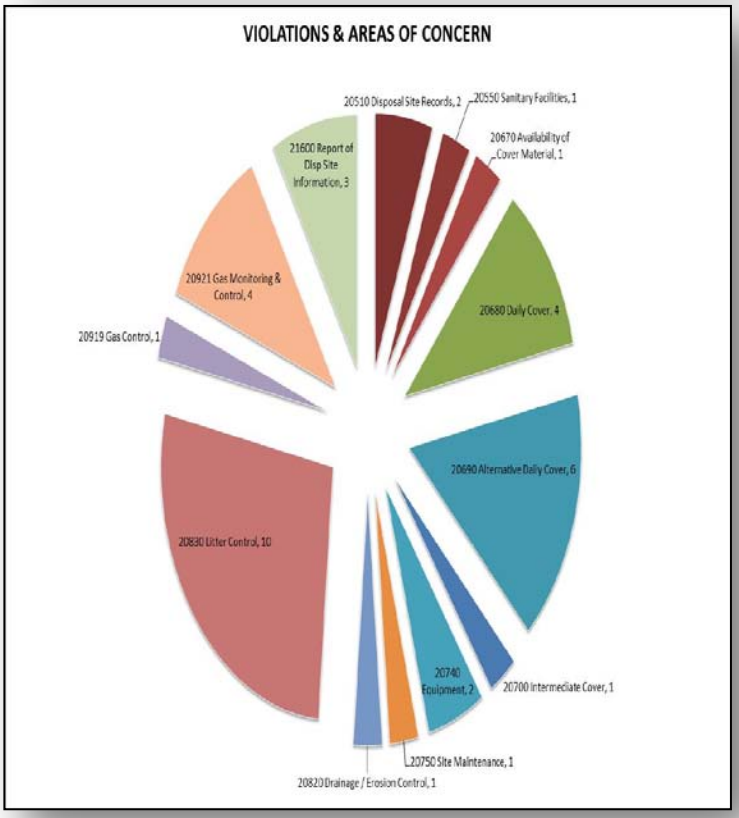
The inspection history at Blythe is improving. From a total of 14 NOVs or AOCs in 2007, Blythe is down to 4 in 2011 (as of 11/9/2011).

Inspection issues have historically ranked in the following order of frequency:

1. Litter
2. ADC
3. Gas Monitoring and Control
4. Daily Cover
5. RDSI

Blythe should focus on basic operational compliance issues of litter, ADC, site maintenance and daily cover.





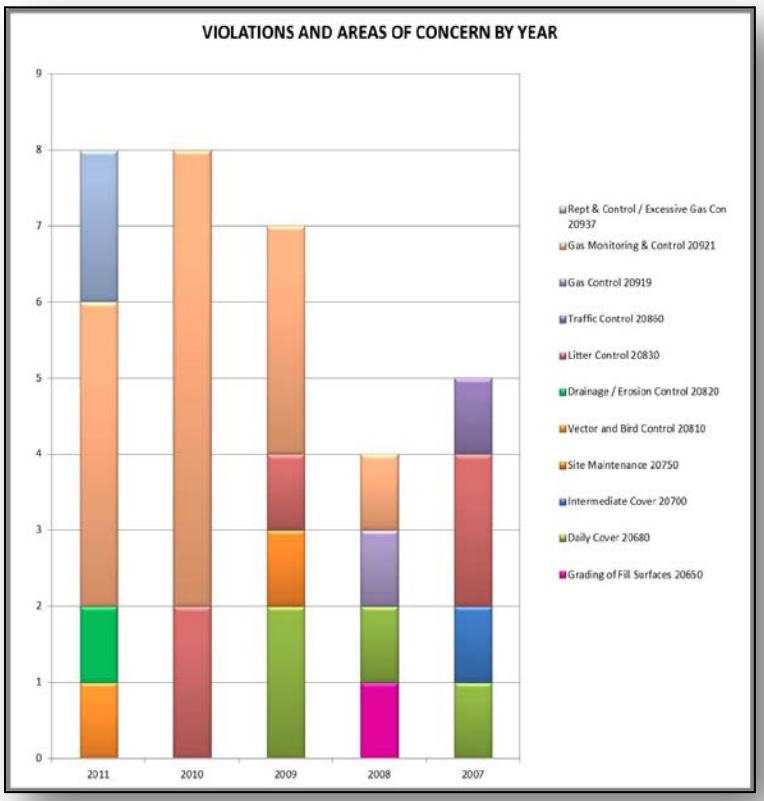
6.2 *BADLANDS INSPECTION HISTORY*

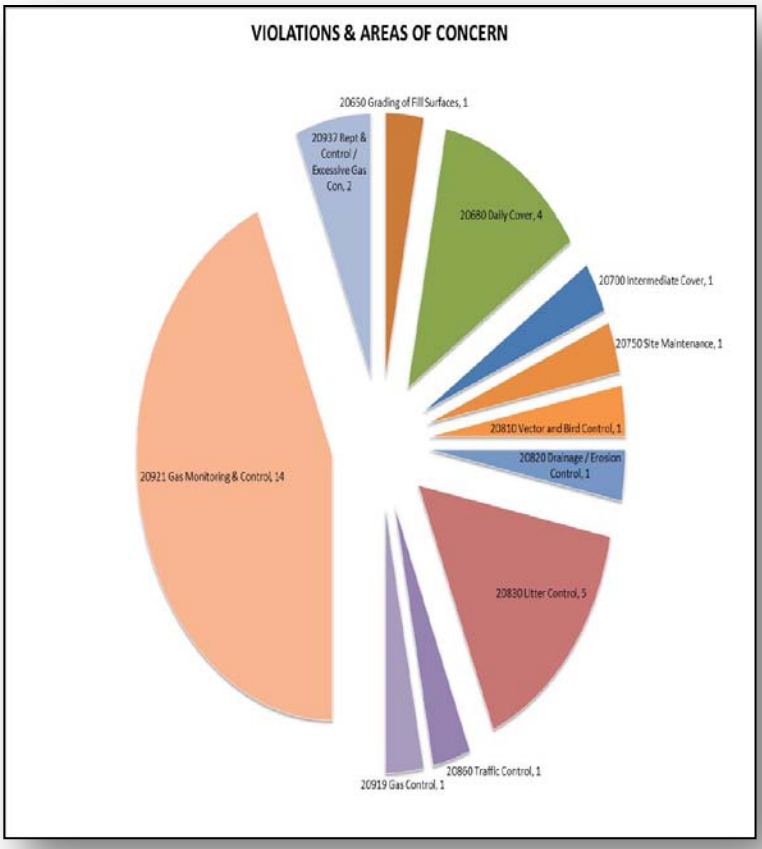
The inspection history at Badlands shows an increase in inspection issues, primarily due to increasing problems with landfill gas. However, from an operational perspective, the number of inspection issues is decreasing – if gas issues are ignored. From a total of 5 NOVs or AOCs in 2007, Badlands is down to 2 in 2011 (as of 10/25/2011).

Inspection issues have historically ranked in the following order of frequency:

1. Gas Monitoring and Control
2. Litter
3. Daily Cover

Badlands should continue the good work operationally …and focus on gas control.





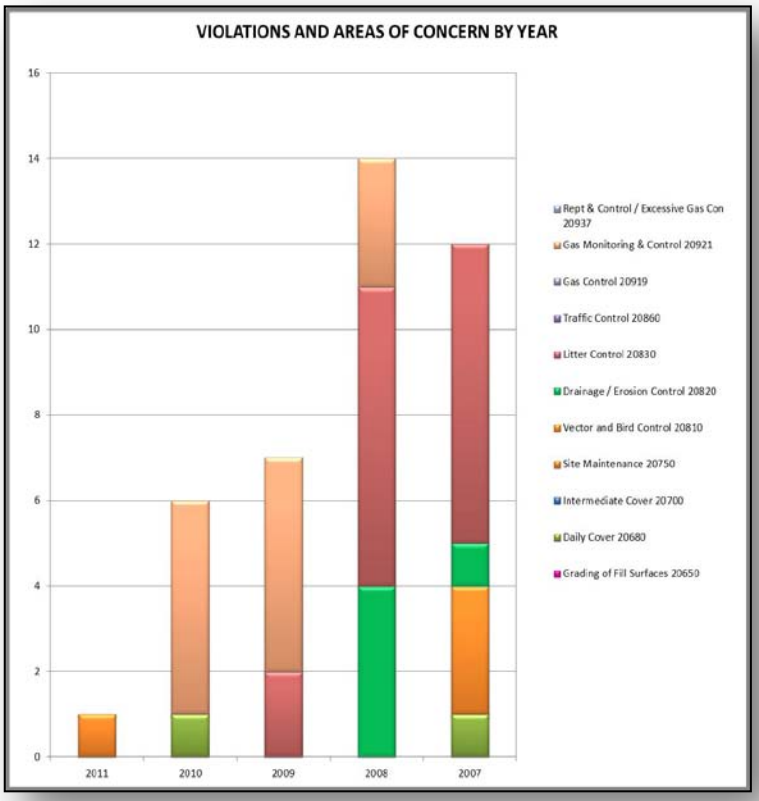
6.3 *LAMB CANYON INSPECTION HISTORY*

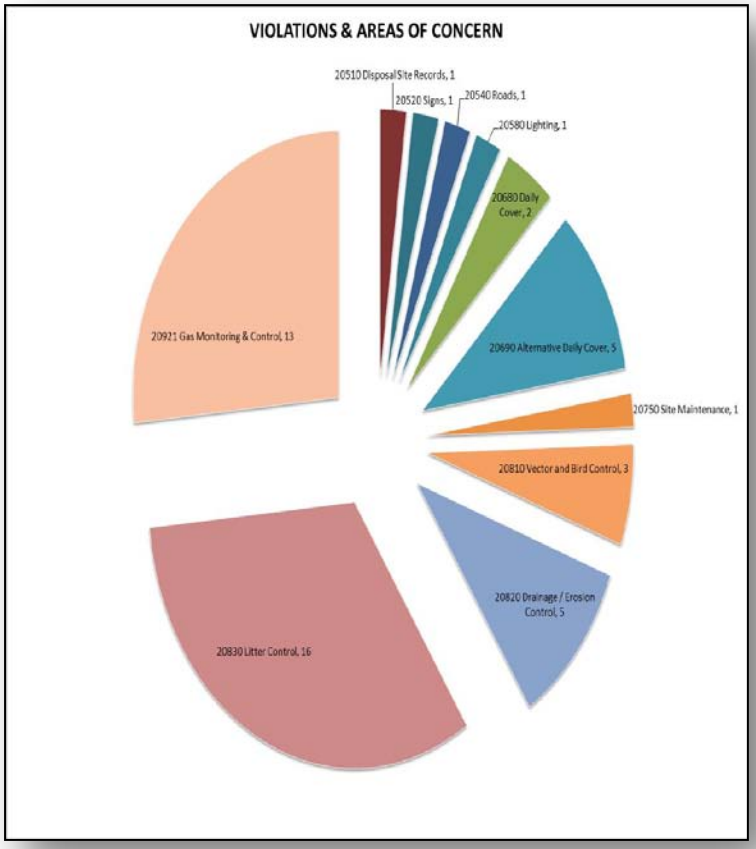
The inspection history at Lamb Canyon shows the most dramatic improvement, both in terms of operational issues and landfill gas control. From a high of 14 and 12 issues in 2007 and 2008, Lamb Canyon shows only 1 issue in 2011 – related to Site Maintenance (as of 11/9/2011).

Inspection issues have historically ranked in the following order of frequency:

1. Litter
2. Gas Monitoring and Control
3. ADC
4. Drainage
5. Vectors/Birds

Lamb Canyon should continue the good work.





The most common inspection issues at all three landfills (excluding landfill gas) are litter, ADC, drainage, and daily cover. Not surprisingly, these are also some of the most common inspections issues at California landfills – in general. And all of these issues are based on a subjective interpretation of the regulations – by the LEA inspector.

Further, we believe that these issues can best be addressed by implementing broad, effective change, rather than dealing with symptoms. For example, instead of focusing on a small area of exposed waste, work with the LEA inspector to develop more flexibility in the use of tarps – perhaps extending the duration of tarp placement at all landfills. Or, work to increase the use and effectiveness of portable litter screens …and put less emphasis on small quantities of windblown litter that is still within the active landfill area and contained by perimeter litter fences.

In our experience, many landfills in southern California – mostly those owned/operated by municipalities – have established an unrealistic performance standard. This was often done in the noble cause of making the landfills ever more compliant. But often this created an artificial standard that oftentimes far exceeded the original intent of the regulations.

From the standpoint of maintaining full compliance, and meeting the intent of the regulations to protect human health and the environment, we recommend the County continue to push back wherever necessary to maintain compliance and reasonableness.

As a case in point, consider the issue of ponded water. The regulations state:

20650. CIWMB - Grading of Fill Surfaces. (T14:Section 17710)

Covered surfaces of the disposal area shall be graded to promote lateral runoff of precipitation and to prevent ponding. Grades shall be established of sufficient slopes to account for future settlement of the fill surface. Other effective maintenance methods may be allowed by the enforcement agency.

These regulations appear to be relatively easy to read and understand …but are they? For example, what exactly is meant by the word, "ponding"? We have seen a landfill violation issued because the indentations left by the compactor's teeth filled with water during a rainstorm. We have also had discussions where an LEA inspector stated that his personal threshold for ponding was if the ponded area exceeded the size of a garbage truck. In cases where subjectivity is required, everyone has an opinion, but who is right …who is wrong …and where should the line be drawn?

In the past 10 years, we have taught more than 20 classes for CalRecycle (formerly the California Integrated Waste Management Board) on landfill regulations and inspection criteria. And the common theme has been: when there is room for interpretation, look for the underlying *intent* of the rules.

In summary, we suggest landfill management continue to work closely with the LEA to affirm that the focus is on the right issues – and that nobody loses sight of the intent of the rules.

7 INBOUND TONNAGE

The greatest factor impacting the workload at these landfills is inbound waste tonnage. As shown here, the annual tonnage at the three sites has declined significantly from a high of 1,427,980 tons in 2005 to 1,060,348 tons in 2011. This represents a decrease of approximately **26%.**

Annual Tonnage	
Blythe, Badlands & Lamb Canyon	
Year	Landfilled Tons
2001	687,815.90
2002	680,162.20
2003	682,764.76
2004	803,314.90
2005	1,427,979.88
2006	1,334,722.73
2007	1,275,198.40
2008	1,125,512.30
2009	999,960.21
2010	1,062,675.25
2011	1,060,348.01

It is important to note that in recent years, 2009-2011 there has been a slight **6%** increase in combined annual tonnage at the Landfills.

Because of the generally downward trend in waste tonnage, these landfills – like many others today – are faced with a declining waste stream …and declining revenue.

On a more detailed level, the workload at EACH landfill is based almost entirely on inbound tonnage. Therefore, we began our detailed evaluation by characterizing that waste stream. For clarity, each landfill is presented separately

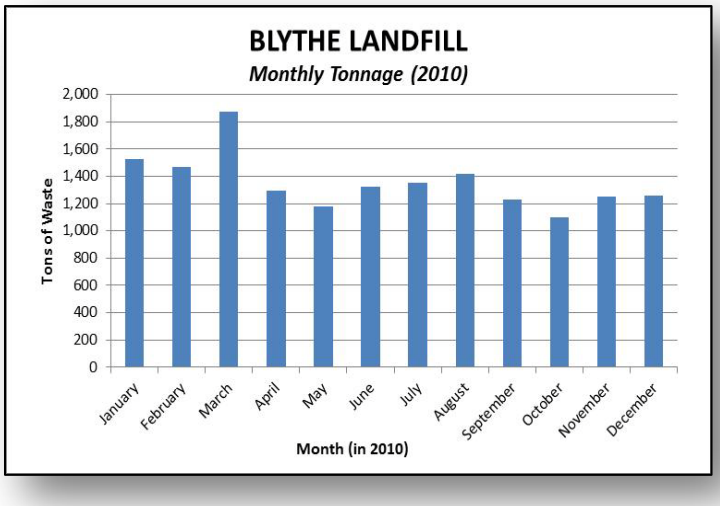
7.1 *BLYTHE LANDFILL -TONNAGE*

7.1.1 MONTHLY TONNAGE-BLYTHE

This chart describes the monthly tonnage received during 2010.

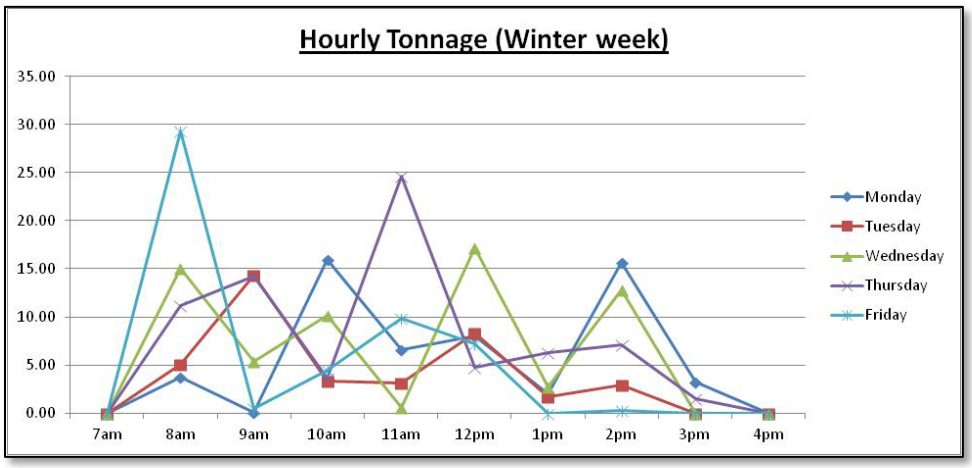
On a monthly basis, inbound tonnage varied from a low of 1,099 tons (October) to a high of 1,873 in March. The average inbound waste flow was 1,355 tons per month.

Seasonal variations in monthly tonnage are considered normal. With only a moderate change in tonnage we saw no obvious opportunity to make any significant staff or equipment changes.



7.1.2 WINTER TONNAGE-BLYTHE

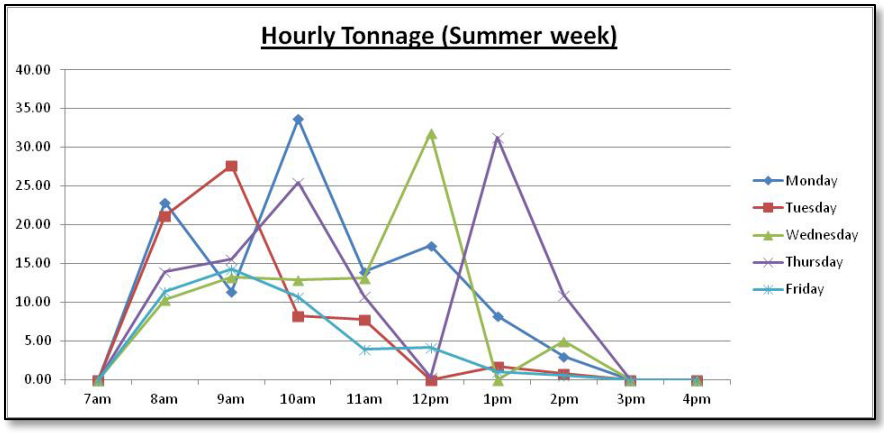
This chart for a week in January, 2011 - shows hourly tonnage for each day of the week (excluding Saturday) from this information we can see several obvious peaks in tonnage. The most consistent peaks are at 8:00 a.m. and 2:00 P.M. There are several inconsistent peaks between 9:00 a.m. and 12:00 p.m. The only consistent slow period appears to be at 1:00 p.m. There seems to be an inconsistent slow period around 9:30 a.m. Outside of these times, the flow becomes more random, generally decreasing toward the end of the day. Based on this information, there does not appear to be an obvious opportunity to reduce the hours of operation during the week.



7.1.3 SUMMER TONNAGE-BLYTHE

This chart – for a week in July, 2011 - shows hourly tonnage (excluding Saturday) similar to the week in January presented above.

This chart shows several inconsistent peaks. The most consistent peak is between 8:00 and 10:00a.m. There is a less consistent peak between 12:00 and 1:00 p.m. Overall this chart presents an inconsistent flow of waste throughout the days.



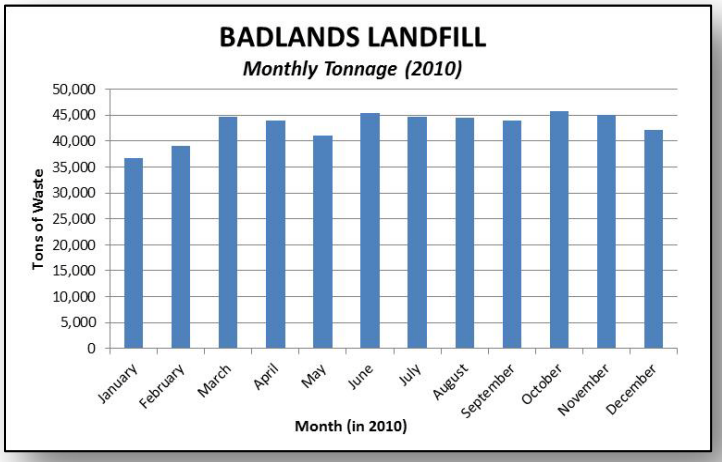
Aside from the peak at 1:00 p.m. on Thursday, there may still be an opportunity to shorten the Landfill's hours of operation towards the end of the day. Such a change should not be made without a more detailed evaluation and affirming that such a change would not further reduce the landfill's inbound tonnage.

Please note that these comments are based on only a 1-week period. Additional evaluation should be done before making any decision regarding hours of operation.

7.2 *BADLANDS LANDFILL-TONNAGE*

7.2.1 MONTHLY TONNAGE-BADLANDS

This chart describes the monthly tonnage received during 2010.

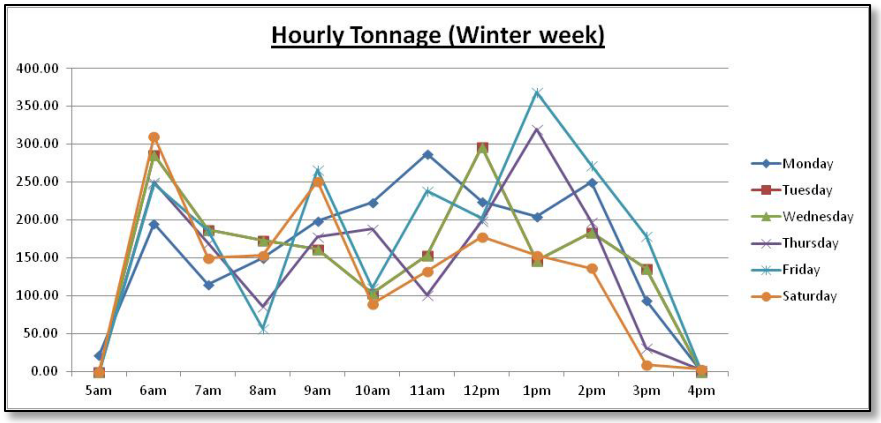


On a monthly basis, inbound tonnage varied from a low 36,680 tons (February) to a high of 45,743 in October. The average inbound waste flow was 43,056 tons per month.

Seasonal variations in monthly tonnage are considered normal. With only a moderate change in tonnage we saw no obvious opportunity to make any significant staff or equipment changes.

7.2.2 WINTER TONNAGE-BADLANDS

This chart for a week in January, 2011 - shows hourly tonnage for each day of the week. From this information we can clearly see a fairly consistent series of peaks, starting at 6:00 a.m. and repeated at 9:00a.m. There appears to be a less consistent peak between 11:00 a.m. and 2:00 p.m. The most consistent slow period appears to be at 8:00 a.m. The flow then becomes more random, generally decreasing toward the end of the day. Based on this information we do not see any obvious opportunities to reduce the hours of operation during the weekdays.

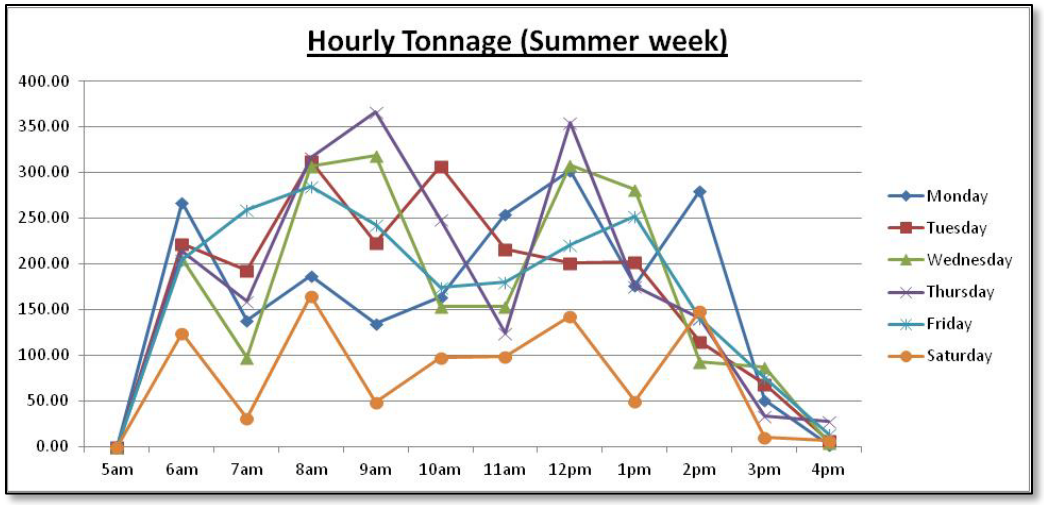


We do see an opportunity to shorten Saturday's hours. This chart shows tonnage dropping off slightly after noon and significantly after 2:00 p.m.

Please note that these comments are based on only a 1-week period. Additional evaluation should be done before making any decision regarding hours of operation.

7.2.3 SUMMER TONNAGE- BADLANDS

This chart – for a week in July, 2011 – shows hourly tonnage for each day of the week. This chart shows peaks at 6:00 a.m. and 12:00 p.m. There are also less consistent peaks between 8:00 a.m. and 10:00 a.m. The most consistent slow periods appear to be at 7:00 a.m. and 11:00 a.m. and then tapering off towards the end of the day. Based on this information we do not see any obvious opportunities to reduce the hours of operation during the weekdays.



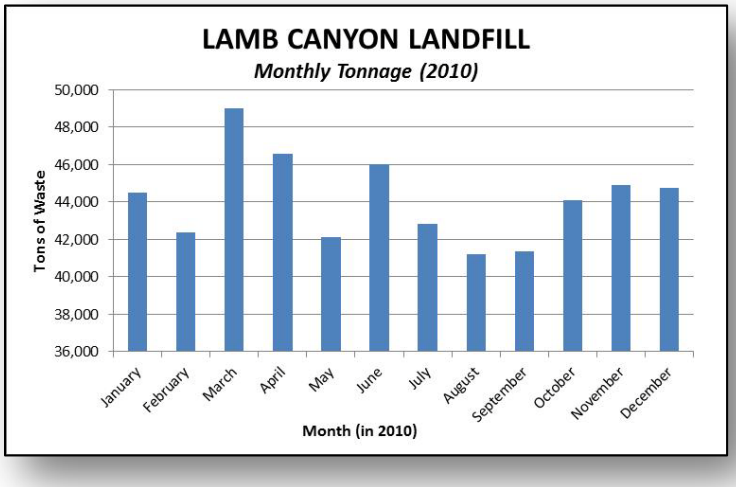
We do see an opportunity to shorten Saturday's hours. This chart shows tonnage dropping off significantly after 2:00 p.m.

Please note that these comments are based on only a 1-week period. Additional evaluation should be done before making any decision regarding hours of operation

7.3 *LAMB CANYON LANDFILL-TONNAGE*

7.3.1 MONTHLY TONNAGE-LAMB CANYON

This chart describes the monthly tonnage received during 2010.

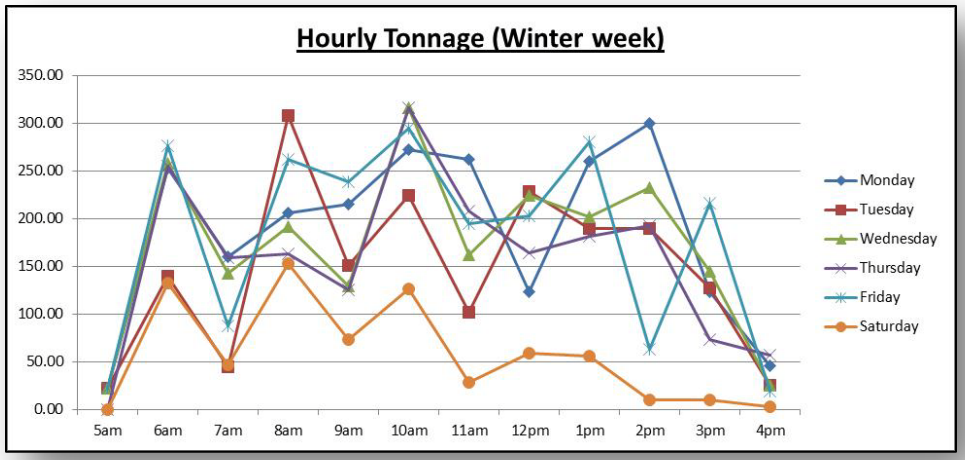


On a monthly basis, inbound tonnage varied from a low 41,212 tons (August) to a high of 48,992 in March. The average inbound waste flow was 44,145 tons per month.

Seasonal variations in monthly tonnage are considered normal. With only a moderate change in tonnage we saw no obvious opportunity to make any significant staff or equipment changes.

7.3.2 WINTER TONNAGE – LAMB CANYON

This chart for a week in January, 2011 - shows hourly tonnage for each day of the week. From this information we can clearly see a fairly consistent series of peaks, starting at 6:00 a.m. and repeated at 2-hour intervals. There then appears to be a slower period starting at 11 am until around 1:00 p.m. Beyond that time, the flow becomes more random, generally decreasing toward the end of the day. Based on this information, it appears there may be an opportunity to shorten the landfill's operating hours during the week, by perhaps closing the gate at 3:00 p.m. Such a change should not be made without a more detailed evaluation of which haulers are generally bringing waste after 3:00 p.m., and affirming that such a change would not further reduce the landfill's inbound tonnage.

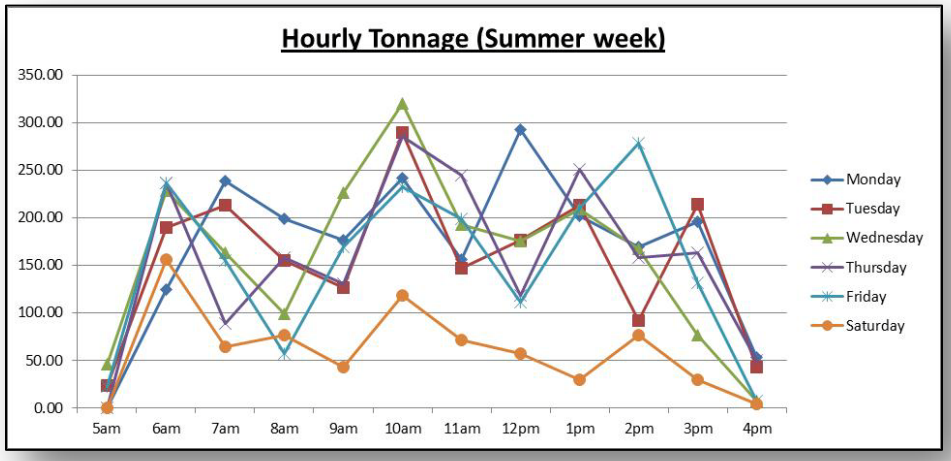


Similarly, we see an opportunity to shorten Saturday's hours. This chart shows tonnage dropping off slightly after noon and significantly after 2:00 p.m.

Please note that these comments are based on only a 1-week period. Additional evaluation should be done before making any decision regarding hours of operation.

7.3.3 SUMMER TONNAGE – LAMB CANYON

This chart – for a week in July, 2011 – actually shows less tonnage than the week in January presented above. And in fact, the monthly tonnage chart indicated similar trend.



This chart also shows some peaks, but overall presents

a more consistent flow of waste. We see less opportunity for reducing hours of operation during the week.

Aside from the peak at 2:00 p.m. on Saturday, there may still be an opportunity to shorten Saturday's hours. But again, such a change should not be made without a more detailed evaluation of which haulers are generally bringing waste on Saturday afternoon, and affirming that such a change would not further reduce the landfill's inbound tonnage.

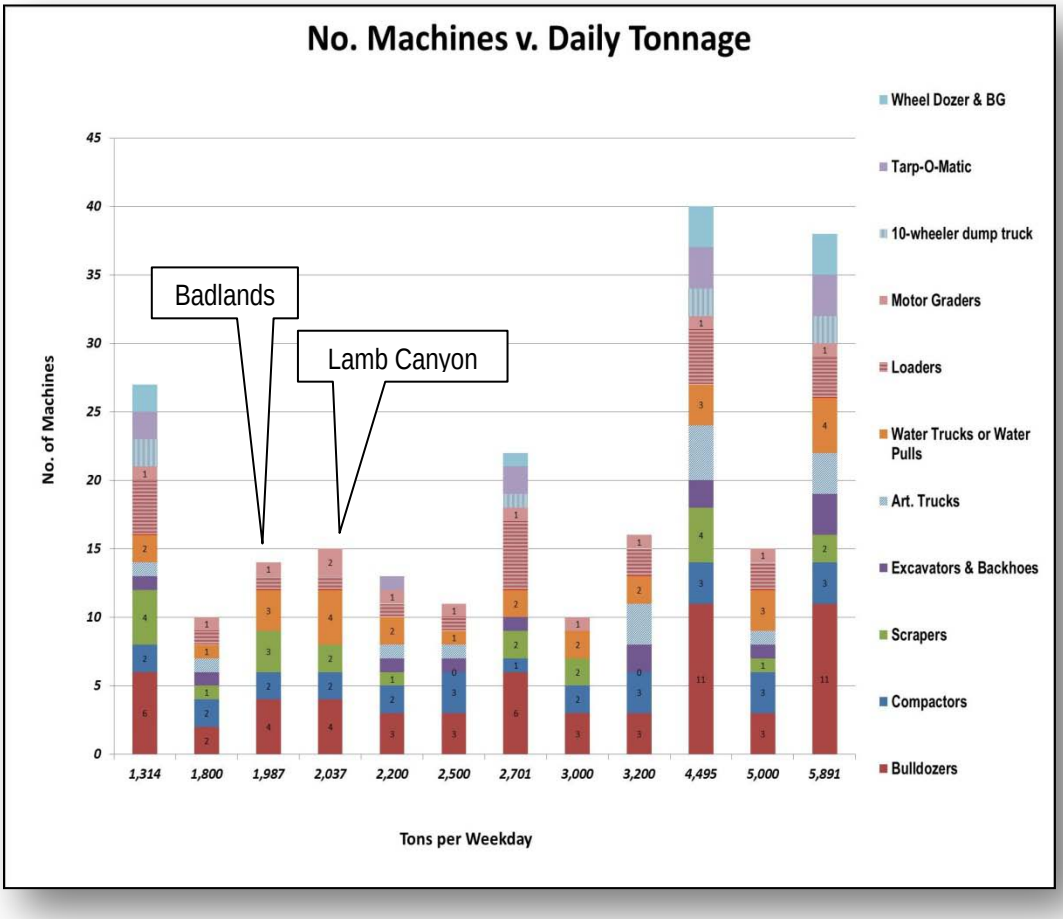
Please note that these comments are based on only a 1-week period. Additional evaluation should be done before making any decision regarding hours of operation.

8 EQUIPMENT – GENERAL

A vital step of this CORE assessment was to gain an understanding of the equipment fleet. After reviewing the number, type and size of machines at the Riverside County landfills, comparisons were made to other similar facilities.

As part of the review, several other similar landfills in California were surveyed. The Figure below shows the results of that survey. Please note that Blythe was not included in this review because of its lower tonnage related to the comparison facilities.

This chart shows landfill fleet size compared to daily tonnage. As would be expected, larger landfills (i.e., more tons per day) will generally have more machines. However, there is significant variation, mostly due to landfill operator choices, methods of operation, other ongoing projects (i.e., large excavations) and recent tonnage history. Regarding the last factor, landfills that had experienced a significant drop in waste tonnage (due to the recession) often have excess equipment that is not necessary. Riverside County's landfills fall into this category.



With experience working at over 200 landfills – and supported by the survey conducted for this project, we offer the following findings and recommendations regarding the number of machines at each facility.

8.1 *NUMBER OF MACHINES*

We recognize Riverside County's ongoing efforts regarding the continuous monitoring and adjustment to the size of the Landfill Fleet. The reduction of inbound tonnage over recent years has been a driving force behind the need for this adjustment. The following recommendations are based on our findings. We have considered factors such as equipment production rates, backup equipment, specialized equipment, inbound tonnage, owning and operating cost and a reduction in cover soil usage and handling.

It should be noted that the fleet downsizing process had already begun well before this analysis was performed. Over the past year, it appears that Badlands and Lamb Canyon have each eliminated 1 dozer and 2 scrapers. Additional machine reductions are recommended elsewhere in this report.

It is our opinion that the County can reduce the number of machines at these landfills, while still maintaining a sufficient fleet to efficiently handle the inbound waste and other necessary construction activities such as site maintenance.

While the following recommendations could lead to an optimum fleet size for the current landfill condition, a detailed analysis that incorporates equipment resale value, opportunity value, tonnage trending, system expansion, replacement costs, rental availability and costs, and mobilization costs should be carefully considered before releasing equipment with no remaining capital costs.

8.1.1 BLYTHE LANDFILL

Currently the Blythe Landfill is operating with 4 pieces of Landfill Equipment and 1 Water Truck. Based on the previously mentioned factors we feel that the current Blythe Fleet is properly equipped to perform the required tasks.

Because of the low tonnage at this site, a limited amount of equipment hours are required to complete the daily tasks. This causes the hourly Owning and Operating costs to be higher than if the equipment logged more hours. This is simply a function of the fixed costs (i.e., purchase cost) being amortized over fewer hours), resulting in a higher cost per hour.

However, as a more aggressive approach – one which could result in lower hourly Owning and Operating costs – we suggest exploring the feasibility of the following alternative fleet. This proposed fleet would require 1 piece of Landfill Equipment and 1 Water Truck. Obviously the absence of a Landfill Compactor would affect cell density and would ultimately shorten the landfill's life-span.

- Eliminate the Compactor and the Bulldozer; replace both of these pieces of equipment with a suitable Track loader.
- Eliminate the Scraper; utilize strategically placed cover soil stockpiles placed by either a contractor or a County Scraper brought to the site on a quarterly or as needed basis.

- Eliminate the Grader; utilize a contractor or a County Grader brought to the site on a quarterly or as needed basis.

While the previous recommendations could lead to an optimum fleet size for the current landfill condition, a detailed analysis that incorporates equipment resale value, opportunity value, tonnage trending, system expansion, replacement costs, rental availability and costs, and mobilization costs should be carefully considered before releasing equipment with no remaining capital costs.

8.1.2 Badlands Landfill

Currently the Badlands Landfill is operating with 11 pieces of equipment and 3 water trucks. Based on the previously mentioned factors we feel that the ideal Badlands Fleet size would be 8 pieces of equipment and 2 water trucks.

We recommend eliminating the following equipment:

- Either the D8R or the D9L Bulldozer.
  Based on utilization rates at this site and considering the need for a backup and a smaller Bulldozer we feel the site could efficiently operate with 1 less Bulldozer.
- 1 Water Truck.
  Based on the utilization rates of the Water Trucks we feel that this site could efficiently operate with 1 less Water Truck.
- 1 of the 637 Scrapers and the 623 Scraper.
  Based on the utilization rates, and our suggestion that cover soil be reduced we feel that this site could operate efficiently with 2 less Scrapers.
  We understand that the 623 Scraper is currently being utilized in a training capacity. We suggest the County explore other methods of training the Scraper operators. Options might include: training the operators on the existing 637 scraper, sending them to Blythe to work with that scraper, or simply renting a small scraper (i.e., 613 or 615) periodically when training a group of new operators. The decision regarding the 623 scraper may be one of logistics in regard to training. We did not evaluate it in that regard. However, we do suggest the 623 not be retained to serve as a production machine.

While the previous recommendations could lead to an optimum fleet size for the current landfill condition, a detailed analysis that incorporates equipment resale value, opportunity value, tonnage trending, system expansion, replacement costs, rental availability and costs, and mobilization costs should be carefully considered before releasing equipment with no remaining capital costs.

8.1.3 Lamb Canyon Landfill

Currently the Lamb Canyon Landfill is operating with 11 pieces of equipment and 4 water trucks. Based on the previously mentioned factors we feel that the ideal Lamb Canyon Fleet size would be 8 pieces of equipment and 2 water trucks.

We recommend eliminating the following equipment:

- 1 D8R Bulldozer.
  Based on utilization rates at this site and considering the need for a backup and a smaller Bulldozer we feel the site could efficiently operate with one less Bulldozer.
- 2 Water Trucks.
  Based on the utilization rates of the Water Trucks we feel that this site could efficiently operate with 2 less Water Trucks.
- 1 of the 637 Scrapers.
  Based on the utilization rates, and our suggestion that cover soil be reduced we feel that this site could operate efficiently with 1 less Scraper.
- 1 of the 140 Motor Graders.
  Based on the utilization rates, we feel that this site could operate efficiently with 1 Motor Grader.

While the previous recommendations could lead to an optimum fleet size for the current landfill condition, a detailed analysis that incorporates equipment resale value, opportunity value, tonnage trending, system expansion, replacement costs, rental availability and costs, and mobilization costs should be carefully considered before releasing equipment with no remaining capital costs.

8.2 *SIZE OF EQUIPMENT*

For the most part the Equipment used within the Riverside County Landfill Fleet is of proper size when compared to the required tasks. We do offer the following suggestions.

- We do not see the need for a D10 Bulldozer at the Badlands Landfill. When upgrading this Bulldozer we would recommend replacing with a more suitable sized Bulldozer such as a D9, assuming that the inbound tonnage continues at the current pace.
- We acknowledge that the 623 Scraper at the Badlands Landfill is currently being utilized in a training capacity. Due to its limited capacity and the length of the haul road, we do not recommend using this Scraper as a production machine.

8.3 *UTILIZATION OF LANDFILL EQUIPMENT*

Equipment utilization is an important measure of both the size and number of pieces of equipment. We evaluated the utilization of all landfill equipment at all three Riverside County Landfills. It was determined that some of the Landfill Equipment could be better utilized from the standpoint of achieving full utilization.

Of course, a utilization factor of 100% would be ideal but we understand that it is not realistic, and a job efficiency factor needs to be considered. A job efficiency factor of 85% accounts for time when a machine is not working due to unavoidable servicing, fueling, downtime, shift changes, etc. Thus, any machine with a utilization factor of 85% or higher, is considered fully utilized.

It should be noted that some machines, such as Motor Graders, Wheel Loaders, Finish Bulldozers, Backup Equipment and all of the equipment at Blythe will, by the nature of the work they perform, have low utilization rates. In these cases, it is entirely reasonable to accept a low utilization rate for a single

machine. However, when multiple machines – of the same type – have low utilization rates, we carefully scrutinized the need for multiple machines.

Overall, within the current Riverside County Landfill fleet, there are 26 pieces of landfill equipment that could be working. We have calculated the utilization rates based on available operating days and available operating hours per day. These two factors determine the total number of available operating hours. We have compared the actual annual operating hours to the available operating hours and determined the utilization rates. Excluding water trucks and support equipment the averaged Landfill Equipment utilization rate for all three Riverside County Landfills is **28%.** Please note that this utilization rate is based on the current operations, which may include some activities that simply are not necessary. Thus, if the current fleet was limited to performing only those tasks which are necessary, their utilization rate would be lower.

During our landfill site visits we did notice that numerous pieces of equipment were being prepared to go to auction. The equipment that was scheduled for auction has not been included in the following utilization charts. It is our opinion that the practice of monitoring and selling unused or underutilized equipment should be continued. In general landfill fleet size should be a direct result of inbound tonnage and maintaining the balance between these two items is a dynamic process. We believe that the County is aware of this and should continue to eliminate underutilized equipment as needed.

The bottom line is that each machine and group of machines must be evaluated in light of its contribution and the necessity of the tasks it performs.

8.3.1 Utilization of Landfill Equipment (Blythe Landfill)

Blythe Landfill Equipment Utilization				
Equipment	Average Hours per day (2010/11)	Available Annual Hours	Actual Annual Hours (2010/11)	Utilization Rate
Elevating Scraper 01-957	0.40	2176	109	*5%*
Bulldozer 99-954	1.01	2176	275	*13%*
Landfill Compactor 99-957	0.46	2176	125	*6%*
Motor Grader 95-932	0.55	2176	150	*7%*

When compared to the other two sites the Blythe Landfill has many unique circumstances that affect equipment utilization. Obviously, the inbound tonnage at Blythe limits the amount of equipment hours that are required to process the waste on a daily basis. The distance from other Riverside County Landfills limits the ability for Blythe to share equipment that is not required on a regular basis, such as the Motor Grader and Scraper.

We offer the following suggestions regarding Landfill Equipment utilization at Blythe.

- An Increase in inbound tonnage. Basically, any added tonnage would require an increase in equipment hours to process the waste. We understand that the City of Blythe tonnage has recently been redirected to the Blythe Landfill. This increased tonnage should increase the utilization rates by a nominal amount.
- As previously discussed a more aggressive approach would be to “re-tool” the Blythe equipment fleet. An example of this would be replacing the Dozer and Compactor with a Track Loader and eliminating the Grader and Scraper. This approach would increase the utilization rate of the proposed Track Loader and would eliminate the low utilization rates of the Scraper and Motor Grader.
- The third option would be to simply do nothing. The current fleet that is being used at Blythe is properly matched for the tasks at hand. The sites low inbound tonnage simply does not support higher Equipment utilization rates.

8.3.2 UTILIZATION OF LANDFILL EQUIPMENT (BADLANDS LANDFILL)

Badlands Landfill Equipment Utilization				
Equipment	Average Hours per day (2010/11)	Available Annual Hours	Actual Annual Hours (2010/11)	Utilization Rate
Bulldozer 00-941	7.68	3244	2,373	*73%*
Landfill Compactor 00-942	5.34	3244	1,649	*51%*
Open Bowl Scraper 00-943	2.73	3244	845	*26%*
Elevating Scraper 00-944	0.03	3244	10	*0%*
Bulldozer 02-940	3.68	3244	1,137	*35%*
Wheel Loader 03-946	1.36	3244	419	*13%*
Bulldozer 03-951	3.70	3244	1,144	*35%*
Motor Grader 04-958	3.08	3244	953	*29%*
Bulldozer 06-958	2.40	3244	742	*23%*
Open Bowl Scraper 06-959	3.59	3244	1,110	*34%*
Landfill Compactor 98-947	4.49	3244	1,387	*43%*

We offer the following suggestions or observations, regarding Landfill Equipment utilization at Badlands.

- In our opinion this site does not require 4 Bulldozers. By eliminating 1 of the Bulldozers it would increase the utilization rates of the remaining 3.
- The required need for a backup Compactor is causing the individual Compactors utilization rates to be approximately half of what would be considered fully utilized. With this in mind the current utilization rates of the Compactors are acceptable.
- From a utilization standpoint we feel that 2 of the 3 Scrapers should be eliminated. We recognize that the 623 Scraper is utilized as a training Scraper.
- The specialized equipment such as the Motor Grader, Wheel Loader, Finish Bulldozer and backup Equipment are obviously not being utilized on a full time basis. Due to the specialized nature of the work that they perform it is normal that they will have lower utilization rates.

8.3.3 UTILIZATION OF LANDFILL EQUIPMENT (LAMB CANYON LANDFILL)

Lamb Canyon Landfill Equipment Utilization				
Equipment	Average Hours per day (2010/11)	Available Annual Hours	Actual Annual Hours (2010/11)	Utilization Rate
Open Bowl Scraper 02-960	3.67	3223	1,127	*35%*
Bulldozer 03-952	4.97	3223	1,527	*47%*
Landfill Compactor 05-952	3.68	3223	1,131	*35%*
Open Bowl Scraper 05-953	4.29	3223	1,316	*41%*
Wheel Loader 06-948	1.75	3223	538	*17%*
Bulldozer 06-957	2.17	3223	667	*21%*
Landfill Compactor 09-948	5.04	3223	1,547	*48%*
Motor Grader 94-915	2.72	3223	836	*26%*
Motor Grader 97-918	0.72	3223	220	*7%*
Bulldozer 98-951	3.73	3223	1,145	*36%*
Bulldozer 99-953	1.50	3223	460	*14%*

We offer the following suggestions or observations, regarding Landfill Equipment utilization at Lamb Canyon.

- In our opinion this site does not require 4 Bulldozers. By eliminating 1 of the Bulldozers it would increase the utilization rates of the remaining 3.
- The required need for a backup Compactor is causing the individual Compactors utilization rates to be approximately half of what would be considered fully utilized. With this in mind the current utilization rates of the Compactors are acceptable.
- From utilization standpoint we feel that 1 of the 2 Scrapers should be eliminated.
- Based on the utilization rates we suggest eliminating 1 of the 2 Motor Graders.
- The specialized equipment such as the Motor Grader, Wheel Loader, Finish Bulldozer and backup Equipment are obviously not being utilized on a full time basis. Due to the specialized nature of the work that they perform it is normal that they have low utilization rates.

8.3.4 UTILIZATION OF LANDFILL WATER TRUCKS (ALL SITES)

Water Truck Utilization Rates				
Machine	Average Hours per day (2010/11)	Available Annual Hours	Actual Annual Hours (2010/11)	Utilization Rate
Blythe				
Water Truck 96-425	1.49	2176	405	*19%*
Badlands				
Water Truck 01-419	3.73	3244	1,153	*36%*
Water Truck 97-433	2.94	3244	910	*28%*
Water Truck 98-448	0.86	3244	267	*8%*
Lamb Canyon				
Water Truck 00-410	2.64	3223	809	*25%*
Water Truck 02-436	4.06	3223	1,247	*39%*
Water Truck 07-402	4.63	3223	1,421	*44%*
Water Truck 07-403	5.82	3223	1,787	*55%*
			Average	32%
*Water truck units have been converted from miles to hours				

We calculated the utilization rates for the Water Trucks separately from the Landfill Equipment. We had to make some assumptions while converting the provided annual miles to annual hours. Since landfill water trucks are used primarily at low speeds and accumulate relatively low mileage, it is our opinion that hourly usage is a much more accurate form of measurement.

The average utilization rate for all of Riverside County's Water Trucks is **32%.** We feel that this rate shows that the Water Trucks are being underutilized from a standpoint of comparing actual hours used to available hours. Based on this knowledge we feel that 1 Truck at Badlands and 2 Trucks at Lamb Canyon could be eliminated.

We suggest installing hour meters in the water trucks to allow for accurate hourly tracking. Once landfill staff can accurately track the water truck utilization on an hourly basis we suggest that water truck utilization be closely monitored and any necessary changes regarding the number of water trucks be made.

8.4 *BACKUP EQUIPMENT*

We acknowledge the need for backup equipment for machines such as trash dozers and compactors that may not be readily available on the open market. In addition, we understand that the County currently has excess equipment in its fleet due to the following reasons:

- The closure of the Edom Hill landfill resulted in the deployment of the newer existing equipment at the remaining open sites.
- The 26% reduction in inbound tonnage.

8.4.1 BLYTHE LANDFILL

We do not t feel that it is necessary to have any backup equipment for the current equipment fleet at the Blythe Landfill. In the event that the Bulldozer or Compactor break down the landfill can still temporarily operate with just one of these machines.

8.4.2 BADLANDS LANDFILL

We feel that backup equipment should only be present for the frontline trash handling equipment.

In addition to the frontline Bulldozer there should be a backup Bulldozer that is capable of working in both dirt and trash. For this particular site either the current D8R or the D9L could be used depending on how they are configured.

We agree with continuing the practice of having two 836 Compactors on site, one as a primary and one as a backup.

We do not feel that it is necessary to have any backup Water Trucks onsite. In the event that a backup Water Truck is needed, one can be sourced at a local rental company.

We do not feel that any backup Scrapers are needed for this site. With a detailed fill sequence plan and periodic stockpiling of cover soil a backup Scraper is unnecessary.

The support equipment such as the Motor Grader and the Loader do not require backup equipment. In the event that backup equipment is needed, it can be sourced through a local rental company.

8.4.3 LAMB CANYON LANDFILL

We feel that backup equipment should only be present for the frontline trash handling equipment.

In addition to the frontline Bulldozer there should be a backup Bulldozer that is capable of working in both dirt and trash. For this particular site one of the D8R Bulldozers could be used, assuming that it is properly configured.

We agree with continuing the practice of having two Compactors on site, one as a primary and one as a backup.

We do not feel that it is necessary to have any backup Water Trucks onsite. In the event that a backup Water Truck is needed, one can be sourced at a local rental company.

We do not feel that any backup Scrapers are needed for this site. With a detailed fill sequence plan and periodic stockpiling of cover soil a backup Scraper is unnecessary.

The support equipment such as the Motor Grader and the Loader do not require backup equipment. In the event that backup equipment is needed, it can be sourced through a local rental company.

8.5 *FLEET AGE/SERVICE LIFE (ALL SITES)*

During our site visits and after reviewing the provided equipment data we took notice of the age of the County's Landfill Fleet, Water Trucks included. We were most concerned with anticipating capital expenditures regarding the Landfill Fleet. Our calculations show that currently the average age within Riverside County's Landfill fleet is **10.28** years old. Surprisingly, this is a moderately high number when compared to other Municipal Landfill Fleets in the region. This number is more in line with that of a competitive Private Landfill Contractor. Keep in mind, that Equipment age cannot be the sole factor when analyzing Equipment life. It is also extremely important to consider Equipment hours in relation to Equipment age. It is our opinion that in a Landfill environment, fully utilized Equipment should expend its usable service life within 10-15 years.

According to the most recent hour meter readings and the County's own service life estimates the average service life for Riverside County's Landfill Fleet is **37%** expended.

Using the previous calculations and assuming the County is expecting to obtain 100% service life the Fleet would be on average **27.8** years old. Obviously a fleet of this age is unrealistic, and would have numerous limiting factors mainly pertaining to declining reliability and serviceability.

We feel that a large factor contributing to this unbalance is the previously discussed, underutilized Equipment. The intended goal being that equipment reaches 100% service life within a reasonable time frame, while still being used in the most efficient manner. To accomplish this, it is generally better to have fewer machines that receive normal utilization rather than many machines that receive low utilization. We acknowledge that in cases such as specialized Equipment, backup Equipment and Equipment acquired from closed sites the intended goal will be difficult to achieve. We suggest that the County look further into this matter.

Fleet Age and Service Life							
Unit	Make / Model	Purchase Date	Hour Meter 10/17/2011	Estimated Service Life (Hours)	Today's Date	Years Old	Expended Service Life
Blythe							
01-957	Caterpillar 623-F Elevator Scraper	12/14/01	3,510	25,000	1/23/2012	10.12	14%
99-954	Caterpillar D7-R Dozer	1/27/99	6,837	25,000	1/23/2012	13.00	27%
99-957	Al-Jon 81 K/R Compactor	12/13/99	1,677	25,000	1/23/2012	12.12	7%
95-932	Caterpillar 140-G Motor Grader	4/25/95	15,250	25,000	1/23/2012	16.76	61%
96-425	Autocar / Volvo 6X6 Water Truck	6/5/96	10,612	25,000	1/23/2012	15.64	42%
					Blythe Average	13.53	30%
Badlands							
00-941	Caterpillar D10-R Dozer	03/14/00	25,901	25,000	1/23/2012	11.87	104%
00-942	Caterpillar 836 Compactor	03/16/00	20,410	25,000	1/23/2012	11.86	82%
00-943	Caterpillar 637-E Scraper	04/07/00	12,695	25,000	1/23/2012	11.80	51%
00-944	Caterpillar 623-F Scraper	04/04/00	5,455	25,000	1/23/2012	11.81	22%
01-419	Peterbuilt 6X6 Water Tanker	01/12/01	15,217	41,667	1/23/2012	11.04	37%
02-940	Caterpillar D6-R Dozer	01/22/02	6,405	25,000	1/23/2012	10.01	26%
03-946	Caterpillar 950-G Loader	03/14/03	4,483	25,000	1/23/2012	8.87	18%
03-951	Caterpillar D8-R Dozer	05/17/03	7,181	25,000	1/23/2012	8.69	29%
04-958	Caterpillar 143H Grader	04/26/04	6,762	25,000	1/23/2012	7.75	27%
06-958	Caterpillar D9-L Dozer	05/01/06	9,796	25,000	1/23/2012	5.73	39%
06-959	Caterpillar 637-E Scraper	04/19/06	6,648	25,000	1/23/2012	5.77	27%
97-433	VOLVO 6X6 Water Tanker	11/12/97	13,163	41,667	1/23/2012	14.21	32%
98-448	VOLVO 6X6 Water Tanker	03/30/98	15,848	41,667	1/23/2012	13.83	38%
98-947	Caterpillar 836 Compactor	03/30/98	21,986	25,000	1/23/2012	13.83	88%
					Badlands Average	10.50	44%
Lamb Canyon							
00-410	Kenworth 6X6 Water Tanker	08/04/00	22,226	83,333	1/23/2012	11.48	27%
02-436	International 6X6 Water Tanker	05/28/02	16,998	83,333	1/23/2012	9.66	20%
02-960	Caterpillar 637G Scraper	01/16/02	10,908	25,000	1/23/2012	10.02	44%
03-952	Caterpillar D9-R Dozer	05/17/03	14,939	25,000	1/23/2012	8.69	60%
05-952	AL-JON 600CS Compactor	06/14/05	12,320	25,000	1/23/2012	6.61	49%
05-953	Caterpillar 637G Scraper	07/28/05	7,232	25,000	1/23/2012	6.49	29%
06-948	Terex Wheel Loader TXL300-2	08/30/06	3,229	30,000	1/23/2012	5.40	11%
06-957	John Deere Dozer 850-J	02/03/06	4,785	25,000	1/23/2012	5.97	19%
07-402	International 6X6 Water Tanker	09/12/07	10,390	83,333	1/23/2012	4.37	12%
07-403	International 6X6 Water Tanker	09/12/07	9,693	83,333	1/23/2012	4.37	12%
09-948	Caterpillar 836H Compactor	07/01/09	3,594	28,000	1/23/2012	2.56	13%
94-915	Caterpillar 140-G Grader	08/06/94	14,103	25,000	1/23/2012	17.48	56%
97-918	Caterpillar 140-G Grader	01/02/97	9,582	25,000	1/23/2012	15.07	38%
98-951	Caterpillar D8-R Dozer	07/27/98	15,990	25,000	1/23/2012	13.50	64%
99-953	Caterpillar D8-R Dozer	01/21/99	10,401	25,000	1/23/2012	13.01	42%
*Water truck units have been converted from miles to hours					Lamb Canyon Average	8.98	33%
				All Sites Average		10.28	37%

8.6 *EQUIPMENT SERVICES*

It is our understanding that the Fleet Services section functions as part of the County's Waste Management Department (WMD). We see this as a positive arrangement. Some of the benefits of this arrangement should be increased communication, responsiveness and oversight. As a comparison, other Municipal Landfills commonly rely on Fleet Services that are not under their supervision. This practice commonly has issues such as excessive downtime, extended response time and a lack of departmental cohesiveness.

It is our opinion that the Fleet Services staff appears to be skilled, competent and well equipped. The most frequent comments that were heard were regarding issues in procedure or policy. More specifically it was noted that the current processes of ordering parts and contracting major rebuilds caused excessive Equipment downtime. We suggest that the current processes and procedures are further examined with the intended goal being limiting Equipment downtime.

8.6.1 FUELING

It is our understanding that the Badlands and Lamb Canyon sites have Fleet Services staff dedicated to equipment fueling. This is a standard practice throughout the industry and we do not recommend any changes.

Due to the minimal amount of Equipment at the Blythe Landfill the Equipment Operator performs equipment fueling. This is an acceptable practice since dedicated fueling staff cannot be justified.

We recommend continuing the current practice of accurate fuel usage tracking and logging at all sites. This data is vital in calculating Equipment Owning and Operating costs and can also aid in budgeting etc.

8.6.2 SERVICING

Based on our follow up interviews with Landfill staff, it was noted that Equipment servicing has dramatically improved in recent years. Overall we did not notice any major issues regarding Equipment Servicing. Due to the age of the Equipment Fleet we strongly suggest that equipment servicing and preventative maintenance remain a top priority.

8.6.3 Minor Repairs

While performing individual Equipment inspections during our sites visits we did notice numerous minor repairs in need of correction. During follow up interviews it was mentioned that the process of ordering parts was often the reason for minor repairs not being fixed in a timely manner. Some of the issues that we noticed were oil leaks, cracked hydraulic sight glasses, leaking hydraulic cylinders and excessively damaged tires. We do not know if in fact the parts ordering process was to blame for these outstanding repairs. It is our opinion that there seemed to be an above average amount of minor repairs in need of attention.

8.6.4 Major Repairs

The practice of sending large repairs such as engine/transmission rebuilds etc. out for repairs is understandable and is a common occurrence throughout the industry. We do question how long this process takes. During our site visits and follow up staff interviews it was noted that equipment is often down for an extended period of time awaiting repair. We recognize the need for competitive bidding for large repair orders performed by a vendor. Landfill operations can be negatively affected by a piece of Equipment that is out of service for an extended period of time. We suggest considering a more efficient system that would allow for a quicker repair turnaround and would result in less equipment down time. It is our understanding that management has recently entered into a parts contract with a major equipment manufacturer that may accomplish this goal.

8.7 *Cost*

8.7.1 Owning and Operating Cost

As part of our assessment we calculated the Owning and Operating costs for the Landfill Equipment and Water Trucks at all three Riverside County sites. All of the required background data was provided by County staff. Caterpillar's format for determining Owning and Operating was used for these calculations and is considered the industry standard. Equipment purchase price, ownership term, average annual

hours, fuel consumption, maintenance, repair reserve and labor costs are a few examples of the many factors that were included in these calculations. The following charts show the hourly Owning and Operating cost for all Equipment and Water Trucks within the Riverside County Landfill Fleet.

Blythe Landfill Hourly Owning and Operating Cost		
Make/Model	Unit	Hourly Cost
Caterpillar 623-F Elevator Scraper	01-957	$115.29
Caterpillar D7-R Dozer	99-954	$168.59
Al-Jon 81 K/R Compactor	99-957	$118.43
Caterpillar 140-G Motor Grader	95-932	$75.46
Autocar / Volvo 6X6 Water Truck	96-425	$65.54
Site Average		$108.66

When compared to other Municipal Landfills in California Riverside County's hourly Owning and Operating costs are relatively low. We credit the following reasons for the low hourly costs:

- The County's labor costs are relatively low when compared to other Municipal Landfills in the region. Labor costs are often a large component of hourly Owning and Operating costs.
- The County's practice of retaining Equipment for a longer period of time allows for the owning costs to be amortized over a longer period of hours.

Badlands Landfill Hourly Owning and Operating Cost		
Make/Model	Unit	Hourly Cost
Caterpillar D10-R Dozer	00-941	$136.80
Caterpillar 836 Compactor	00-942	$122.18
Caterpillar 637-E Scraper	00-943	$161.96
Caterpillar 623-F Scraper	00-944	$126.77
Peterbuilt 6X6 Water Tanker	01-419	$42.91
Caterpillar D6-R Dozer	02-940	$105.55
Caterpillar 950-G Loader	03-946	$62.89
Caterpillar D8-R Dozer	03-951	$122.87
Caterpillar 143H Grader	04-958	$69.15
Caterpillar D9-L Dozer	06-958	$125.57
Caterpillar 637-E Scraper	06-959	$159.96
VOLVO 6X6 Water Tanker	97-433	$46.60
VOLVO 6X6 Water Tanker	98-448	$49.11
Caterpillar 836 Compactor	98-947	$124.17
Site Average		$104.04

We feel that if any equipment was eliminated from the current fleet, the hourly costs (based on Caterpillar's model) for the remaining equipment should decrease due to increased usage.

We recommend the County conduct a more detailed assessment of Equipment Owning and Operating cost – taking into consideration Opportunity Costs (i.e., the opportunity being to sell the excess machines at their current market value as opposed to utilizing these machines because they are currently available.)

Lamb Canyon Landfill Hourly Owning and Operating Cost		
Make/Model	Unit	Hourly Cost
Kenworth 6X6 Water Tanker	00-410	$42.06
International 6X6 Water Tanker	02-436	$41.72
Caterpillar 637G Scraper	02-960	$179.40
Caterpillar D9-R Dozer	03-952	$121.17
AL-JON 600CS Compactor	05-952	$124.22
Caterpillar 637G Scraper	05-953	$168.49
Terex Wheel Loader TXL300-2	06-948	$68.79
John Deere Dozer 850-J	06-957	$104.00
International 6X6 Water Tanker	07-402	$45.06
International 6X6 Water Tanker	07-403	$43.89
Caterpillar 836H Compactor	09-948	$128.00
Caterpillar 140-G Grader	94-915	$102.62
Caterpillar 140-G Grader	97-918	$66.85
Caterpillar D8-R Dozer	98-951	$115.20
Caterpillar D8-R Dozer	99-953	$149.02
Site Average		$100.03

9 LANDFILL

The CORE assessments covered the main activities performed by the heavy equipment, including pushing, spreading, compacting and covering of waste, transport of soil, access road maintenance, litter control, drainage systems, and dust control.

Most of the time on-site however, was spent watching, filming and photographing the operation. This allowed for a rigorous set of evaluations. We were able to gain some understanding of the operation by simply watching. But in order to look deeper into the waste handling process – beyond what we could visually see while on-site – we conducted various time-motion studies. The results of this work are presented on the following pages.

9.1 *TIPPING PAD*

The tipping pads at all three landfills appeared to be of adequate size and configuration to match the inbound waste flow rate. At the time of our site visit, waste was being pushed downhill at Blythe …and uphill at Badlands and Lamb Canyon.

We found that the focus of the crew was directed on the waste-handling operation – which is appropriate. Occasional delays for inbound trucks were typical of other well-run landfills, and the spotters were doing a good job of keying off the heavy equipment operators regarding placement of the next truck. This is preferred over what we sometimes see where the garbage trucks tend to run the operation by demanding to unload immediately.

We also noted that the trucks were required to clean-out at the edge of the tipping pad, rather than moving to a separate clean-out area. This also added a few minutes to vehicle unloading time, but served to keep the deck cleaner.

There was some spilled trash in the unloading area, but we believe this is acceptable and preferred – when compared to the alternative of constant grading of the deck.

Overall, the operation at the tipping pad appeared to be organized and safe.

9.1.1 BLYTHE

The tipping pad layout and waste-handling process at Blythe appeared to be clean, simple and efficient. This is due to two factors. First, the site manager/operator is very competent and coordinates his actions well. Second, because of his heavy workload at the time of our visit (i.e., manager & operator), there simply isn't any time to waste.

9.1.2 BADLANDS & LAMB CANYON

Badlands and Lamb Canyon were using a similar layout at their respective tipping pads. Vehicles unloaded at the toe of the slope and waste was pushed uphill to the face.

9.2 *PUSHING TO FACE*

The pushing operation at all three landfills is typical of other well-run facilities. The most positive thing noted in regard to pushing, was that each site used only one dozer. This is obviously appropriate for Blythe, with its low tonnage, but for the larger landfills, using one dozer shows a lean, efficiency-minded approach. Alternatively, we see many other similarly-sized landfills – especially municipal landfills – that would be using 2 or more dozers for this task.

So, even though we are recommending further reductions in machine numbers, the use of a single dozer at the face was very positive.

In addition to our visual observation, we'll present the findings of our time-motion studies here.

10 DETAILED PRODUCTION ANALYSES

Various detailed production (time-motion) studies were also performed during this study. They include: Activity Sampling; Video Analysis and; Value-Stream Mapping. These techniques – all of which are used to streamline operations by improving efficiency and eliminating waste – are explained on the following pages.

10.1 *VIDEO ANALYSIS*

The second step of productivity measurement was to conduct Video Analyses. Unlike Activity Sampling – which identifies what percentage of time is spent on specific tasks – Video Analyses identifies how much time is spent on those individual tasks.

To conduct the Video Analyses, we evaluated several days of video, condensing it into a few major categories of work. These include:

10.1.1 TIME TO UNLOAD

This refers to the time it takes for a truck to unload once is has backed into place on the edge of the tipping pad.

10.1.2 Time on the Ground

The length of time that individual loads sit on the edge of the tipping pad before to being pushed to the face was also measured. This data – when combined with the unload time – shows how long an individual slot (i.e., parking space) is occupied by a vehicle.

10.1.3 Time to Push

The next step in the process of moving waste from the trucks to the active face is pushing. In this step, the dozers push waste from the edge of the tipping pad to the face – placing the load in the appropriate location for the dozer.

10.1.4 Time to Return

Finally, we also evaluated the second part of the dozer's cycle – the return trip.

In regard to these tasks, we typically hope to see the data fall into a pattern of Normal Distribution (i.e., the classic Bell Curve). When there is no Bell Curve, it often indicates some type of variability. In the case of unloading time, it often reflects several different types of unloading vehicles, such as: roll-off, route and transfer trucks. This variation may also be due to other factors, including: condition of truck; type of material in the load and; slope of truck when dumping.

10.2 *Activity Sampling – Dozer and Compactor*

We also conducted Activity Sampling of the primary (trash) dozer and the compactor at each landfill.

The above-listed tasks are discussed for each of the three landfills on the following pages. The results of our Detailed Production Analyses indicate that these three landfills are operating at a normal rate of efficiency. In our experience, their performance is above average compared to other municipal landfills, and typical of similarly-sized private landfills.

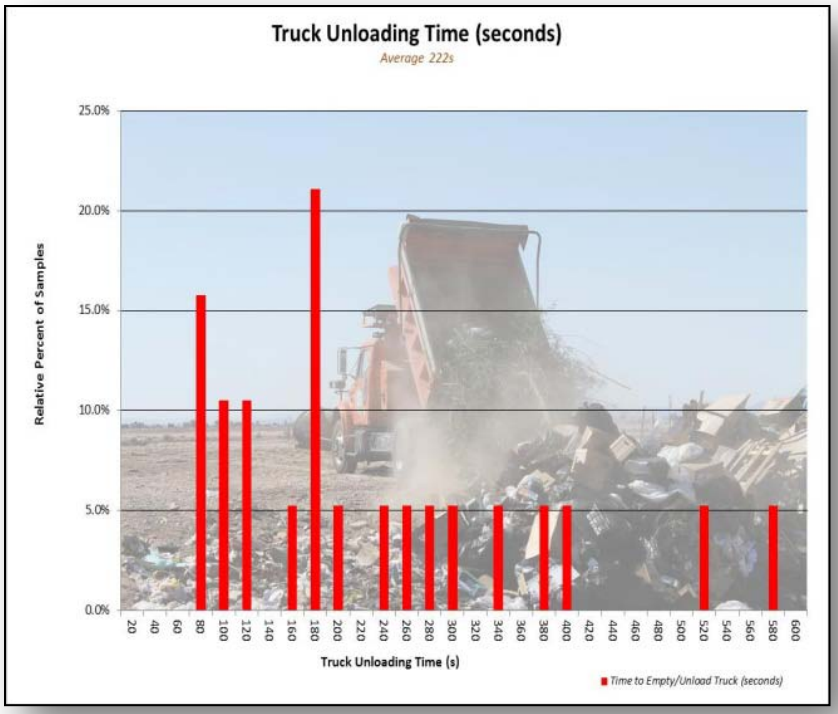
The results of these studies should be taken in the context that every operation – at every landfill – has inherent inefficiencies. This information should provide Riverside County with useful data to enable them to continue improving their operation.

It should be noted that we have performed these types of analyses at other municipal and private landfills, and the results from this study indicate a competitive level of performance.

10.3 *Video Analysis and Activity Sampling- Blythe*

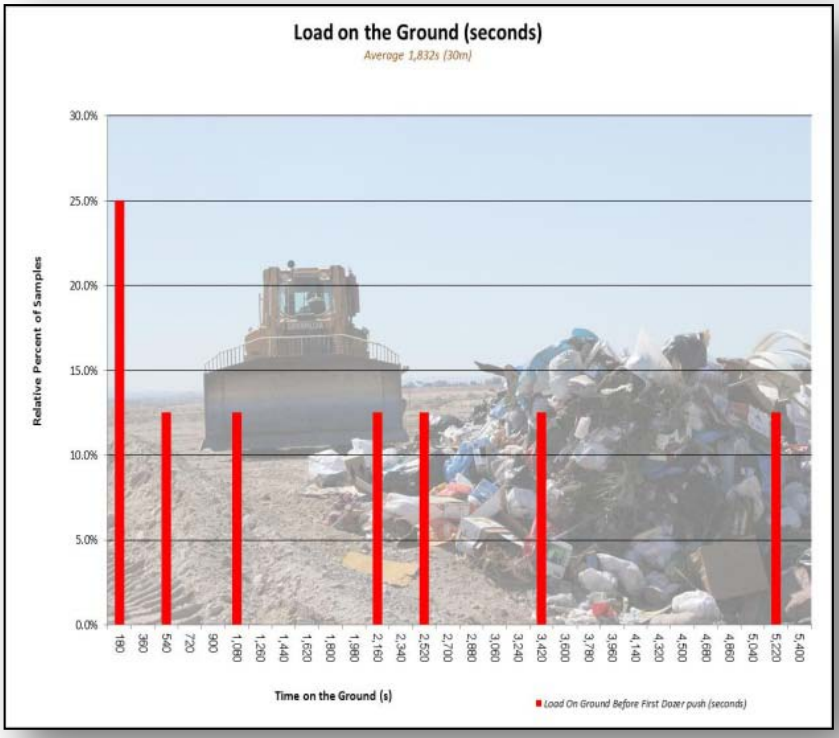
10.3.1 Time to unload - Blythe

At Blythe, it took vehicles an average of 3m: 42s (3 minutes and 42 seconds) to unload. The actual times ranged from just over 1 minute …to nearly 10.



10.3.2 Time on Ground - Blythe

Once dumped, loads sat on the ground an average of 30m: 32s before being pushed. Initially this may sound like a long time. But keep in mind that Blythe receives few loads, and it is actually more efficient to let them stack up, before starting the dozer and pushing them.



In fact, at most landfills we generally do not recommend that every load be pushed immediately, particularly during slow periods, when truck arrival is sporadic. At these times, it does not make sense to have a dozer poised at the tipping pad when it is likely to have more wait time than push time.

10.3.3 Total Slot Time - Blythe

Based on an average "Unloading Time" of 3m 42s, and an average "On the Ground" time of 30m 32s, the average "Occupied" time for each slot is 34m: 14s. Thus, each slot can handle – on average – 1.75 loads per hour. At 3.2 tons per load (per JTD tonnage ÷ load count), that's 5.6 tons per hour …per slot.

So, with 6 slots, Blythe can receive approximately 34 tons of waste before it must be pushed …even more if the loads are double-stacked. With the relatively low tonnage at Blythe, waiting in line is not an issue.

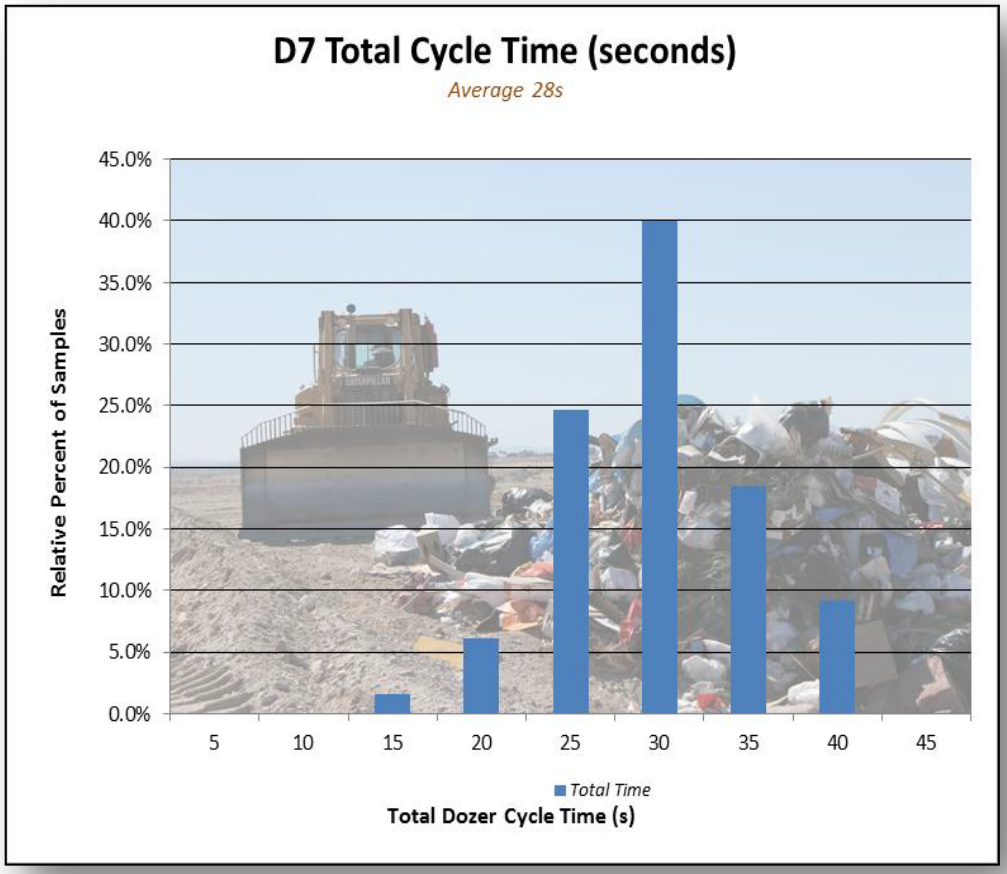
10.3.4 Time to Push - Blythe

It was found that the average push time – from the edge of the tipping pad to the face was 15s.

10.3.5 Time to Return - Blythe

The results of our evaluation indicate an average return time of 13s.

Thus, the average cycle time for the dozer, was 28s. This means that under ideal conditions, the dozer at Blythe could make approximately 128 pushes per hour. At 3.2 tons per push, that works out to raw production rate of 410 tons per hour (tph).



If we back this down to 85% efficiency, the production rate decreases to 348 tph.

And finally, if we assume that every 3rd push is a cleanup push, the dozer's production rate is down to 232 tph.

Blythe receives approximately 60 tons per day – which the dozer could handle in approximately 16 minutes.

Are there other issues and other tasks? Yes, of course. We estimate that another 1 hour per day is required for:

- Pre-fill Striping
- Placing Tarps
- Placing Cover Soil
- Other Activities

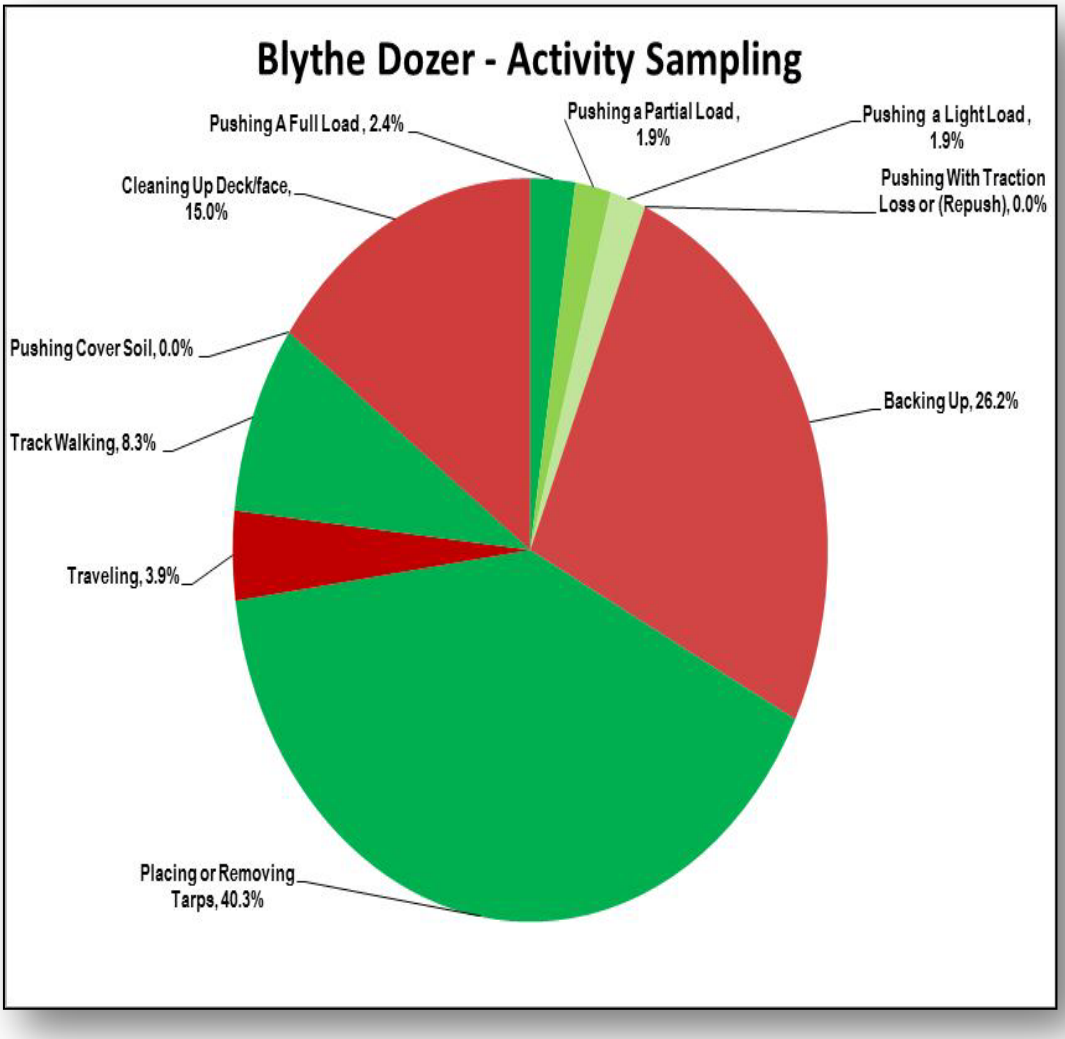
In fact, based on County records, the dozer at Blythe works approximately 1 hour per day.

10.3.6 Dozer Activity Sampling – Blythe

As part of our evaluation at Blythe, we performed an Activity Sampling study on the dozer. We found that it did a variety of things during the day, some which would be classified as Value Added (VA) – these are essential activities …and some which are classified as Non-Value Added (NVA) – these are non-essential activities.

VA activities may include pushing a full load, backing up, placing a tarp, etc. NVA activities may include pushing a light/partial load, traveling, waiting, making unnecessary moves, etc.

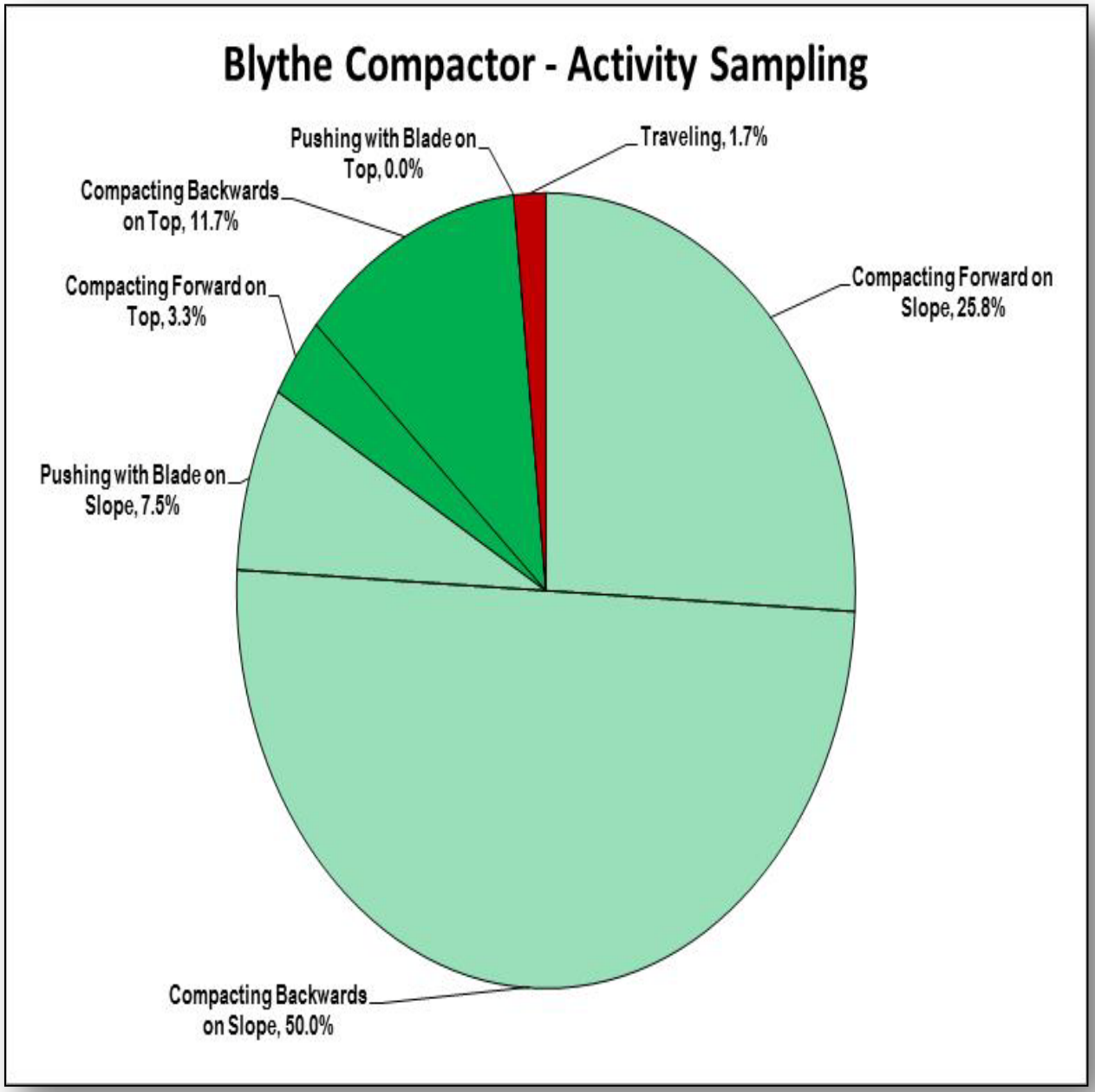
It should be noted that backing up, is a vital part of an efficient, full-payload (VA) push. But backing is also required when the dozer is performing NVA activities. Based on our review, the dozer at Blythe may be able to increase efficiency by focusing on making full-payload pushes and spending less time cleaning the deck between customers.



10.3.7 Compactor Activity Sampling – Blythe

We also performed activity sampling for the compactor. This portion of our study revealed that the compactor spends 83% of its time on the cell's slope (where it is least effective), and 15% of its time on the top (where it would be most effective). The other ~2% is spent traveling.

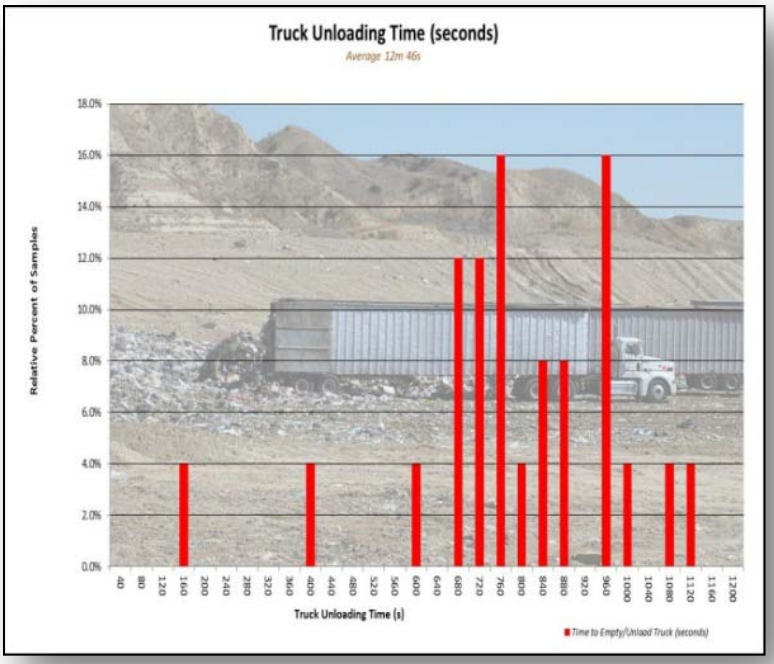
While compacting on a slope is by far the most common practice at landfills across the U.S. – for both municipal and private landfills, it is not the most efficient method. Later in this report, we discuss the benefits of changing to a pancake or "flat-pack" process. This is something we recommend for all three landfills.



10.4 *VIDEO ANALYSIS AND ACTIVITY SAMPLING- BADLANDS*

10.4.1 TIME TO UNLOAD - BADLANDS

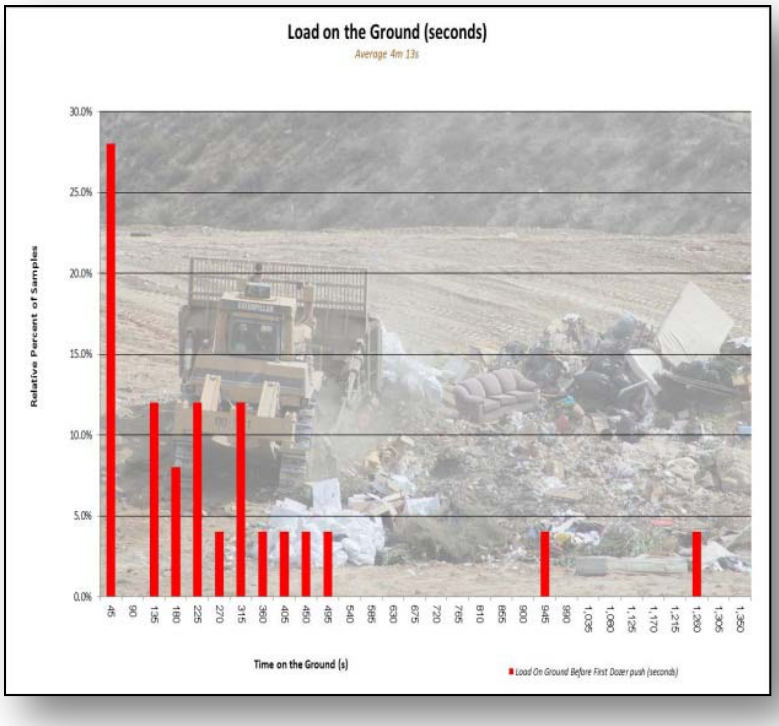
At Badlands, it took vehicles an average of 12m: 46s to unload. The actual times ranged from just under 3 minutes …to nearly 19. These longer times reflect some of the live floor trucks which take longer to unload and clean out.



However, it should also be noted that this is 81% longer than the average unloading time we measured at Lamb Canyon.

Much of the difference is due to the predominate type of truck (transfer trucks take longer than route trucks), but there may also be an issue related to driver culture or environment. For example, it is our understanding that the drivers who come to Badlands are paid by the hour and may not have an incentive to quickly clean out their trucks. In contrast, the drivers that come to Lamb Canyon are paid by the load and clearly have an incentive to be as efficient as possible which results in less time at the tipping pad.

We also noted that at Lamb Canyon, trucks had a longer waiting line more often than at Badlands. We did not perceive this as problematic, but rather a result of loads sitting on the ground (prior to pushing) a bit longer- 6m: 0s (Lamb Canyon) vs. 4m: 13s (Badlands). The longer waiting line may induce a bit of pressure on those who are dumping (at Lamb Canyon), to finish unloading and make room for the next vehicle.



10.4.2 TIME ON GROUND - BADLANDS

Once dumped, loads sat on the ground an average of 4m: 13s before being pushed. This is much shorter than what we measured at Blythe – and reflects the fact that with higher rates of inbound tonnage,

the dozer at Badlands must be available and pushing on more of a continual basis.

It should be noted though, that during the few slow periods, the dozer did occasionally park. This is shown by the few loads that sat for a longer time …up to 21 minutes.

10.4.3 Total Slot Time - Badlands

Based on an average "Unloading Time" of 12m 46s, and an average "On the Ground" time of 4m: 13s, the average "Occupied" time for each slot is 16m 59s. Thus, at Badlands each slot can handle – on average – 3.53 loads per hour. At ~18 tons per load, that's 64 tons per hour …per slot.

So, with 6 slots, Badlands can receive approximately 384 tons of waste before it must be pushed.

Because of the slower unloading times at Badlands, the unloading slots are not as productive as those at Lamb Canyon. This results in reduced efficiency for the dozer, and even though Badlands uses a D10 (as opposed to Lamb Canyon's D9), the dozer at Badlands works 2.7 hours more per day.

Generally, during peak times, the dozer cannot wait for all of the slots to fill up, but must be diligent to push as waste arrives. And, during those busy times, prompt pushing helps to minimize the time trucks may have to wait in line.

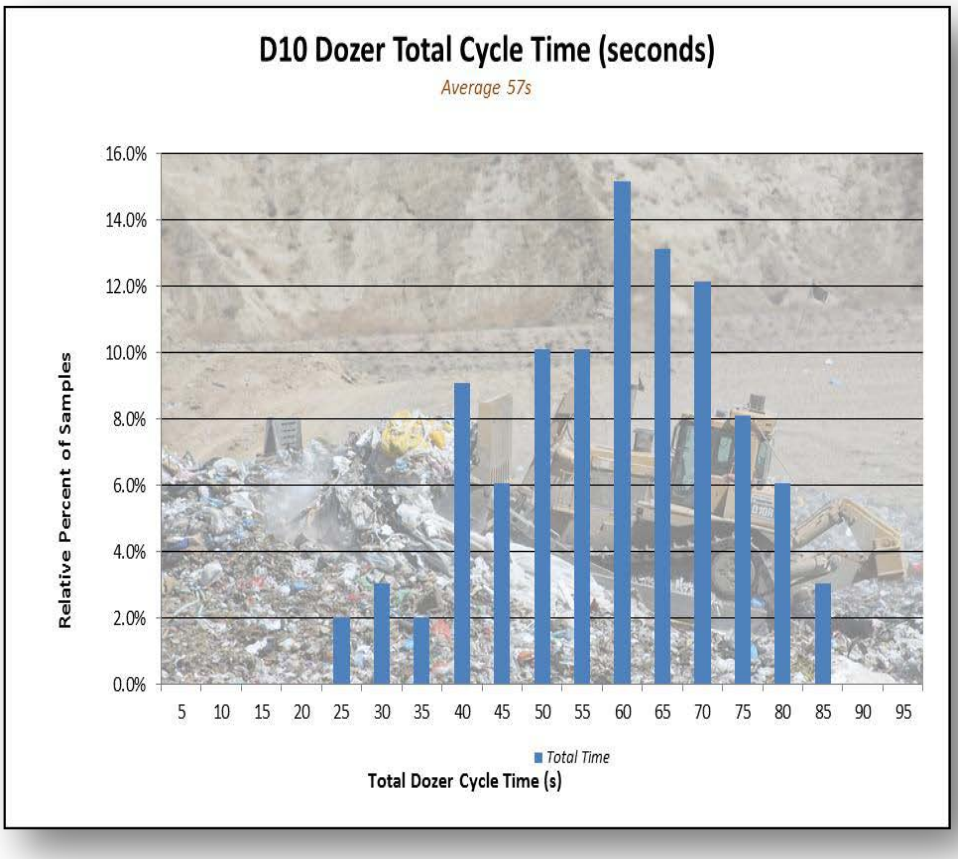
However, when truck arrival is sporadic, it is more efficient for the dozer to stop – and wait until the unloading area fills before pushing. This simply ensures that when the dozer is working, it spends a higher percentage of its time making production pushes …not waiting.

10.4.4 Time to Push - Badlands

It was found that the average push time – from the edge of the tipping pad to the face was 35s.

10.4.5 Time to Return - Badlands

The results of our evaluation indicate an average return time of 22s.



Thus, the average cycle time for the dozer, was 57s. This means that under ideal conditions, the dozer at Badlands could make approximately 63 pushes per hour. At 18 tons per push, that works out to a raw production rate of 1,134 tons per hour (tph).

If we back this down by 85%, and then assume that every 5th push is a cleanup push, the dozer's maximum production rate is approximately 771 tph.

Badlands receives approximately 1,672 tons per day – which the dozer could handle in approximately 2.2 hours – under ideal conditions. But of course the landfill doesn't receive all of this tonnage in a large block …but across the entire day.

So, this number should be taken in the context that the waste arrives at a varying, though somewhat predictable rate. The actual conditions at this landfill – or any landfill – are never ideal. Thus, while a tentative schedule can be made for the dozer, it must in fact, respond to waste as trucks arrive. And as a result, there will be some inherent inefficiency due to waiting, re-positioning, etc. So the 2.2 hours becomes a target toward which we strive, even knowing that the actual machines hours will be higher.

Also, there are other tasks that the dozer performs (i.e., removing/placing tarps), but they could likely be handled in approximately 1 hour per day.

Overall, our target for the dozer at Badlands is 3.2 hours per day.

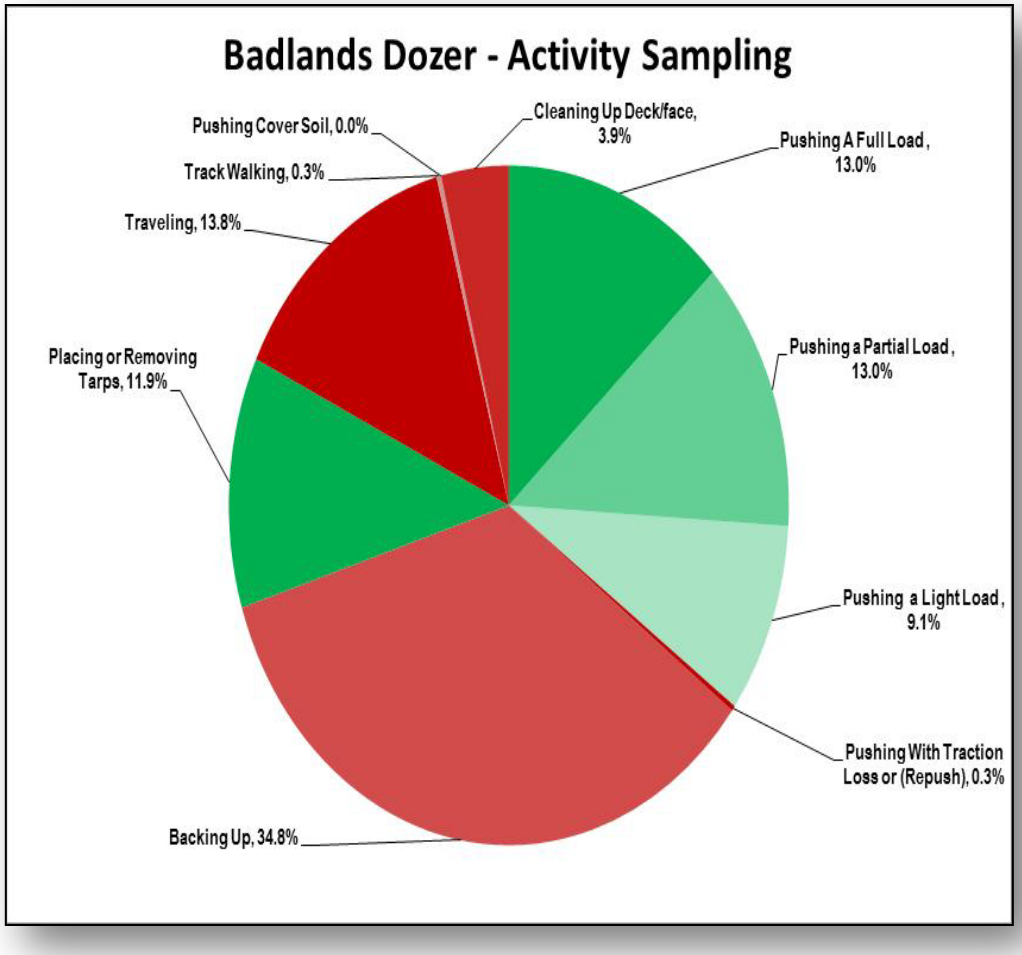
As a point of reference, the D10 dozer at Badlands currently logs an average of 7.7 hours per day. This simply means that there is some opportunity to reduce dozer hours by eliminating some of the Non-Value Added activities shown in the following section.

10.4.6 Dozer Activity Sampling – Badlands

As part of our evaluation at Badlands, we performed an Activity Sampling study on the dozer. We found that it did a variety of things during the day, some which would be classified as Value Added (VA) – these are essential activities …and some which are classified as Non-Value Added (NVA) – these are non-essential activities.

VA activities may include pushing a full load, backing up, placing a tarp, etc. NVA activities may include pushing a light/partial load, traveling, waiting, or making other unnecessary moves.

It should be noted that by eliminating some of the NVA activities, the dozer's daily hours are actually expected to decrease. This would decrease the machine's utilization rate. But remember, the goal is to maximize efficiency – not necessarily to achieve the highest possible utilization rate.



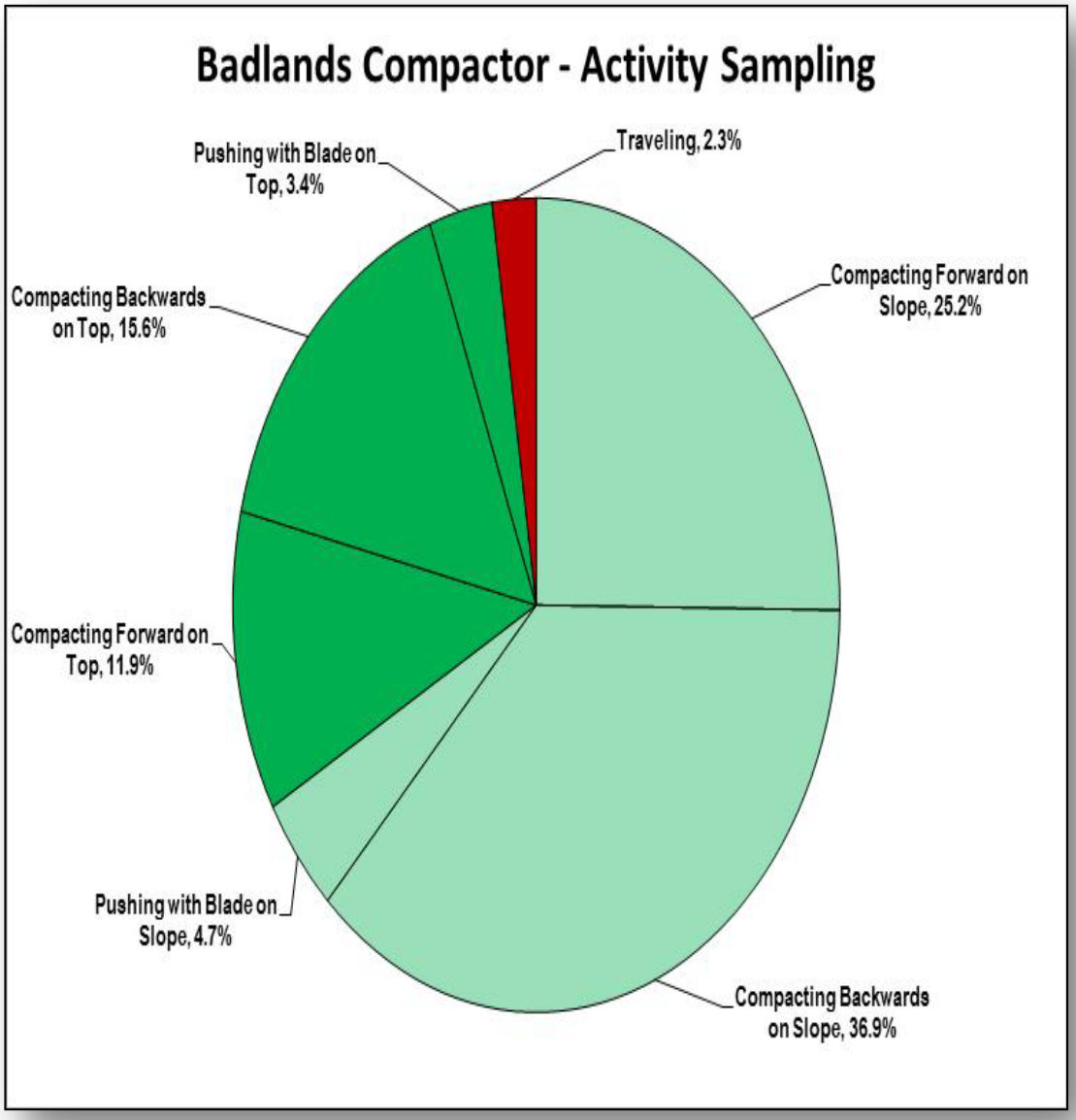
To increase the efficiency of the Badlands dozer, we suggest it focus on making full-payload pushes, spend less time traveling, and minimize deck cleaning, doing only what's required to provide safe vehicle access.

In addition to the activities shown here, the D10 dozer spent 10.6% of its time parked, and was outside the frame of the video 30.4% of the time.

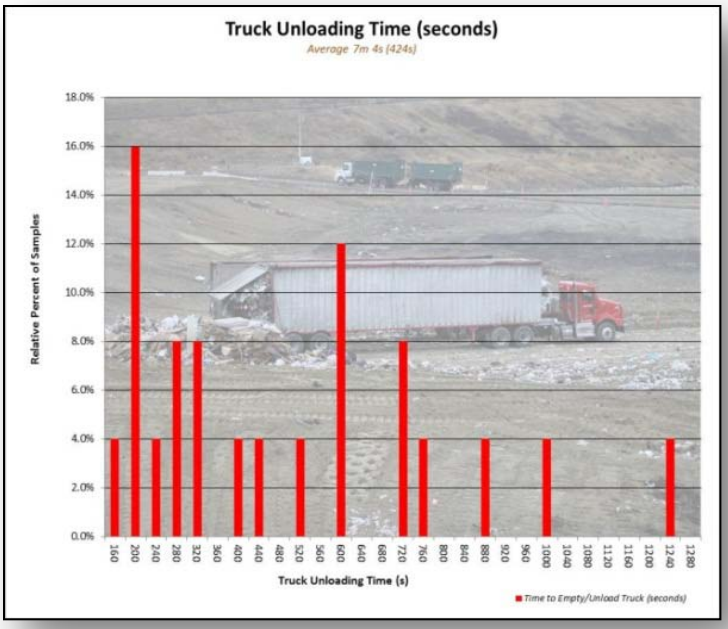
10.4.7 Compactor Activity Sampling – Badlands

We also performed activity sampling for the compactor. This portion of our study revealed that the compactor spends 67% of its time on the cell's slope (where it is less effective), and 31% of its time on the top (where it would be more effective). The other ~2% is spent traveling.

While compacting on a slope is by far the most common practice at landfills across the U.S. – for both municipal and private landfills, it is not the most efficient method. Later in this report, we discuss the benefits of changing to a pancake or "flat-pack" process. This is something we recommend for all three landfills.



10.5 *VIDEO ANALYSIS AND ACTIVITY SAMPLING-LAMB CANYON*



10.5.1 TIME TO UNLOAD – LAMB CANYON

At Lamb Canyon, it took vehicles an average of 7m: 4s (7 minutes and 4 seconds) to unload. The actual times ranged from 6 minutes …to more than 20. But on average, the unloading time is much faster than the Badlands average of 12m: 46s. This difference was discussed in greater detail in the previous section (Time to Unload – Badlands).

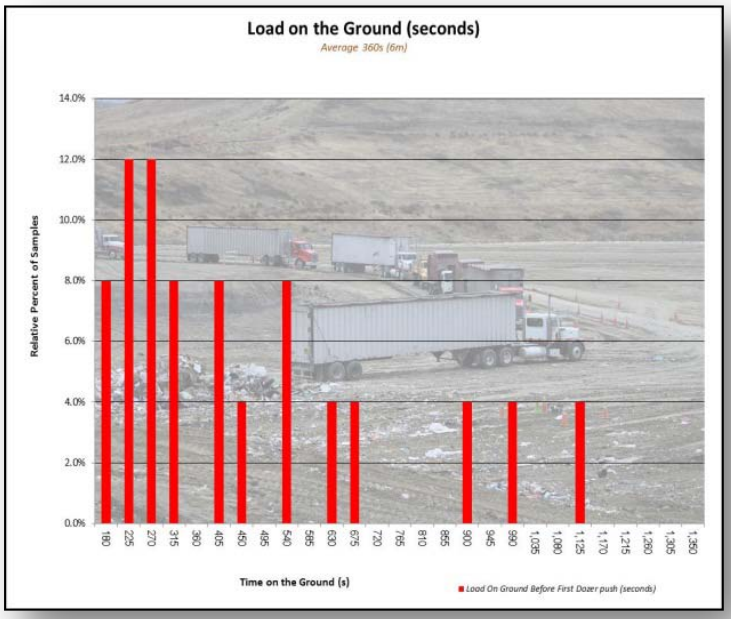
In any case, we suggest that the unloading system at Lamb Canyon is efficient and well-run.

10.5.2 TIME ON GROUND - LAMB CANYON

Once dumped, loads sat on the ground an average of 6m: 0s before being pushed. This is a bit longer than what we found at Badlands – where the average was 4m: 13s. However, we did not perceive this to be significant – and may simply be based on the difference is dozer size (e.g., D9 at Lamb Canyon v. D10 at Badlands).

We also believe that the time a load sits on the ground before being pushed is not directly related to production. Generally, it is best for the dozer to push the trash in blocks – when the tipping area is nearly filled – rather than pushing each load as quickly as possible.

Accordingly, we do not recommend that every load be pushed immediately, particularly during slow periods, when truck arrival is sporadic. At these times, it does not make sense to have a dozer poised at the tipping pad when it is likely to have more wait time than push time. The dozer's activity should be adjusted, based on the flow of inbound waste.



10.5.3 Total Slot Time - Lamb Canyon

Based on an average "Unloading Time" of 7m: 4s, and an average "On the Ground" time of 6m 0s, the average "Occupied" time for each slot at Lamb Canyon is 13m: 4s. Thus, each slot can handle – on average – 4.6 loads per hour. At 15 tons per load, that's 69 tons per hour …per slot.

So, with 6 slots, Lamb Canyon can receive approximately 414 tons of waste before it must be pushed …even more if the loads are double-stacked. We do not recommend double-stacking transfer loads, but considering the pushing capability of the D9 dozer, double-stacking the packer and route trucks makes sense.

The productivity of the unloading slots at Lamb Canyon is 8% higher than what we measured at Badlands. Because Badlands receives a higher percentage of transfer trucks, we'd expect it would be higher than Lamb Canyon.

10.5.4 Time to Push - Lamb Canyon

It was found that the average push time – from the edge of the tipping pad to the face was 34s.

10.5.5 Time to Return - Lamb Canyon

The results of our evaluation indicate an average return time of 27s.

Thus, the average cycle time for the dozer, was 61s. This means that under ideal conditions, the dozer at Lamb Canyon could make approximately 59 pushes per hour. At 15 tons per push, that works out to 885 tons per hour (tph).

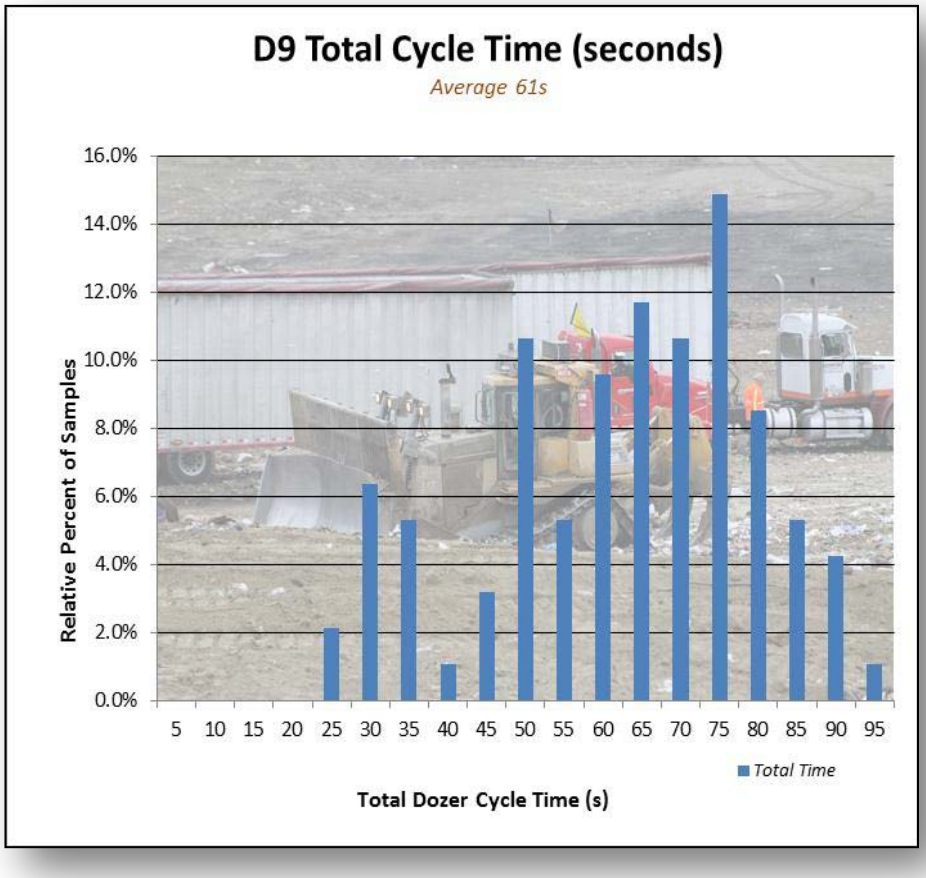
If we back this down to 85% efficiency, the production rate decreases to 753 tph.

And finally, if we assume that every 5th push is a cleanup push, the dozer's production rate is down to 602 tph.

Lamb Canyon receives approximately 1,726 tons per day – which the dozer could handle in approximately 2.9 hours.

Are there other issues and other tasks? Yes, of course. We estimate that another 1 hour per day is required for:

- Pre-fill Striping
- Placing Tarps
- Placing Cover Soil
- Other Activities



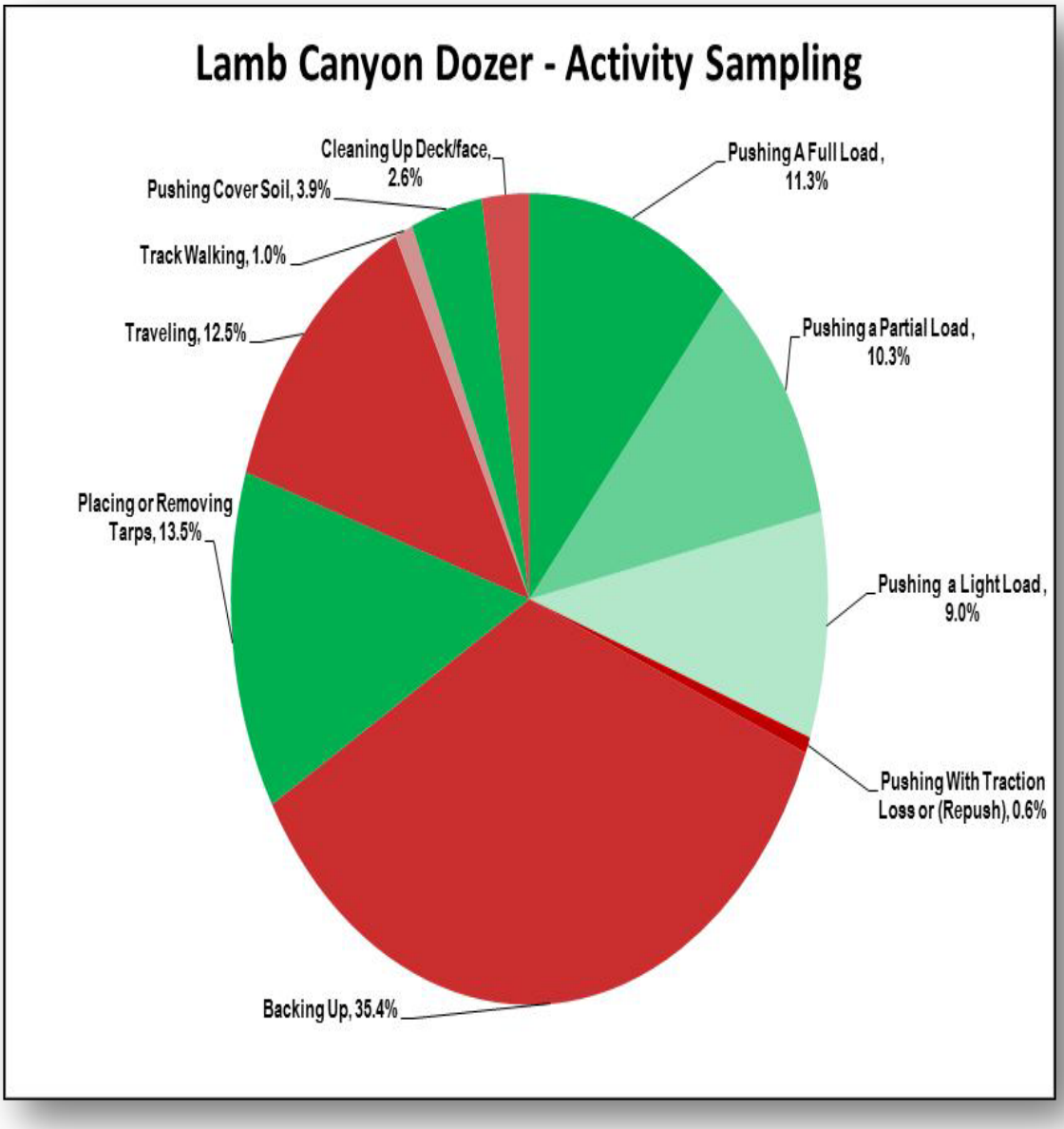
Thus, at Lamb Canyon we estimate the dozer could ideally handle the inbound waste – and other duties – in approximately 3.9 hours per day. As a point of reference, the D9 dozer at Lamb Canyon currently logs an average of 5.0 hours per day. This indicates an efficient and predictable level of performance. Additional improvement will be gained primarily by reducing Non-Value Added activities.

10.5.6 Dozer Activity Sampling – Lamb Canyon

As part of our evaluation at Lamb Canyon, we performed an Activity Sampling study on the dozer. We found that it did a variety of things during the day, some which would be classified as Value Added (VA) – these are essential activities …and some which are classified as Non-Value Added (NVA) – these are non-essential activities.

VA activities may include pushing a full load, backing up, placing a tarp, etc. NVA activities may include pushing a small load, traveling, waiting, making unnecessary moves, etc.

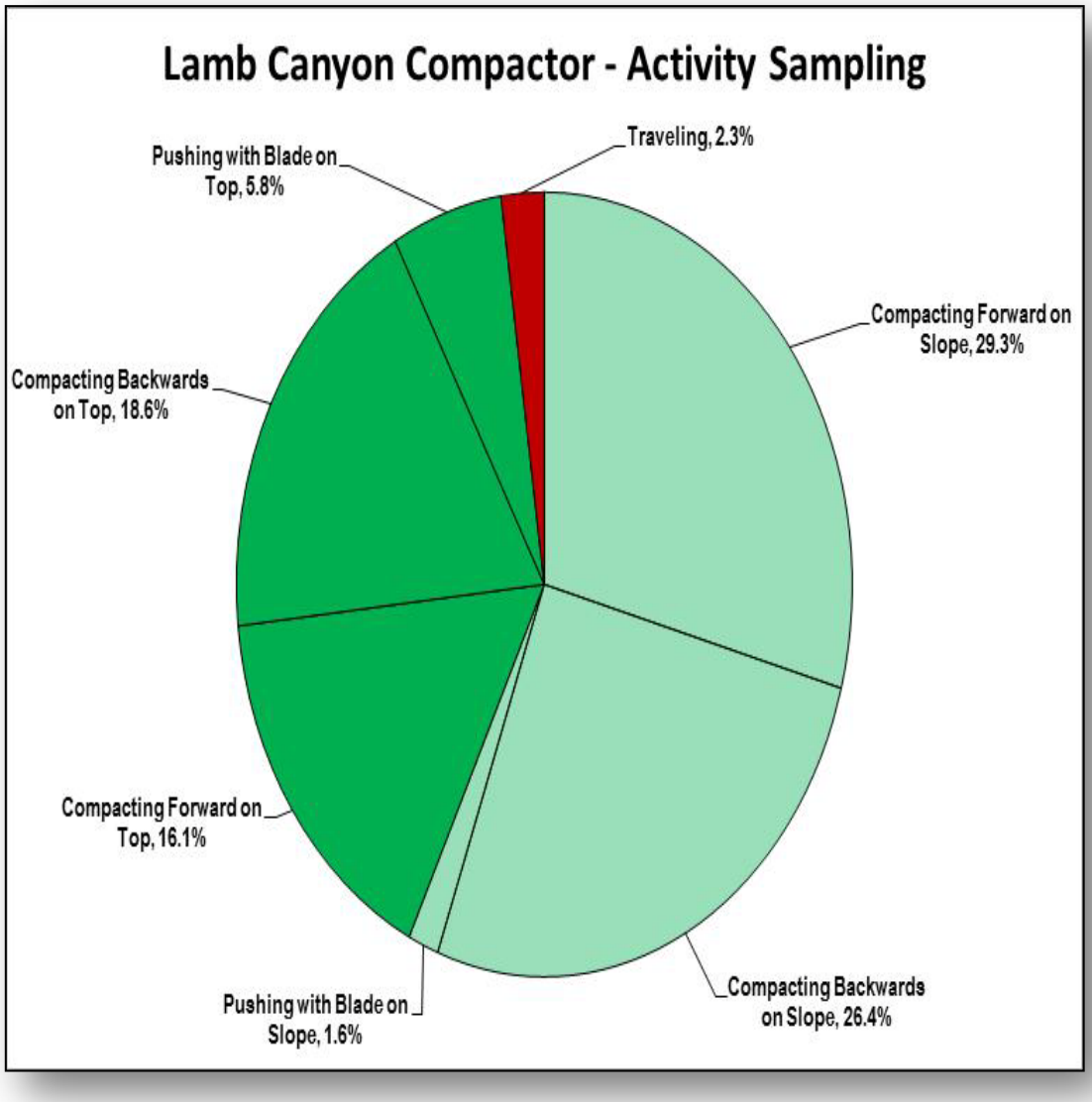
In addition to the activities shown here, the D9 dozer spent 18.6% of its time parked, and was outside the frame of the video 14.1% of the time.



10.5.7 Compactor Activity Sampling – Lamb Canyon

We also performed activity sampling for the compactor. This portion of our study revealed that the compactor spends 83% of its time on the cell's slope (where it is less effective), and 15% of its time on the top (where it would be more effective). The other ~2% is spent traveling.

While compacting on a slope is by far the most common practice at landfills across the U.S. – for both municipal and private landfills, it is not the most efficient method. Later in this report, we discuss the benefits of changing to a pancake or "flat-pack" process. This is something we recommend for all three landfills.



11 TIPPING PAD OPERATIONS

The tipping pads at all three landfills were properly oriented and well-run. Generally, the spotters were controlling traffic and there was good evidence of coordination between the spotter(s) and operator(s) in regard to where and when to place specific loads.

The pushing operation is typical of other landfills we have evaluated, and the fact that a single dozer is used, even at the larger 2 landfills is a good indicator of efficiency. However we did find – at all three landfills – that only 1 out of three pushes with the dozer was a full load. The other two were partial or light loads. This indicates some pressure to get the waste pushed from the pad quickly, rather than waiting to gather full loads.

We understand the need for cleanup pushes at the tipping area. And typically we'd expect that every 3rd push (at Blythe) or every 5th push (at Badlands or Lamb Canyon) to be a cleanup push. It should be noted that this is quite typical at both municipal and privately operated landfills. It should not be considered a serious inefficiency, but rather something to work on during training sessions with the operators and spotters.

In general, the dozers were able to keep up with the inbound waste. We did however, note some in-efficiencies. For example, in the waste-handling operation, the dozers and compactor should be working as an integrated team. The focus should work backward, starting with the production rate of the compactor; the dozers should be feeding a steady rate of trash to the face for the compactor to handle. This waste should be spread in a

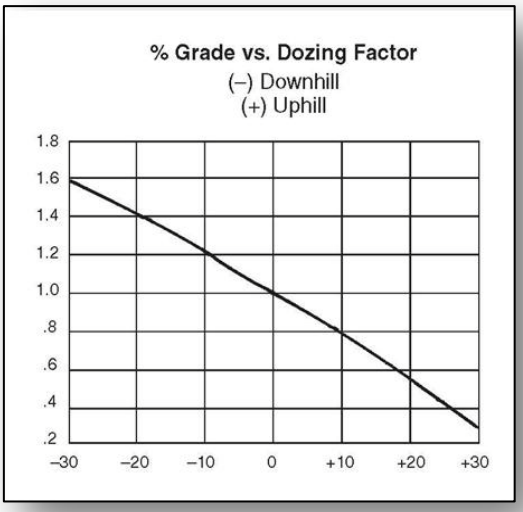
repetitive pattern, allowing the compactor to process each layer of trash before the next is placed. This frequently did not occur. Instead of keying off the compactor, we sometimes saw the bulldozers responding to the trash trucks. It appeared that in some cases, the dozers were more concerned with pushing the trash, than coordinating with the compactor.

We also saw the compactors regularly waiting for the dozer to push a load into place. This is inefficient and a direct result of not having enough room for spreading the inbound waste in a standardized pattern.

We believe this is not just an operator issue; it is also a management issue. The solution is to develop a standardized process for waste handling, clearly communicate it to the operators, and then affirm that it is happening through direct observation and review of regular benchmarking. Our recommendation is that the waste operation should first key off the compactor's production rate and working to a predetermined pattern of waste placement and compaction.

Increased pushing productivity could also be obtained by pushing downhill whenever possible.

11.1 *PUSH DOWNHILL*



Changing from uphill pushing to downhill pushing will provide the greatest possible increase in dozer productivity. According to Caterpillar, pushing up a 3:1 slope will decrease dozer productivity by as much as 70% while pushing downhill on a similar slope will increase productivity by nearly 60%. This dramatic increase in production will allow the landfill crew to handle the days' trash with fewer pushes, easier pushes, fewer dozers, reduced machine wear, less fuel consumption and considerably less cost.

We understand the drawbacks of pushing downhill: increased potential for litter; tendency to build "cliffhangers;" increased tipping pad maintenance; slower cycle times; reduced visibility when backing across the hinge point; etc. However, we also recognize many of the benefits: easier on machine – especially during hot weather; increased productivity – resulting in fewer pushes; faster cycle times; faster pad clean-off; etc.

One option that allows pushing downhill, and also minimizes some of the drawbacks, is to establish two similar unloading areas. This is explained in the following section.

11.2 *CONSIDER PUSHING FROM TWO PADS*

Having two locations from which to push (downhill) – and then alternating between them – will create less crowding and reduce the risk of accident/injury. Here's how it would work: Trucks would be directed to dump from one location until every slot has been filled with waste – without double stacking loads (except for packer trucks which you may want to double-stack). Then, the traffic would be re-directed to the second area. And while the second area is in use, the dozer(s) would push loads from the first area. Once the dozer(s) finish and the first area is clean, trucks would be re-directed back to that area.

This process would continue, with the active unloading area alternating back and forth. The trucks and dozers are never working in close proximity and there would be no need for a spotter to be working in/around the trucks. Instead, the spotter could be directing traffic from a central location– perhaps a fork in the road – always from the protection of the spotter's station. Once the regular drivers get used to this system, the entire process should work quite easily and efficiently.

This change will provide many benefits, including:

1. Less Crowding – More Room to Unload
2. Safer for Spotters
3. Downhill Pushing – Easier on Dozers & Less Costly
4. Flat area for Compactor to Work – Increased Waste Density
5. Allows Broader Use of Tarps
6. Less concern regarding reduced visibility when backing up/over the hinge point
7. Reduces Use of Cover Material

11.3 *CELL CONSTRUCTION*

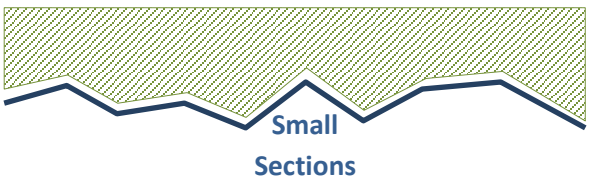
In regard to cell construction and in an effort to increase the efficient use of airspace, it is recommended that the three landfills consider halting the practice of constructing individual daily cells. The current system results in cells having a top that is long and very narrow. Based on our site visit, it appears the average top width of the daily cells may be as narrow as 30 feet at the larger landfills, and less than 10 feet at Blythe. This narrow top creates three problems for the landfill operation.

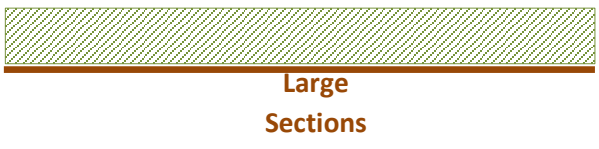
FIRST, the process of compacting along such a narrow top is difficult for the size of the compactor – a machine whose length exceeds the width of the top deck. Clearly, within such a narrow space, the compactor cannot manuever well, nor achieve effective compaction.

This is compounded by the results of our video analyses that indicate the compactor spends an average of 29% of its day working on the top …and 69% on the lower portion of the face. Yet, it appears that the top represents less than 20% of the cell's total surface area.

SECOND, because of the limited area on the top of the cell, it is very difficult for the compactor to properly grade and finish this area. A larger area provides room for the compactor operator to feel and see the surrounding grade – and then connect to it with the current cell. Remember, the average width of the top area is 30 feet or less. But some portions of the top deck may actually be narrower than the compactors wide blade.

As a result, the grade of the top deck has lots of variation. Conversely, if the top deck was much larger, it would be easier for the compactor operator to construct it to a smooth, uniform grade. The process is similar to spreading plaster with 1"-wide putty knife vs. one that is 10"wide. Then of course, the small dozer operator must make up the difference with cover soil. And, while the finished (covered) product looks the same, the small sections of each daily cell require signficantly more soil.





THIRD, having to complete the top of the cell at the end of every day creates a "crunch time." Here's what happens at this time:

1. Last Load is dumped
2. Load is pushed to the face
3. Load is spread for the compactor
4. Compactor further spreads the trash
5. Compactor compacts the trash
6. Compactor trims/fills
7. Compactor then re-compacts
8. Small dozer spreads soil across the top of the cell

All of these tasks must happen during the final 30-60 minutes of the day. The push is on to finish and clock-out …and as a result, the quality of the finished product is not as good as it could be if there was additional time.

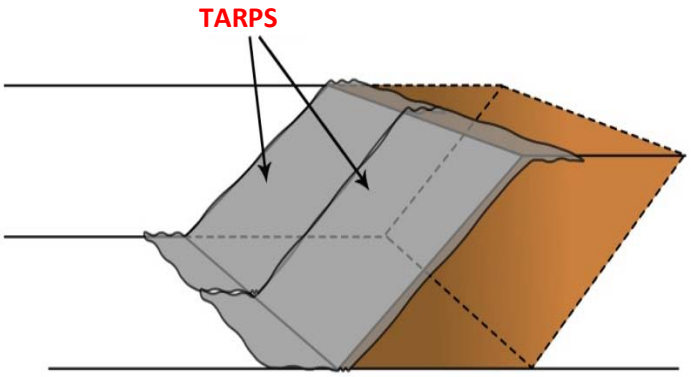
So, these three factors combined, create situation where the waste is not optimally compacted and too much soil is used. As a solution, we recommend the landfill begin to construct weekly cells that consist of daily horizontal layers – or pancakes.

While it is fairly common within the landfill industry to use the current method of constructing cells on a steep slope, it is inefficient. Changing to a pancake (horizontal) system will eliminate many of the operational problems described in this report and will result in a decrease in operating cost, increased waste compaction, reduced soil use …and better use of airspace.

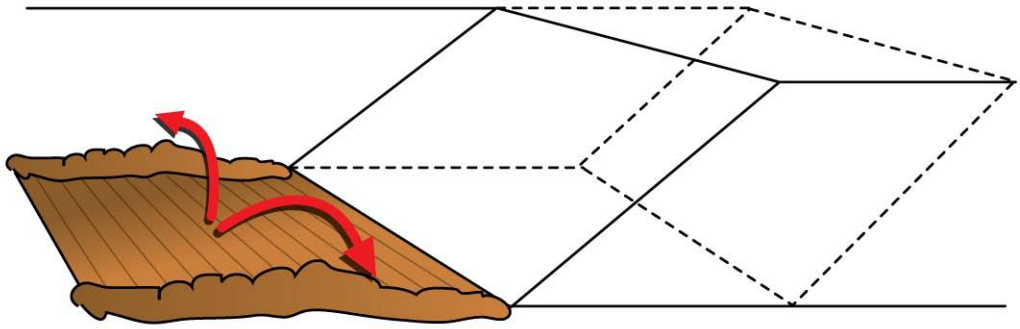
The first benefit is related to geometry and the fact that smaller daily cells require a higher degree of skilled placement of soil by equipment operators than a larger cell. As cell size increases, the surface area within which a more accurate grade can be obtained increases.

So, in order to take maximum advantage of this economy of scale, the landfills would construct what are, in essence, multi-day cells (i.e., weekly cells). Thus, instead of building and covering daily cells, each containing one days' tonnage, the crew would construct weekly cells that contain ~5-6 days of waste. To do this, the landfills would construct a stack of "pancake" cells each week. The crew would cover the

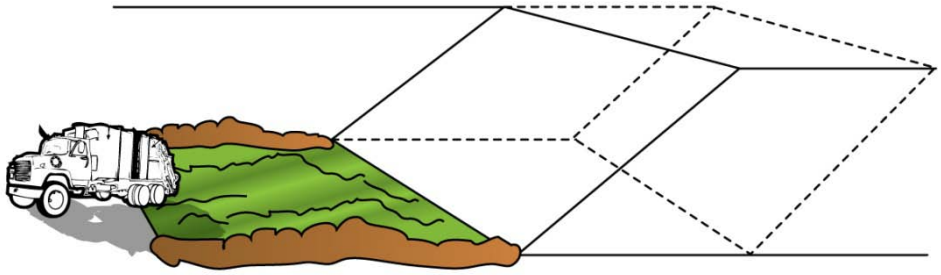
top and the front face of the daily cells with tarps, and the side of the cells with soil and/or mulch.



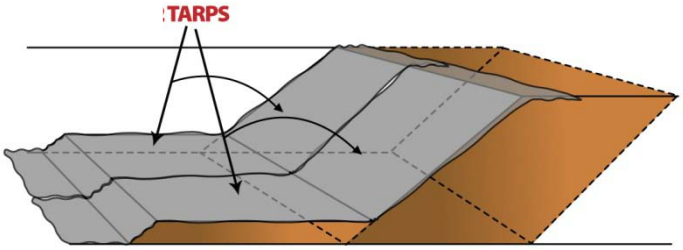
At the beginning of the next week (or when the current stack is completed), previously-placed soil (i.e., what was placed on top of the previous lift) would be stripped for the next footprint. The stripped soil would be stockpiled at the side of the cell for re-use throughout the week.



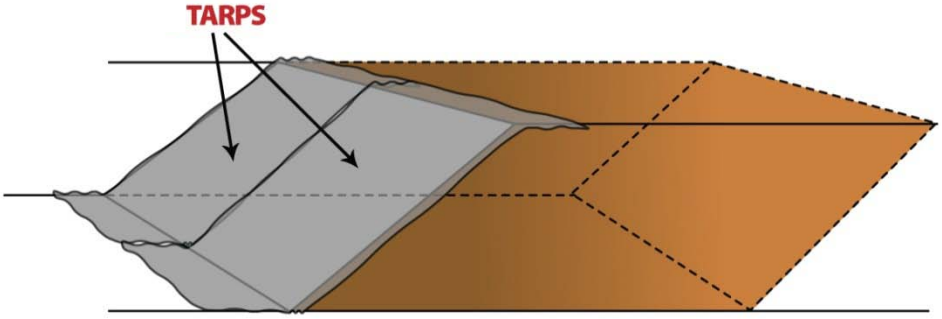
Waste would be spread horizontally across the stripped area and compacted. It is estimated that each day's pancake will be approximately 2-5 feet deep. The horizontal dimensions would vary from one landfill to another.



At the end of the day, the waste would be covered with a tarp. Only the side edge receives cover soil or other type of ADC.

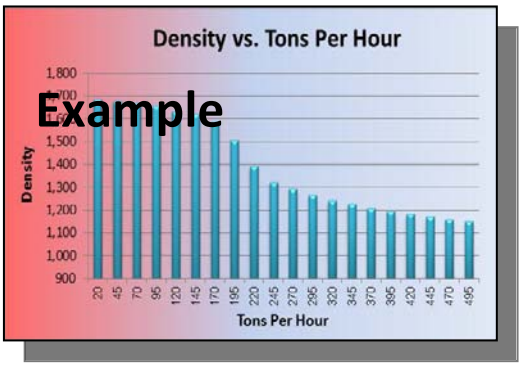


At the end of the week, the stacked pancakes will be approximately the same depth as the current daily cells. The key here is not timing – but matching the tie-in depth of the surrounding waste. Reaching grade may occur in 5 days …or 8. But regardless, when complete – the top would be covered with soil, the side could be covered with mulch or other form of ADC, and the face would be covered with a tarp. Then the next stack would begin.



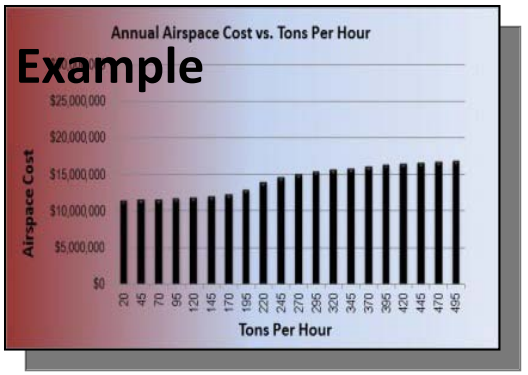
By changing the way daily waste cells are constructed, and by minimizing the quantity of soil used for daily cover, the landfills will improve waste density and further reduce soil use.

11.3.1 COMPACTION



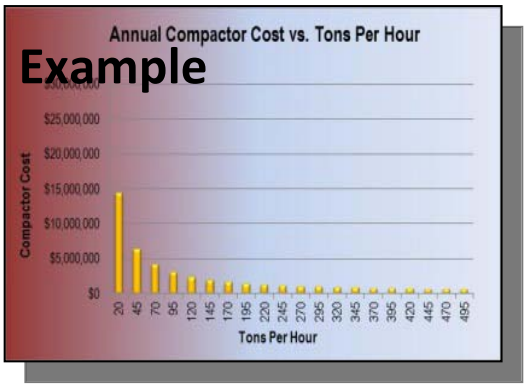
Waste Compaction is perhaps the most important single component of landfill operations – and waste density, one of the most important benchmarks. From that perspective, we have focused considerable effort at evaluating the current compaction-related processes.

One of the first things we looked at – a simple compaction benchmark – was this: How does the compactor's effort compare to the inbound waste tonnage?



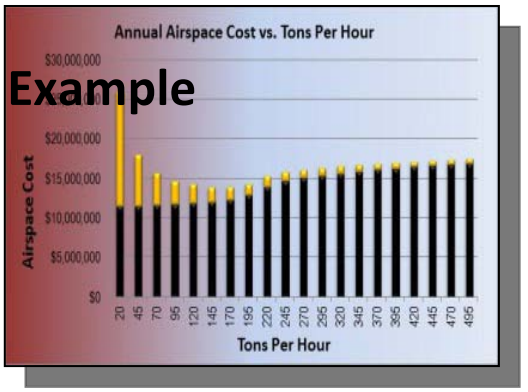
In terms of compacting, there is an optimum point – a place where the combined cost of operating the compactor and the consumption of airspace are minimized. This *least-cost* point, most often expressed in tons per compactor hour, is the compactor's optimum production rate. This is explained below:

The process begins with a production curve. This is critical information and always best when it is site-specific. As expected, the waste density will vary depending on how many tons per hour the compactor is processing. Logically, as the flow rate of tonnage increases, density decreases.



The next step is to calculate how the compactor's effort – at various production rates – impacts airspace consumption and airspace cost. As would be expected, the compactor's production rate and airspace cost are inversely related: as waste density decreases, airspace costs increase.

The next step is to calculate how the compactor's production rate impacts compactor cost. Again, the results are logical: at very low production rates (i.e., few tons per hour), more compactor time is required to process the inbound waste …and the cost attributed to the compactor increases.



Finally, these two costs – airspace and compactor – are combined into a total cost, shown at varying production rates (i.e., tons per hour). This combined cost typically shows a minimum (i.e., least cost). This identifies the production rate that results in the lowest overall cost. It is expressed in (compactor) tons per hour.

Please Note: These production rates – and associated costs – are based solely on our experience at other landfills. They are not based on any work done at Riverside County's Landfills.

So, without site-specific data, and based on BRS' experience, we estimate that the optimum waste density would be achieved when the compactor processes waste at a rate of approximately 150-200 tons per hour (at Badlands and Lamb Canyon) and 70-90 tons per hour (at Blythe).

The compactors are currently operating within those ranges:

Blythe	*71 tph*
Badlands	*170 tph*
Lamb Canyon	*198 tph*

12 STAFFING

As part of our assessment we reviewed the provided organizational charts for all three Riverside County Landfills. Our Landfill site visits, staff interviews and initial presentation of findings allowed us to further evaluate the Landfill staff. We offer the following findings and recommendations regarding landfill operational staffing.

12.1 *MANAGEMENT*

We found that the Management staff was extremely competent and motivated. We were most impressed with the proactive nature of the staff. During the course of the assessment and during our initial presentation we presented some potential issues and findings. The management staff commonly had solutions in process to many of the issues that were presented. We feel that this type of attitude and atmosphere is a vital ingredient of a well-run Landfill.

12.2 *EQUIPMENT OPERATORS*

During our evaluation, we found the operators to be skilled at their work. Most showed the ability to safely and effectively control their equipment. We observed few issues in regard to skill.

We compared the number of operators to the current number of machine hours. Typically, we assume that an operator is available to work approximately 4 weeks per month …or 48 weeks per year. This allows for vacation, sick days and holidays. Accordingly, this is 1,920 hours per year. Thus, an operator has the potential to log 1,920 machine hours per year.

Based on this model, under ideal conditions, each operator would be expected to log 1,920 machine hours per year. The following table shows the actual number from each landfill.

Annual Operator Hours v. Annual Machine Hours				
Facility	**No. Operators**	**Expected *(Ideal)* Annual Machine Hours**	**Actual Annual Machine Hours**	**Operator Staffing Efficiency**
Blythe	1	1,920	999	52%
Badlands	8	15,360	14,602	95%
Lamb Canyon	10	19,200	15,151	79%
Overall Total:	19	36,480	30,752	84%

Blythe is a unique situation, where the Site Supervisor has also been serving as the only operator. Thus, based on the assumption that an operator could log 1,920 hours per year does not directly apply …and if it were applied (i.e., in the above Table), the overall efficiency would be calculated at a lower rate. This should not be misinterpreted to infer that Blythe is inefficient, because it is in fact operating at a very high efficiency in regard to operator effort vs. machine hours.

The two larger landfills both show relatively high efficiency, with Badlands slightly higher than Lamb Canyon.

It should be noted, that this analysis looks at the utilization of machines vs. the number of operators. It does not necessarily indicate that the number of machines and/or operators is ideal, but simply looks at the current relationship between the two.

Our recommendations, as explained throughout this report lean toward a reduction in machine hours, which may also indicate a reduction in staffing. We suggest the County re-visit the operator staffing and/or scheduling, once the machine use has been re-evaluated.

12.3 *Waste Inspectors and Landfill Safety Monitors*

The County has put a great deal of time and effort into the waste inspection program. We feel that this amount of effort often exceeds the industry standard and in some cases is unnecessary. For example the number of loads that are checked at the Blythe Landfill often exceeds what is required by County Ordinance 779. We understand that the County uses this same employee for litter control, waste recycling, traffic direction and fee collection duties to offset his work week and limit his time spent on waste inspection; however, we feel even less time can be spent on waste inspection by focusing on meeting the minimum requirements.

After reviewing the organizational charts we noticed sufficient staffing regarding traffic direction. We understand and support the need for Landfill Safety Monitors also known as “spotters”.

12.4 *Maintenance and Construction Workers*

We had limited interaction with the Maintenance Construction Workers. After reviewing the organizational charts we noticed that this position is used for many different tasks. We feel that the adaptability of this position is an efficient practice and should be continued.

13 SAFETY

Riverside County has taken significant steps in their operation to improve safety for workers and customers. One clear example is the All Stop system, by which any worker can transmit an alarm – which everyone else on the crew hears – causing all machines and activity to immediately halt.

Another example of attentiveness to worker/customer safety is the established procedure of requiring all people on site to wear safety vests. Not only are the safety vests required but

they are available to purchase at the scale house if a person does not have one available. This level of action clearly shows how the staff is interested in insuring that safety procedures are followed without exception.

13.1 *HEALTH AND SAFETY PLANS*

Safety plans and procedures appear to meet or exceed industry and regulatory standard.

13.2 *PERIODIC TRAINING*

Overall, workers should be continually challenged to expand their knowledge base – which of course includes a wide range of topics related to safety, environmental, regulatory, economic and operational issues.

While performing our Blythe site visit the County's online training program was pointed out by staff. We are unclear if this system is used at all of the sites. We feel that this is a unique and effective form of conducting periodic safety training.

13.3 *SAFETY RECOMMENDATIONS*

Overall, we suggest that worker presence on the ground, near the tipping area be minimized whenever possible. For the spotters, this means staying in pre-determined areas (i.e., the spotter station). During pre-dawn and other periods of low-light, we further recommend the spotters stay at the light plants and minimize mobility on and near the tipping pad whenever possible.

For the waste inspectors, we also suggest their presence at the tipping pad be minimized whenever possible. And, while we understand the necessity of conducting waste screening (per California Code of Regulations Title 27, County Ordinance 779 and the facility's operating permit), the benefit of extracting a relatively small quantity of prohibited waste is small compared to the risk of placing a worker on the ground, at the tipping pad.

We feel that it is important to acknowledge that all of the Landfills we visited had many safety procedures in place to protect workers on or near the tipping pad. The Emergency All-Stop system, use of two way radios, portable light plants and required personal protective equipment are all examples of excellence. The fact that these procedures are in place clearly shows that worker safety is not taken lightly.

While performing our Landfill site visits we spent a substantial amount of time reviewing the Scraper haul routes. Most of this effort was related to assessing the operational effectiveness of the Scraper

routes. We determined that at all three landfills there were safety issues regarding “blind spots” and “bottlenecks” in the Scraper haul routes. Limited visibility in Heavy Equipment compounded by “blind spots” could become a serious issue if a smaller vehicle was unexpectedly encountered on the haul road.

For example, the Lamb Canyon site had an area that had an elevation change and an “s turn”. We noticed similar issues at the Badlands and Blythe Landfills. The most practical solution to solving these haul road issues would be realigning the haul roads. A byproduct of this road realignment would be an increase in Scraper production rates.

We feel that the practice of backing up while watering in the Water Trucks should be discontinued. The risk of backing into a worker or another piece of equipment could be eliminated by watering in a forward motion.

We noticed that a majority of the Landfill equipment had safety flags or “whips” installed. We support this practice and feel that it demonstrates the level of safety awareness within the department. Our issue is that most of the flags were in poor condition and were not very visible. We feel that these flags should be replaced on a regular basis so they may maintain their intended purpose.

14 ENVIRONMENTAL CONTROLS

14.1 *LITTER*

Based on the LEA inspections for the last 5 years litter has been an issue at all of the Riverside County Landfills. Over the past 5 years there has been a total of 31 NOV’s or AOC’s related to litter. It does appear that over recent years these numbers have started to decline. The following paragraphs summarize our findings and opinions based on the conditions of the sites when we visited them.

The Blythe Landfill was exceptionally clean in regards to litter. This is most likely a result of the low inbound tonnage. In our opinion the current

cleanliness of this site exceeds the industry standard. The current practice which requires the litter crew to travel an excessive distance is not efficient. We would recommend using a local litter crew, possibly through a staffing agency or as work release program.

In our opinion the amount of litter at the Badlands Landfill is within the industry standard. The quantity of litter at this site is in line with what one would expect to find at a privately operated Landfill. We do suggest that more effort be put into containing the litter as close to the daily cell as possible as opposed to allowing the litter to migrate throughout the site. Less labor would be needed if the litter was captured in a more confined area.

Lamb Canyon had much more litter present when compared to the other two Landfills. We recognize that seasonal high winds at the Lamb Canyon site can make litter control efforts very difficult. We feel that the amount of litter at this site is within the industry standard but if not kept in check could become an issue. We did notice a small amount of litter on the outskirts of the Landfill. The impressive network of perimeter litter fencing at this site did seem to catch a majority of the blowing litter but also requires a large amount of labor to keep clean. We would suggest that the Landfill revisit the use of portable litter fencing, similar to the ones that are already on site. By arranging the portable fences as close as possible to the daily cell migrating litter should be minimized. The intended result would be a reduction in labor that is needed to keep the perimeter fencing clean.

14.2 *BIRDS*

We found that the “bird canons “were not effective. The birds have become habituated to the canons and would often land very close to them. We suggest that the canons be used more intermittently and possibly in conjunction with other accepted methods (i.e., predator decoys, acoustic controls and model airplanes). When compared to the industry as a

whole there did not appear to be an excessive number of birds at any of the landfills that we visited. We do not feel that the current conditions justify the need for a falconer.

14.3 *COYOTES*

Due to the remote location of the three landfills, coyotes will most likely be present. We did see coyote tracks during our site visits. We feel that proper tarp maintenance and placement is the most effective means of limiting coyote activity. The current level of activity does not appear to be an issue, we do recommend ongoing monitoring.

14.4 *ODOR*

We did not notice any excessive odor while conducting our site visits. Nor did we see specific loads such as dead animals or sludge which are typically associated with odor. It is true that any putrescible waste can cause odors, but the lack of offensive odor at the facilities is most likely be attributed to good operational practices such as proper tarp utilization and the application of cover soil.

15 SITE CONDITIONS

15.1 *LIGHTING CONDITIONS*

We agree with the current practice of utilizing portable light towers during low light conditions. From a safety standpoint we stress the importance of limiting the number of workers on the ground even when the light towers are being used. We also suggest that workers stay within close proximity to the light towers, preferably within a protective structure (i.e., spotter's station), similar to what is currently in use at Lamb Canyon.

15.2 *ACCESS*

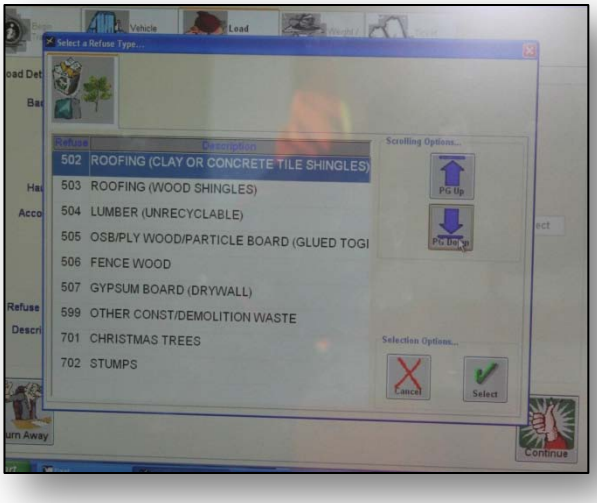
All of the sites we visited were easily accessible. The signage directing customers to the appropriate dumping areas was clear and easy to understand. The access roads within the Landfills were satisfactory. We did note that some of the roads at Badlands and Lamb Canyon would benefit from more frequent grading. From a safety and supervision standpoint we recommend that the recycling area at the Blythe Landfill be moved closer to the active area of the Landfill.

15.3 *WILDFIRE PROTECTION*

We recognize the need for vegetation as an erosion control measure at all the landfills. Due to the remote nature of the Landfills the possibility of a wildfire encroaching onto the sites needs to be

considered. It is suggested that areas around the gas system and other improvements continue to be adequately protected from wildfire through removal of vegetation and debris.

16 SCALE BOOTH OPERATION



As part of our evaluation, we spent time in each of the three scale booths and talked with the current attendants. Overall, the booths are organized and operated efficiently. All are using the same scale software program. It is simple, intuitive, and appears to provide adequate subdivision of waste categories.

There appear to be few conflicts with customers, and those that do occur, are usually reconciled easily by the attendant. On a rare occasion, the Site Supervisor will intervene. Here are some of the more common issues:

- **NOT HAVING A SAFETY VEST**
  Solution: Customer may purchase a plastic safety vest for 75 cents …or $9 for a cloth vest.
- **DOES NOT HAVE A TARE WEIGHT**
  Solution: The customer must weigh back on the way out
- **DOES NOT HAVE A VALID DRIVER'S LICENSE**
  Solution: The customer is instructed to return with his/her license. Alternatively, the customer is given a list of disposal sites that will not require a driver's license.
- **DOES NOT COMMUNICATE ORIGIN OF WASTE**
  Solution: Generally, when this happens it is simply a communication issue. By re-phrasing the question, the attendant can usually obtain the correct answer.

Any vehicle (including Mom & Pop vehicles) can obtain a tare weight sticker. This allows them to pay on their way in. However, many elect not to do so because they want an exact tare on their "weigh back."

Some vehicles will leave without stopping for a "weigh back" and avoid paying their fee. When this happens, the scales distribute the driver/vehicle information to other county facilities to minimize the chance of it occurring again.

There are cameras at the two larger landfills, but the old style CRTs are difficult to see when there is bright sun outside. We'd recommend changing them out with flat-screen units that provide better contrast and viewing ability.

The following discussion addresses the individual sites.

16.1 *BLYTHE*

The gate attendant at Blythe appears to range from less than 10 transactions per day …to over 40 on a busy day. The average is approximately 24. The manual system of entering every transaction is quite easy.

Because of this relatively light workload, the gate attendant regularly does other activities that can be performed in close proximity to the scale. These include picking up litter and maintaining the landscaping around the scale booth. Discussions with the scale-booth attendant indicate she would have time to assist with other duties (i.e., paperwork) that is currently being performed by the site manager.

The attendant also transports cash and makes deposits to the local bank, but because the daily amount is quite small, there appears to be no significant security risk.

The Waste Inspector and/or the Site Supervisor help fill in. Similarly, the Waste Inspector and the Scale-house Attendant rotate to cover the occasional Saturday the site is open.

16.2 *BADLANDS & LAMB CANYON*

The scale operations at Badlands and Lamb Canyon are straight-forward. Inbound commercial vehicles are logged into the system using unique I.D. numbers assigned to each truck and trailer. Some issues may occasionally arise when a transfer truck switches to another trailer, but typically when this occurs, the drivers are attentive and provide the correct vehicle/trailer I.D. numbers.

In regard to the efficiency of the current operation, we believe it is well-matched to the inbound tonnage. In regard to the potential for automation, many of the transactions could be automated, but it is our opinion that the benefits do not currently justify the change – from manual to an automated system. There would still be the need for a scale-booth attendant, and the automation would be somewhat of a redundancy.

Because most of the waste entering the landfills is delivered by commercial haulers, there is relatively little cash on hand and the cash that is collected is picked up by a security vehicle. Accordingly, we see little security risk with the current system related to cash handling.

The traffic director also helps operate the fee booth early in the morning, until the regular attendant arrives.

17 SUMMARY

Overall, the landfills are being operated in an efficient and proactive manner. From a utilization and operational requirement standpoint, it is our opinion that the County can reduce the number of

machines at these landfills, while still maintaining a sufficient fleet to efficiently handle the inbound waste and other necessary construction activities such as site maintenance.

While our recommendations could lead to an optimum fleet size for the current landfill condition, a detailed analysis that incorporates equipment resale value, opportunity cost, tonnage trending, system expansion, replacement costs, rental availability and costs, and mobilization costs should be carefully considered before releasing any equipment.

Further, when remaining machines have exhausted their useful life and are replaced, the sizing of new machines should be carefully considered in light of operational improvements and anticipated waste tonnage. Two examples to consider are: Replacing the D10 dozer with a D9; and replacing the dozer/compactor/scraper at Blythe with a single machine (i.e., a track-loader). We also recommend a continual effort to minimize soil use through maximizing the current use of tarps. Increased attention to road maintenance is suggested, as is an improved layout for the scraper haul roads.

We also recommend the County maintain the benchmarking system, in order to monitor ongoing performance. This is vital if the County is to continue along the path of increasing efficiency and reducing operating costs.

Further, we suggest the County continue to train operators in regard to the overall process of landfill operation. This should include specific training on the *why* – as well as the *how* – of landfill operation. The training should include continued emphasis on the interaction between the entire crew in regard to waste flow into the landfill – and how it impacts the operation. Developing clear lines of communication and process will be important. For example, the waste flow at the tipping pad and face should focus initially on maximizing the effectiveness of the compactor. This would include managing inbound traffic, pushing waste to the face, and perhaps most importantly, the development of a fill pattern that would allow the dozer and compactor to work more in unison.

We suggest the landfills work toward developing a process that incorporates a pancake system of filling to maximize compaction effort, better control surface grades and more efficiently use equipment (downhill operations).

We suggest there be continued effort to streamline the machine maintenance and repair process, with an effort to make sure machines are properly maintained and that the repair process moves as quickly as possible.