Schneider Hall Follow Up Audit

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I. Executive Summary

Western Michigan University provides campus the ability to improve sustainability through solid waste reduction and recycling research. WMU has an organized system of recycling receptacles: paper/cardboard (P/C), glass/plastic/metal (GPM) or landfill (LF). Schneider Hall was the first building on campus to utilize the stainless steel receptacles containing a three-bin system in a centralized area. This provides the Office for Sustainability an opportunity to research the effectiveness of enhanced recycling receptacles and practices.

The 2012 Climate Action Plan shows that solid waste on the WMU campus makes up 2.6% of all GHG (green house gas) emissions. This amount was determined in a 2009 GHG inventory. The amount of waste found in this follow-up Schneider Hall audit will be useful in determining how much solid waste has decreased in the past 2 years and how much additional is needed to reach the goal of zero waste by 2065.

The focus of this study was to (1) weigh, sort, and record the total landfill and recycling (separated into P/C and GPM) generated on the three floors of Schneider Hall to obtain recycling and contamination rates, (2) compare weights and rates of the new enclosed stainless steel receptacles, to the current three bin, pod system, and (3) compare the results from this waste audit to that of a Schneider Hall baseline waste audit from two years ago.

This research project aims to address the important issue of proper recycling and waste management. With the university promoting sustainable practices, this study gives insight into how effective the use of separate recycling bins are and if students, faculty, and staff are utilizing this opportunity. Sorting by floor can show which population, if any, is using these receptacles properly. With classrooms on the first floor, computer labs and offices on the second floor and third floors, the results can show which group is conducting proper waste management.

During four weeks of data collection, the procedures varied to increase productivity. The first two weeks sorting was performed in a one-by-one system in which each data-collector assisted with sorting and weighing each bag. During the third week this was changed to increase efficiency. A table was introduced to decrease the amount of bending and lifting required of the data-collector. Morning shifts consisted of much fewer bags to sort. Afternoon shifts consisted of one set of morning shift bags that needed sorting and the three floors from the afternoon shift. The afternoon shifts and morning shifts varied greatly in the composition of the bags sorted. During morning shifts, the amount of LF, P/C, and GPM were much lower than the afternoon shifts. These significant increases of weights in the afternoon shift could be accounted for the higher number of faculty and students present during the day.

The results in this follow up audit showed significant decreases in the overall amount of waste and recycling present in Schneider Hall. This overall decrease was present on all three floors of Schneider Hall and was consistent through the four weeks of research. In the 2 years since the baseline audit, the overall solid waste in Schneider Hall has decreased 54%. This is evidence to support progress towards a waste free environment as outlined in the ACUPCC (American College and University Presidents’ Climate Commitment).

II. Introduction

In 2009 President John Dunn signed the ACUPCC (American College and University Presidents’ Climate Commitment) agreement to make WMU a more sustainable campus. The ACUPCC requires an emissions inventory, a target date to become climate neutral, steps to reduce GHG (green house gas) emissions as listed in the short-term actions, sustainability practices incorporated into the educational curriculum of the university, and creation of an action plan to fulfill these goals.

The 2012 Climate Action Plan states that 2.6% of all GHG emissions at WMU are made up of solid waste. According to the 2012 WMU Climate Action Plan, a “90% reduction in GHG emissions due to wastewater and solid waste combined is a reasonable goal to achieve by 2065.” (Pancella, Glasser 15) According to data collected in
the Schneider Hall audit, solid waste was reduced by approximately half in the two years since the baseline audit was conducted. If this trend is consistent throughout the WMU campus, then the GHG emission should be reduced to approximately 1.3%. This can assist WMU in reaching the recycling goal of 45% and diversion goal of 55% by 2015.

On December 5, 2013 WMU passed a tobacco-free policy that will take effect September 1, 2014. This policy includes the prohibition of any tobacco products including: cigarettes, cigars, pipes, bidi, hookah, and other tobacco products. Students and faculty will be prohibited from using tobacco products on any WMU property except in enclosed, personal vehicles. Recyclable containers are commonly used as a reservoir to dispose of chewing tobacco. This then contaminates a once recyclable item with bio-hazardous material that cannot be recycled. If lids are not properly tightened or a lid is not present, and the chewing tobacco is disposed of into a recycling receptacle, the rest of the items may become contaminated as well.

WMU promotes a sustainable environment through the many sustainable options available to students and faculty. These options include stainless steel bins and other separated receptacles to dispose of their waste and recycling. With WMU pledging to become waste-free by 2065, a number of accurate surveys of each form of waste are needed to show the progress that is being made. Full-scale surveys and audits of the WMU campus would be extremely difficult to perform (due to time constraints and number of employees available), as a result many smaller audits provide data that can be used to estimate the reduction in waste campus wide.

This study was a follow-up audit in Schneider Hall comparing a baseline audit that was conducted 2 years ago. This follow-up study compared the results of stainless steel bins and the three-pod system available for students and faculty to use in Schneider Hall. Landfill waste and recycling were weighed Monday afternoons through Friday mornings. The weights of landfill (LF), paper/cardboard (P/C), and glass/plastic/metal (GPM) were recorded for two shifts Tuesday through Thursday and one shift each Monday and Friday. Bags were collected and tagged by custodial staff, brought to the loading dock of Schneider Hall, and then sorted. The contamination collected (recyclables in landfill or trash in recycling) was removed and placed into the appropriate bag designated “paper/cardboard,” “glass/plastic/metal,” or “landfill.”

One aim of this study was to provide evidence for whether or not students and faculty are properly utilizing the enhanced recycling system. This study focused on the usage of stainless steel bins and the three-pod system. The amount of contamination in both the landfill and the recycling were recorded. The contamination rates in the landfill consisted of the weight of recycling found in landfill bags. The contamination rates in the recycling consisted of the weight of trash or incorrect recyclables found in recycling bags. The rates of recycling and the rates of contamination were recorded after the audit concluded and these percentages will assist in determining the overall waste reduction amount that Schneider Hall has achieved in the past 2 years.

It was found that students and faculty, when recycling, are doing so properly with low amounts of trash contamination found in the recycling bags. It was found that students and faculty, when disposing of their trash, are also disposing of recyclable items into the landfill bags. A high contamination rate of recyclables in landfill was found. Removing trash and recycling from classrooms, centralized waste and recycling locations. It was found that waste was reduced by half of what was found in the baseline audit.

Potentially negative effects in the large reduction of waste include displacement of waste into other receptacles. This could provide misleading information about the overall reduction of waste. Therefore future research could be conducted to examine surrounding outdoor receptacles.
III. Methodology and Data

All three floors of Schneider Hall experienced a waste audit during the weeks of October 14 through November 4, 2013. All landfill (LF), paper/cardboard (P/C), and glass/plastic/metal (GPM) pods were emptied and sorted Monday through Friday. Monday sorting was only done in the afternoon, Friday sorting was only done in the morning, and Tuesday through Thursday sorting was done both in the morning and afternoon. Custodial staff delivered landfill and recycling from each floor to the loading dock of Schneider Hall in both the morning and afternoon. During the first week of sorting, the custodial staff attached pre-made labels coordinated to the floor and bin number with the LF, P/C, or GPM label and whether or not it came from a stainless steel bin or one of the three-bin pods. The last three weeks of sorting, custodial staff wrote out the floor and bin number with the LF, P/C, or GPM label.

Pods consist of a three bin systems labeled: landfill, paper and cardboard recycling, and glass, plastic, metal recycling. The three bins were grouped together and marked with signage taped to the side of the bin. The landfill in the pods contained a circular hole, the paper contained a slot, and the glass, plastic, and metal contained a circular hole. Each bin in the pod was a different shape. Stainless steel receptacles display signage securely located above the designated square opening for landfill, a vertical slot for paper, and circular hole for glass, plastic, and metal. Pods and stainless steel receptacles were labeled by floor, receptacle type, bin type, and numerically ordered starting from the southwest corner of Schneider Hall and progressing clock-wise around the building. An example of a label would be F1SS-1GPM: F1 represents floor one, SS represents stainless steel receptacle, 1 represents the location of the receptacle, and GPM represents the bin type of glass, plastic, metal. The weights of the bags were then recorded onto the collection sheet corresponding to the bag label.

Figure 1. Receptacle labels

Floor two was the only floor to contain both stainless steel receptacles and the three-bin system. Floors one and three only contained the pods. Weights for the pods on all of the floors and the stainless steel receptacles were kept separate on the data sheet to determine the correlation between receptacle location, contamination, and overall weight. The total weights for the stainless steel receptacles and the three-pod system were then compared to determine the effectiveness of the centralized stainless steel receptacles over the three-bin system.
Prior to sorting, protective gloves were worn to prevent any contamination from touching the data-collector’s skin. Then a large, blue tarp was placed on the ground to prevent contamination to the floor. A bathroom scale was set on the floor without the tarp underneath to prevent any inaccurate readings. A rolling cart was placed near the edge of the blue tarp and used as a desk to record data. Large garbage bags were used to weight total landfill, paper/cardboard, and glass/plastic/metal at the end of every shift.

Once the sorting area was set up, all of the bags collected by custodial staff were placed on the end of the blue tarp. Each bag was weighed, the weight was recorded, and the bag was then sorted. Any contamination in the bag was weighed and recorded. If recycling was found in the landfill, that amount was weighed and recorded as either “P/C” or “GPM” in landfill; if landfill was found in recycling it was recorded as “trash in recycling”. The contents of each bag were then placed into the appropriate bags (LF, P/C, or GPM). This process was repeated for each of the bags present. At the end of each shift’s bags, the total weight for landfill, paper/cardboard, and glass/plastic/metal were recorded. These values were placed at the bottom of that day’s data sheet. This process was repeated for the first two weeks.

During the third week, prior to sorting, the bags were organized into separate piles of recycling and landfill. Then the same process of sorting, weighing, and recording was followed but the returnable cans and bottles were sorted into a separate GPM bag. The total weight of returnable cans and bottles was still included in the total GPM weight. At the end of each shift, these returnable cans and bottles were taken to the Office for Sustainability and placed in the large bin outside the building for deposit items.
During the third week a table found in the loading dock, was placed in the center of the room. The large, blue tarp was then placed on top of it with excess tarp laid out to each side to prevent contamination to both the table and the floor. The morning shift used a wood pallet and two old landfill receptacles to make a small sorting table. The tarp was placed under the pallet-sorting table rather than draped over it.

**Figure 6. Table used in afternoon shifts**

**Figure 7. Wood pallet used in morning shifts**

After the four weeks of sorting was complete, all data were entered into Excel spreadsheets by floor, by week, and by total weights. Once all data were entered into the spreadsheet, the recycling rate and the contamination rates were computed. The recycling rate was found using Equation 1. The recycling rate was computed for each floor, each week, and for the total amount of recycling during the sorting period. The contamination rate of recycling in landfill was computed using Equation 2 for each floor, each week, and for the total amount of recycling in landfill during the sorting period. The contamination rate of trash in recycling was found using Equation 3 for each floor, each week, and for the total amount of trash in recycling during the sorting period.

**Equation 1. Recycling rate**

\[
\left( \frac{\text{Total Recycling}}{\text{Total Landfill} + \text{Total Recycling}} \right) \times 100 = \text{Recycling Rate}
\]

**Equation 2. Contamination rate of recycling in landfill**

\[
\left( \frac{\text{Recycling in Landfill}}{\text{Total Landfill}} \right) \times 100 = \text{Landfill Contamination Rate}
\]
Equation 3. Contamination rate of trash in recycling

\[
\left( \frac{\text{Trash in Recycling}}{\text{Total Recycling}} \right) \times 100 = \text{Recycling Contamination Rate}
\]

The values from these three equations were then placed into tables and graphs to compare the significant differences between the recycling rates, contamination rates of landfill, and contamination rates of recycling. These values show the rates at which students and faculty members of Schneider Hall are properly handling waste and recyclables.

Setting

This study took place in Schneider Hall in the loading dock. Schneider Hall is comprised of three floors; the first floor consisted of classrooms and a café, the second floor contained one computer lab, a study lounge, classrooms, administrative offices, and the only lecture hall in the building, the third floor included offices, conference rooms, and a breakroom. The loading dock comprised a small area of approximately 12x38 feet. The loading dock contained equipment that custodial staff uses. These machines were placed on the far end opposite the door, against the right wall of the loading dock. On the left wall there were piles of glass windows and shelving units. There were large boxes placed on the floor in the loading dock, along each side. The loading dock door that opened towards the garbage bins outside was attached to a loud alarm that was set off whenever the door closed. For floor plans of Schneider Hall refer to Appendix D.

IV. Discussion

The process taken while sorting and recording these values was changed approximately half way through this study to increase efficiency and productivity. The first week proved to be a trial period of working with the custodial services and the team to determine the best course of action. After the first week it was determined that having custodial staff write out the bag tag was more efficient than attaching pre-made tags. This allowed custodial staff could take own route of collection through the building. This process also decreased workload for Office for Sustainability staff by removing the time required and the responsibility of creating tags for each bag.

The process of weighing with the bathroom scale proved to be very time consuming. In order to get the most accurate reading, the person weighing would need to step on the scale whilst holding the bag, remember or record that value, step off the scale, wait for it to reset, and then step back on the scale without the bag to obtain a tare weight. This weight was then subtracted from the first weight. During the first week the scale would repeatedly change values by significant amounts of 0-5 pounds. This decreased accuracy for the first week. Once the bathroom scale was replaced during week 2 and the fish scale was introduced during week 3, efficiency of sorting and accuracy of the weights were both increased.

Some interesting items found during this waste audit included hypodermic needles, an at home HIV kit, a large amount of chewing tobacco, a large amount of unopened/unexpired food, a large amount of transparencies, DVDs and VHS tapes, a fish tank decoration, metal kitchen tongs, Tupperware, one pound of bubble wrap, compostable waste, and ants.

The percentage of recycling varied significantly per floor. Figure 2 below shows the percentage of recycling per floor, per week in the follow-up audit. Floor 3 shows a much higher recycling rate than either floor 2 or floor 1. Over the course of the study, floor 2 seems to have improved on the recycling rate at a steady rate. Floor 1 seems to have increased recycling rates from week 1 to week 2, but decreased from week 2 to week 4.
Both figures 1 and 2 show that floor 3 had the highest percentage of recycling compared to floors 1 and 2. Floor 3 appears to have improved recycling rate by approximately 8% (approximately 55% in the baseline audit and 63% in the follow up of Schneider Hall). Floor 2 appears to have improved on the percentage of recycling as well. In the baseline waste audit the highest percentage was reached during week 2 of the study and was at approximately 42%. In the follow up waste audit floor 2 reaches the highest percentage of recycling at week 4 at approximately 57.8%. This is a 15.8% increase in percentage of recycling. Floor 1 continues to have the lowest percentage of recycling, though the overall percentage of recycling increased. In the baseline waste audit, floor 1 had its highest recycling rate during week 1 of the audit at approximately 27%. In the follow up audit, floor 1 reached its highest percentage during week 2 at approximately 33.7%.

Figure 1. Percent of recycling per floor, by week from baseline waste audit of Schneider Hall

![Percent Recycled Per Floor](image1)

Figure 2. Percent of recycling per floor, by week from follow-up audit of Schneider Hall

![Percent Recycled Per Floor](image2)

In figures 3 and 4, the percentage values show that there was significantly more recyclables in landfill bins than there was trash in recycling bins. This shows that the population of Schneider hall tends to contaminate the landfill with recycling much more than they contaminate the recycling bins with trash. The percentage of trash in recycling was highest on floor 1. The percentage of recycling in landfill was highest on floor 2. Week 1 showed the highest percentage of contamination in both the recycling and the landfill. The highest percentage of recycling in landfill was at approximately 61%. For floor 2, during week 1 there was approximately 30 pounds less landfill sorted and approximately 15 pounds more recyclables found in landfill. This could account for the high percentage. The highest percentage of trash in recycling was at approximately 17%.
Figure 3. Percent of Recycling in Landfill Contamination

Figure 4. Percent of Trash in Recycling Contamination

Figure 5 shows the total weights of the landfill and recycling found in the follow-up audit of Schneider Hall. There was a total of 1691.3 pounds of landfill found and 1355.7 pounds found in this follow-up audit.

Figure 5. Total weights of landfill and recycling for the follow up audit of Schneider Hall
Figures 6 and 7 show the floor 1 comparative differences between the baseline waste audit and the follow-up audit of Schneider Hall. Figure 6 shows the baseline waste audit with a total landfill from floor 1 of 1,746.1 pounds. In figure 7 (the follow up audit) the total amount of landfill throughout the audit was 723.75 pounds. This is approximately 69.6% less than in the baseline audit. The total amount of paper/cardboard for the baseline audit was 304.3 pounds (figure 6) and 54.75 pounds in the follow-up audit (figure 7). This is an 82% decrease in paper/cardboard generated. In the baseline audit the total amount of glass/plastic/metal was 168.5 pounds (figure 6) and in the follow up audit the amount of glass/plastic/metal was 104.85 (figure 7). This is a 38% decrease in weight.

**Figure 6. Total weights of landfill, paper/cardboard, and glass/plastic/metal of the baseline audit of Schneider hall for floor 1**

![Baseline Total Weights Floor One](image1)

**Figure 7: Total weights of landfill, paper/cardboard, and glass/plastic/metal of the follow-up audit of Schneider hall for floor 1**

![Follow-Up Total Weights Floor One](image2)

Figures 8 and 9 show the floor 2 total weights of landfill, paper/cardboard, and glass/plastic/metal generated. The total landfill in the baseline audit was found to be 1,140.5 (figure 8) and the total landfill was found to be 465.9 pounds in the follow-up audit (figure 9). This is a 59.2% decrease in weight. In figure 8 the total paper/cardboard was found to be 372.6 pounds. In figure 9, the total paper/cardboard was found to be 87.5 pounds. This is an
86.5% decrease in weight. In figure 8 the total glass/plastic/metal weight was found to be 50.7 pounds. In figure 9 the total glass/plastic/metal weight was found to be 58.4 pounds. This is a 15.2% increase in weight.

**Figure 8. Total weights of landfill, paper/cardboard, and glass/plastic/metal of the baseline audit of Schneider hall for floor 2**

![Baseline Total Weights Floor Two](image)

**Figure 9. Total weights of landfill, paper/cardboard, and glass/plastic/metal of the follow up audit of Schneider hall for floor 2**

![Follow-Up Total Weights Floor Two](image)

The total weights of landfill, paper/cardboard, and glass/plastic/metal for floor 3 of the baseline audit were found to be 997.5 pounds (figure 10) and 501.6 pounds for the follow-up audit. (figure 11). This is a 49.8% decrease in weight. The total weights of paper/cardboard for the baseline audit were found to be 910.3 pounds (figure 10) and 119.3 pounds in the follow-up audit (figure 11). This is an 87% decrease in weight. The total weights of glass/plastic/metal for the baseline audit were found to be 68.8 pounds (figure 10) and 37.6 pounds in the follow up audit (figure 11). This is a 44.4% decrease in weight.
The total weight of landfill in the baseline audit was found to be 3,884.1 pounds (figure 12) and was found to be 1,791.3 pounds in the follow up audit (figure 13). This is a 54% decrease in overall landfill. The total weight of paper/cardboard for the baseline audit was found to be 1,587.2 pounds (figure 12) and was found to be 261.6 pounds in the follow up audit (figure 13). This is an 81.2% decrease in paper/cardboard generated. The total glass/plastic/metal weight in the baseline audit was found to be 288 pounds (figure 12) and was found to be 200.8 pounds in the follow-up audit (figure 13). This is a 31.28% decrease in total glass/plastic/metal generated.
Figure 12. Total weight of landfill, paper/cardboard, and glass/plastic/metal over the course of the baseline waste audit of Schneider hall.

<table>
<thead>
<tr>
<th>Week</th>
<th>Baseline Building Total Landfill and Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount in Pounds</td>
</tr>
<tr>
<td></td>
<td>LF</td>
</tr>
<tr>
<td>Week 1</td>
<td>800</td>
</tr>
<tr>
<td>Week 2</td>
<td>900</td>
</tr>
<tr>
<td>Week 3</td>
<td>1000</td>
</tr>
<tr>
<td>Week 4</td>
<td>1100</td>
</tr>
</tbody>
</table>

Figure 13. Total weight of landfill, paper/cardboard, and glass/plastic/metal over the course of the follow up waste audit.

<table>
<thead>
<tr>
<th>Week</th>
<th>Follow-Up Building Total Landfill and Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount in Pounds</td>
</tr>
<tr>
<td></td>
<td>LF</td>
</tr>
<tr>
<td>Week 1</td>
<td>700</td>
</tr>
<tr>
<td>Week 2</td>
<td>800</td>
</tr>
<tr>
<td>Week 3</td>
<td>900</td>
</tr>
<tr>
<td>Week 4</td>
<td>1000</td>
</tr>
</tbody>
</table>

Figures 14 and 15 show the comparison of stainless steel receptacles to the three-bin system. Figure 14 shows the total weights found in the stainless steel receptacles and the three-bins. Figure 15 shows the contamination rates of the landfill and recycling in the stainless steel and three pods. Figure 14 shows that the pods are being used more for landfill waste and paper/cardboard waste but less for glass, plastic, metal. Figure 15 shows that the contamination rates of recycling in trash are higher in the pod system than in the stainless steel receptacles. Two of the stainless steel bins were located in the hallways and one was located in the front lobby. For the three separate pods that were used to compare these results, one was located in the hallway and the other two were found near the entrances in a study lounge by the door. These three pods were chosen to compare results because they were the most similar in location to the stainless steel bins by being close or in the hallway. Of the five other pods, two were located in office workrooms that are not easily accessible by a large population, and the other three were located in the computer labs with posted no food or drink allowed inside.
Figure 14. Total Weights of Stainless Steel Compared to Three-Bin System

Figure 15. Contamination Rates of Stainless Steel and Three-Bin System

Overall, waste and recycling totals were decreased by significant amounts. With reductions of 54% in landfill, 81.1% in paper/cardboard, and 31.3% in glass/plastic/metal the question of why the amounts are decreased so much arises. Overall the total glass/plastic/metal amounts decreased the least and the paper/cardboard decreased the most. Floor 1 had the greatest decrease in landfill over the course of the follow-up audit. Floor 3 had the greatest decrease in paper/cardboard over the follow-up audit. Floor 3 also had the greatest decrease in glass/plastic/metal over the course of the follow-up audit. With a 15.2% increase of glass/plastic/metal, floor 2 showed the only increase of weight over the course of the follow up audit. These figures show that students and faculty are improperly disposing of their recyclables into the landfill receptacles.

Copious amounts of postconsumer food wastes were generated from on-campus and off-campus catering as well as from personal meals such as lunches and take-out. Catered food waste such as pizza and burritos, was consistently found on the first floor, which is comprised mainly of classrooms. Availability of a commercial scale composting facility would allow this food waste to be composted.
Packaged food was found mainly on floors 2 and 3. These floors are made up of offices and computer labs. Items like unopened packages of cookies, breakfast bars, protein bars, chips, a loaf of bread, fruit containers, fruit salads, fruit mixes, crackers, trail mix, and cereal were found. In addition to what was sorted approximately 100 sandwiches, pre-made salads, fruit cups, sushi packages, breakfast sandwiches, yogurts, Odwalla drinks, and numerous snack packages from a campus café were discovered in the landfill dumpster outside the loading dock. Based on the contents found, and based on general pricing, approximately $500 worth of food waste was found in the dumpster. These sandwiches were found unopened, unexpired and in airtight packaging.

Some bio-hazardous materials found in the landfill bags included three separate hypodermic needles and an at-home HIV kit. These needles were not contained in safe packages and the HIV kit was used. Environmental Safety was notified and they disposed of these items. WMU does not have a secure needle deposit system that is easily accessible to students; they would need to request the appropriate bins. This is something that could be researched to create a centralized needle deposit location.

Chewing tobacco proved to be an extreme contaminant in the recycling and landfill bags. Most of the items used to dispose of the chewing tobacco were recyclable items such as water bottles, soda bottles, or other drink bottles. These items cannot be recycled because they are not empty and are contaminated. These bottles were sometimes not completely closed, which resulted in contamination of the rest of the bag, which could then not be recycled. Chewing tobacco was present in seven landfill bags and in two glass/plastic/metal bags. With WMU going tobacco free in September 2014, there should be a significant reduction in this material.

The baseline audit of Schneider Hall was performed two years previous to this follow up audit. In those two years, the overall weights of landfill and recycling have decreased significantly. This leaves the question of what caused the
decrease. Some possible solutions could be that students and faculty are disposing of their landfill and recyclables in other areas of the campus such as outdoor receptacles, other buildings, parking lots and sidewalks, bathrooms, or they are not disposing of their waste and recyclables on campus but are keeping it in backpacks or bags until going home. Some other possible solutions are that students and faculty are not generated as much waste by using reusable containers or there could be fewer students and faculty in Schneider Hall.

V. Limitation of Your Analysis and Future Work

Some issues encountered during this analysis included bag tag placement, surface area to sort in, and scale error. When the audit began, custodial staff was instructed to place preprinted tags onto the bags for the specific location of where that bag came from. They were to attach it with paper clips. During the first week, many of the tags fell off of the bags and the location of these could not be recorded. Based on the contents of the bag, an assumption was made for the location. Later in the project, custodial staff began writing out the location of the bags instead of using the pre-printed tags and taping them onto the bags instead of using paper clips. This decreased the number of lost tags significantly.

Another problem that arose was that surface area to work in was not efficient. Originally sorting occurred by laying the large, blue tarp onto the floor and sorting the bags directly on the floor. This increased the amount of time taken to sort because it required the sorter to kneel on the ground and sort directly from there. Once the table was introduced during the third week, the speed of sorting increased immensely.

Scale error came from bags and/or items that weighed less than half a pound and would not register on the scale. The value for this amount was set at >.5 pounds. Any bag that did not register a weight had a scale error of .5 pounds.

VI. Conclusion/Recommendations

This follow up audit has shown that overall waste and recycling totals have decreased significantly in the two years since the baseline audit was performed. There has also been a significant increase in the recycling rates. The contamination rates of landfill receptacles were higher than the contamination rates of recycling receptacles. Students and faculty are disposing of their trash properly, however they are continuing to dispose of recyclable items into landfill receptacles. The pod system is used more frequently than the stainless steel receptacles but has
higher rates of contamination in the landfill. Some future studies to consider would include auditing outside receptacles to determine if there is a large amount of waste and recycling that once was disposed of inside Schneider Hall but is now being disposed of outdoors. Also, this audit should be repeated in another two years to determine if the decrease in the amount of waste and recycling is continuous.

If this study is repeated, some protocols to consider changing would include: purchasing and using a more accurate industrial scale to weigh the bags, using a table with a tarp to sort instead of sorting on the ground, and removing all liquid waste into a 5 gallon bucket.

During the first week, the scale proved to be inconsistent with the values given. Using a more accurate scale than a bathroom scale would increase accuracy immensely. During the daily sorting the scale would be used for every bag, used again if there was contamination present in the bags, and then used at the end of each shift to provide the totals. In total, the scale was used each day at least 50 times. This decreases the life of the bathroom scale, which means it needs to be replaced more often than an industrial scale designed for this type of activity. An industrial scale is more durable, accurate, and can weigh more frequently than a bathroom scale. The large platform would allow a bag to be set on the scale and would eliminate the tare process. The scale can be connected to a computer system that would input data directly into a program that could easily be transferred into an excel spreadsheet. This computer software allows for immediate analysis of the exported data, which in turn decreases input error, which could result in inaccurate results. Using a platform scale directly linked to a computer software program will decrease the amount of time necessary to input and analyze data, which would reduce labor costs. The following table is a model of an industrial scale that is appropriate for this sort of activity. It shows the weight capacity, accuracy, size, and price of two models. Either of these scales would be useful for waste auditing. For scale specifications refer to Appendix F.

<table>
<thead>
<tr>
<th>Range/Model</th>
<th>Capacity</th>
<th>Readability</th>
<th>Pan size</th>
<th>Price Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPWplus 75 L</td>
<td>165lb/75kg</td>
<td>0.05lb/20g</td>
<td>35.4x23.6”/900x600mm</td>
<td>$428.00</td>
</tr>
<tr>
<td>CPWplus 150L</td>
<td>330lb/150kg</td>
<td>0.1lb/50g</td>
<td>35.4x23.6”/900x600mm</td>
<td>$436.00</td>
</tr>
</tbody>
</table>

Using a table increased efficiency of sorting immensely and also decreased the pressure on the sorters’ backs. The table allowed multiple sorting to occur simultaneously while sorting on the ground limited sorting to one or two bags at a time. Sorting on the ground required more time, which was decreased by the number of sorters working on each bag. Using a table also decreased the sorter’s chance of touching any dangerous items such as hypodermic needles. The table allowed the sorter to be at a better angle to see what was inside the bag without needing to alter the location of the items inside the bag.

Removing liquid waste before weighing the bags would increase accuracy as well. Many of the bags contained half-filled or full bottles of water or other drinks. The weight of these liquids significantly increased the totals of many GPM and LF bags. Removing the liquid and then weighing the bags will give a more accurate weight as to the contents of the bag. This can be done through the use of a 5-gallon bucket.

Another consideration for future audits is to only sort in the afternoons. During morning shifts, very few to no bags were delivered to the loading dock. During the afternoon shifts, almost all of the bags were delivered and sorted. Students and faculty are present more during the day than in early morning or late evening after afternoon sorting has concluded. This could be why there were so few bags to be sorted during the morning shifts. This proves that afternoon shift is the preferred time to perform these audits in Schneider hall.
VII. References


VIII. Appendices

Appendix A: Contact Log

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Name</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Assistant</td>
<td>Alex Lee</td>
<td>248-496-6637</td>
<td><a href="mailto:Alexander.j.lee@wmich.edu">Alexander.j.lee@wmich.edu</a></td>
</tr>
<tr>
<td>Office Manager, Turner Scale Inc.</td>
<td>Amy Brown</td>
<td>(334) 271-3232</td>
<td><a href="mailto:amy@turnerscaleinc.com">amy@turnerscaleinc.com</a></td>
</tr>
<tr>
<td>Research Assistant</td>
<td>Azri Azhar</td>
<td>269-873-5100</td>
<td><a href="mailto:Azribin.azhar@wmich.edu">Azribin.azhar@wmich.edu</a></td>
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<tr>
<td>Custodial Supervisor</td>
<td>Brian Beridon</td>
<td></td>
<td><a href="mailto:b.beridon@wmich.edu">b.beridon@wmich.edu</a></td>
</tr>
<tr>
<td>Manager of Waste Reduction Services</td>
<td>Carolyn Noack</td>
<td>269-387-8165</td>
<td><a href="mailto:carolyn.noack@wmich.edu">carolyn.noack@wmich.edu</a></td>
</tr>
<tr>
<td>Research Assistant</td>
<td>Jeremy Schwartz</td>
<td>847-624-5707</td>
<td><a href="mailto:Jeremy.m.schwartz@wmich.edu">Jeremy.m.schwartz@wmich.edu</a></td>
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<tr>
<td>Custodial Supervisor</td>
<td>Jim Emery</td>
<td></td>
<td><a href="mailto:john.phillips@wmich.edu">john.phillips@wmich.edu</a></td>
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<tr>
<td>Research Assistant</td>
<td>Kathryn Smith</td>
<td>269-370-1206</td>
<td><a href="mailto:Kathryn.a09.smith@wmich.edu">Kathryn.a09.smith@wmich.edu</a></td>
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<tr>
<td>SWR Researcher</td>
<td>Sean Kennedy</td>
<td>313-407-8333</td>
<td><a href="mailto:Skenndy459@gmail.com">Skenndy459@gmail.com</a></td>
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Appendix B: Communication

October 1-2, 2013
Email communication between Carolyn Noack and Sean Kennedy:
Description: Carolyn was revising an email to Jim Emery, the first shift custodial supervisor at Schneider Hall. The attached file was in the wrong format and had to be resent in a pdf format for editing.

October 2, 2013 12:06 pm
From: Sean Kennedy
To: Jim Emery and Brian Beridon
CC: Carolyn Noack

Hello,
I am a solid waste reduction researcher working for Carolyn Noack, and will be conducting a follow-up waste and recycling audit in Schneider Hall. Our proposed start date is Monday, October 14, and the end date is Friday, November 8. Waste and recycling sorts will take place once a day on Monday and Friday afternoons at 3:00 pm, and twice daily on Tuesday, Wednesday, and Thursday mornings at 8:00 am, and afternoons at 3:00 pm. There will be no sorting on Monday and Friday mornings.

Pods and stainless steel receptacles are labeled by floor, receptacle type, bin type, and numbered in numerical order. Each receptacle is assigned a number in numerical order, starting in the southwest corner of the building and progressing clock-wise around the building. For example, F1SS-1GPM: F1 represents floor one, SS represents stainless steel receptacle, 1 represents receptacle locations/number, and GPM (glass, plastic, metal) is the bin type. Data collectors are to record weights from the labeled bags to the corresponding number in the data collection sheet.

Prior to the start date, all pods and stainless steel receptacles in Schneider Hall will be labeled and floor plans will be provided. Custodial services will empty each bin and tape the appropriate label to the bag of the corresponding bin from the receptacle. Tape and labels will be provided each week and if needed more will be available upon request. All bags of waste and recycling will be set in the loading dock area. Data collectors will sort and weigh the bags, and then all waste and recycling will be disposed in the correct dumpster by data collectors and the data collection supervisor.

Here are the specific procedures for your crew to follow:

- Bring floor plans for location reference, bin tags, and tape on building route
- Find labels corresponding to the label on the receptacle (there are three labels for each receptacle; one of each: Trash, GPM, P/C)
- Remove waste and recycling bags from bin, tie closed, and tape the appropriate label to the bag.
- Place labeled bags of waste and recycling in the loading dock area

Thank you for your cooperation. Please contact Carolyn Noack or me with questions or concerns.
Best regards,
Sean Kennedy

October 7, 2013 5:33 am
From: Jim Emery
To: Sean Kennedy
CC: Carolyn Noack and Brian Beridon
Hi Sean,
Thanks for the info we looking forward to working with you on this project. I will get back to you if we have any questions after I meet with the custodians that work at Schneider.
Thanks,
Jim

October 8, 2013 7:18 am
From: Jim Emery
To: Sean Kennedy
CC: Carolyn Noack and Brian Berdion

Hi Carolyn & Sean
Would it be possible for one or both of you to meet with the Schneider crew to go over our part of the study. Just so we are all on the same page and answer any question the custodians may have.
Thanks,
Jim

October 8, 2013 12:32 pm
From: Sean Kennedy
To: Jim Emery
CC: Carolyn Noack and Brian Berdion

Hi Jim,
Yes, meeting with the Schneider crew would be very helpful. When we meet I will give you the floor plans with marked bin locations, as well as labels and tape for custodial staff to mark the bags. I would be happy to meet you and the Schneider crew at Building Custodial and Support Services or Schneider Hall. I am available to meet tomorrow between 10:30 am and 2:00 pm, or Friday between 9:00 am and 4:00 pm. Doe these times work?
Thanks,
Sean

October 8, 2013 1:56 pm
From: Brian Berdion
To: Sean Kennedy
CC: Carolyn Noack and Jim Emery

Hi Sean,
It would probably be a good idea to meet with me the 2nd shift custodian in the building as well. I would be available anytime after 3pm if you are available. Please let me know. Thank you

October 8, 2013 3:28 pm
From: Sean Kennedy
To: Brian Berdion
CC: Carolyn Noack and Jim Emery

Hi Brian,
I would be happy to meet with you this Friday at 3:15.
Thanks,
Sean
October 9, 2013 7:10 am
From: Jim Emery
To: Sean Kennedy
CC: Carolyn Noack and Brian Berdion

Hi Sean,
Thanks for meeting with us. Friday 9:30am at Schneider would be great, let's all meet at the loading dock and use one of the open classrooms for the meeting.
Thanks,
Jim

October 9, 2013 9:32 am
From: Sean Kennedy
To: Jim Emery
CC: Carolyn Noack and Brian Berdion

Hi Jim,
That sounds like a good plan. See you there at 9:30.
Thanks,
Sean

October 9, 2013 11:55 am
From: Brian Berdion
To: Sean Kennedy
CC: Carolyn Noack and Jim Emery

Thank you Sean, We will be there

October 11, 2013 11:15 pm
From: Sean Kennedy
To: Brian Berdion
CC: Carolyn Noack and Jim Emery

Hi Brian,

The meeting with Jim and the first shift crew went very well. Just to clarify is the Schneider Hall loading dock area a good place for us to meet?
Sean

October 11, 2013 11:30 am
From: Brian Berdion
To: Sean Kennedy

The dock area is fine

Friday, October 11, 2013 9:30 am
Sean Kennedy met with Jim Emery and the first shift custodial crew at Schneider Hall. All parties met outside the loading dock and then moved into the nearest empty classroom. The First shift crew has
many people and meeting in the hallway would have been disruptive to classes. Sean Kennedy informed Jim Emery and the custodial crew of the research project and the waste handling procedures. The matrix of the project was explained in detail to prevent confusion when emptying and labeling bags.

**Friday, October 11, 2013 3:15 pm**

Sean Kennedy met with Brian Berdion and the second shift custodial staff at the Schneider Hall loading dock. There was only one custodian with Brian so the use of a classroom was not necessary for a discussion. The research matrix was discussed and directions on how to label the bags were given. The custodian present with Brian was new to WMU and was having some difficulties understanding the procedures. Brian fully understood the procedures and was happy to assist in the training process.
Dear Mr. Kennedy:

Thank you for your recent inquiry into purchasing an Adam Equipment scale. Turner Scale, Inc is an authorized dealer of Adam Equipment, and they have forwarded your inquiry on to me. Below you will find our pricing for the models that you requested. If after reviewing this you decide that this model does not meet your needs, please let me know. We offer a wide variety of models and capacities, and I'll be happy to assist you with making a selection.

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<th>Readability</th>
<th>Pan size</th>
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<td>436.00</td>
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The above pricing does not include taxes or shipping. Shipping will be PPA, or if you prefer, you can provide your UPS or Fedex account number to bill it directly to your account. The scales would be drop shipped directly to you from the factory, and they are precalibrated prior to shipment. Also, Adam Equipment charges a $10 handling fee for orders less than $1000.

If you would like to place an order, we will require payment via credit card at the time of order. We will need the credit card number, expiration date, cardholder’s name, billing address, and 3-digit verification code on the back of the card. I can process payment over the phone, or I can send you a form to be returned by fax or email.

Please let me know if you have any questions. Thanks for the opportunity! Looking forward to doing business with you!

Sincerely,

Amy Brown
Turner Scale, Inc.
Appendix C: Image Archive

Whole unexpired food waste
Liquid waste and chewing tobacco
Loading dock and area set up
Interesting finds in the landfill
Appendix D: Floor plans
Floor 1
Floor 2
Appendix E: Data Collection Protocol

Schneider Hall Follow-up Data Collection Protocol

General Procedures

Every Monday afternoon, Tuesday and Wednesday twice a day: Trash and recycling will be left on the loading dock by custodial staff. Data collectors will process it by sorting misplaced recycling out of the trash and misplaced trash out of recycling. The sorted recycling and trash will then be weighed separately and placed into appropriate dumpsters.

Once per week: Data collectors will perform the Interobserver Agreement Protocol. Pods and stainless steel receptacles are labeled by floor, receptacle type, bin type, and numbered in numerical order. Each receptacle is assigned a number in numerical order, starting in the southwest corner of the building and progressing clock-wise around the building. For example, F1SS-1GPM: L1 represents floor one, SS represents stainless steel receptacle, 1 represents receptacle locations/number, and GPM stands for bin type; in this example Glass, Plastic, Metal. Data collectors are to record weights from the labeled bags to the corresponding number in the data collection sheet.

Floor two contains two types of centralized waste and recycling receptacles, pods and stainless steel bins. Floors one and three contain only pods. Weights for pods on all floors and stainless steel receptacles are kept separate to determine a correlation among receptacle location, contamination, and weights. Stainless steel bin and pod weights are recorded separately for each bin based on location. However, total weights for stainless steel bins and pods can be compared to determine the effectiveness of the centralized stainless steel bins over pods.

Before handling waste

- Bandage all cuts and scrapes on hands and arms, even on areas that will be covered by gloves

After handling waste

- Follow steps to safely remove vinyl/nitrile gloves
  1. With both hands gloved, peel off one glove starting from your wrist and continuing over your fingers. Hold the inside out glove that has been removed in your gloved hand.
  2. Use the inside out portion of the glove you just removed to peel off the second glove. Both gloves should be inside out when they are removed. This will prevent exposure to blood and other possibly infectious materials on the gloves.
  3. Tuck the first glove inside the second. Dispose of the entire bundle properly.
- Dispose of vinyl/nitrile gloves in landfill bag
- Wash hands thoroughly

Dress code

While participating in any aspect of data collection, data collectors must, AT ALL TIMES, follow the dress code:

- Leather or vinyl gloves, provided by the data-collector
- Closed-toed shoes
- Long pants
- Long sleeves

Daily Protocol

Handling waste bags

- Never load a bag or bin to the point where it is too heavy for you to carry
- If it is necessary to lift a bag of waste out of a bin or brute barrel, tip the barrel on its side and draw out the bag slowly to avoid creating a vacuum, making the bag extremely hard to lift and risking injury.
- While carrying waste bags, hold them away from your body and do not let them rub against your legs. This may require you to only carry one bag at a time in order to have enough strength to hold it away from your body.
- Bags may leak liquid from the bottom, be aware and clean any spills.
- Building Custodial and Support Services empties trash and recycling receptacles, labels bags, and places bags in loading dock.
- Proper labeling of bags requires taping.

Recyclables Sorting
- Empty paper bins by overturning the hallway bin into the collection bin. Empty the Aluminum/Plastic/Glass bins by removing the lid and remove items individually. If the bin’s bag is over half full, remove the entire bag and place into collection bin.
- Weigh and record the recycling following the Weighing protocol below.
- Be aware of dangerous items (listed below) and if one is found, stop collection immediately and notify the data collection supervisor.

Trash Sorting
- Spread out the blue tarp on the loading dock floor.
- Each data collector will sort one bag of trash at a time on the blue tarp. If there are smaller bags inside the large bag, take one out at a time and sort them next to the large bag.
- Before sorting, open the bag up as widely as possible by pulling outward on the upper edges. Cut a 10-12-inch slit down the side of the large bags in order to open them wider. Cut a 5-inch slit into smaller bags if necessary.
- Pull out visible recycling items and place them into separate plastic bags (one for paper/cardboard, one for aluminum/plastic/glass, and one for deposit containers). Leave trash in the original bag.
- Keep deposit bags separate from other recyclables going to the dumpster.
- Move trash inside the bag to uncover recycling items only by using a push stick and never your hand.
- Remember to only touch items that are fully visible.
- Do not allow fingers or hands to reach around a recyclable item where a syringe or sharp object might be concealed.
- Be aware of dangerous items (listed below) and if one is found, stop collection immediately and notify the data collection supervisor.
- Trash bags and sorted recycling bags must be weighed and recorded separately after sorting is complete and liquids emptied, reference the Emptying Liquids and Weighing/Disposing protocol below.

Emptying Liquids
- Some recyclable containers that are found in the trash or gpm bin will have liquids in them (soda cans, coffee cups, Gatorade bottles, etc). Use the first large container found as the liquid reservoir and empty all other liquids into it.
- Empty liquids slowly and from a close proximity so they do not splash.
- Once data collection is complete for that day, empty the reservoir container into a toilet in the nearest restroom. Pour slowly to avoid splashing. If splashes do occur, wipe up with a disinfectant wipe.

Dangerous Items
- If potentially dangerous items are discovered, do not touch it and immediately stop sorting that waste bag. Report the item to the data-collector or data collection supervisor. They will take the proper action for handling and disposal.
- If you come in contact with a potentially harmful powdery or liquid substance, go immediately to the nearest restroom and wash thoroughly with soap and water. Notify the data collection supervisor after substance has been washed off.
- If you become cut, scraped, or require other medical attention, **notify the data collection supervisor immediately.** A first aid kit will be located on the loading dock.

- Dangerous items can include:
  - Broken glass
  - Needles
    - Plastic liquid laundry containers and pop cans may sometimes be used for diabetic needle disposal
  - Empty containers for toxic, flammable, or otherwise harmful materials including cleaning agents, aerosol cans, etc.
  - Bandages, Kleenex, or other item containing blood or other bodily fluid
  - Toner cartridges or any powdery substance that could possibly be inhaled. If cartridge is intact, set it aside and continue sorting the bag. It will be processed as recycling.
  - Bottles that appear to be expanding, under pressure, or contain anything unusual

**Weighing**
- All items need to be weighed after collection/sorting.
- Landfill waste should be weighed in bags. Recycling that is collected in bins should be weighed in the bins. Recycling that is sorted out of the trash may be weighed in it’s new bag.
- Data collectors will tare him/herself on the bathroom scale, then weigh him/herself holding the material, and subtract the tare weight to obtain the material weight.
- If weighing recyclables in a bin, subtract the weight of the bin from the total weight of the contents.
- Always weigh one bag or bin of waste at a time by holding it away from your body.

**Depositing**
- Once bags are weighed and recorded, they may be deposited into the appropriate dumpster. Do not attempt to open dumpster lids while carrying waste bags. Either set the bags down first or open dumpster lids before carrying waste bags outside.
- When depositing bags, hold them over the open dumpster and drop them. Do not toss them from any distance.
- Leave deposit container bag with data collection supervisor.

**Interobserver Agreement Protocol**
- When prompted by the data-collector during one data collection session per week, data collectors will perform the Interobserver Agreement Protocol.
- The data-collector will select one bag of waste to test and one data collector will sort and weigh it according the above protocol while a second data collector is out of sight.
- Also out of sight of the second data collector, the data-collector will then mix the recycling back into the trash bag by setting the recycling items into the trash bag and using a push stick to mix them in.
- The second data collector will then re-sort and weigh the same bag of waste.
- The waste can then be deposited into the appropriate dumpsters.
Appendix F: Notes

Schneider Hall Waste Audit Notes

Week 1 Notes
- 14-Oct F1P6 S2 LF: Paper was GPM/GPM was paper
- 17-Oct F1P4 S2 LF: Pizza and food
- 17-Oct F3P2 S1 LF: Food, needle, test strip with blood, compost
- 17-Oct F3P6 S1 LF: HIV at home kit

Week 2 Notes
- 22-Oct F1P1 S2 LF: Chewing tobacco
- 22-Oct F2P2 S2 LF: Ink cartridge
- 22-Oct F3P1 S1 GPM: Plastic/Paper
- 22-Oct F3P4 S2 LF: Plant
- 23-Oct ALL FLOOR 1 LF: Contained GPM and was extremely contaminated
- 23-Oct F1P6 S1 LF: Pizza
- 23-Oct F3P2 S1: Coffee
- 24-Oct F1P3 S1 LF: Chewing tobacco
- 24-Oct F2P9 S1: Coffee cozies

Week 3 Notes
- 28-Oct F1P2 LF: Did not have tag
- 28-Oct F1P6 S1 LF: Chewing tobacco
- 28-Oct F2SS11 S1 GPM: Did not have tag
- 28-Oct F3P3 S1 LF: Food
- 29-Oct F2P2 S1 LF: Unopened cookies
- 29-Oct F3P5 S1 LF: Ants, unopened lunch bars
- 29-Oct F3P6 S1 LF: Ink cartridge
- 30-Oct F2SS1 S1 P/C: CDs, batteries
- 30-Oct F2P3 S2 LF: Transparencies
- 30-Oct F3P5 S1 LF: Polystyrene
- 31-Oct F1P3 S1 LF: Pizza party
- 31-Oct F2P6 S1 LF: Chewing tobacco
- 31-Oct F3P3 S1 LF: Transparencies
- 1-Nov ALL FLOOR 1 S1 LF: Food waste

Week 4 Notes
- 4-Nov F1P2 S2: No tag
- 4-Nov F2P3 S2 P/C: Scotch brite
- 4-Nov F2SS4 S2 LF: Fish tank toy
- 4-Nov F2P6 S2 LF: Needle
- 4-Nov F3P5 S1 LF: Metal tongs
- 4-Nov F3P8 S2 LF: Apple
- 5-Nov F2P9 S2 GPM: Chewing tobacco
- 5-Nov F3P4 S2 GPM: DVDs
- 6-Nov F2P2 S2 LF: Needle
- 6-Nov F2P3 S1 LF: Tupperware, loaf of bread
- 6-Nov F2P5 S1 LF: 1 pound of bubble wrap, transparencies, VHS tapes
- 7-Nov F1P2 S1 LF: Chewing tobacco
- 7-Nov F2P5 S1 LF: Chewing tobacco
- 7-Nov F2P9 S2 GPM: Chewing tobacco
- 7-Nov F2P10 S1 LF: Chewing tobacco
Scale Error

**Week 1: Oct 14**
Shift 2 A Total LF: 12.6
Shift 2 A Total GPM: 6.8
Shift 2 A Total P/C: 8.95

Shift 2 B Total LF: 13.1
Shift 2 B Total GPM: 7.55
Shift 2 B Total P/C: 9.95

**Week 2: Oct 21**
Shift 2 A Total LF: 32.7
Shift 2 A Total GPM: 18.1
Shift 2 A Total P/C: 18.3

Shift 2 B Total LF: 33.55
Shift 2 B Total GPM: 16.85
Shift 2 B Total P/C: 18.3

**Week 3: Oct 28**
Shift 2 A Total LF: 35.6
Shift 2 A Total GPM: 11.1
Shift 2 A Total P/C: 37.85

Shift 2 B Total LF: 37.6
Shift 2 B Total GPM: 11.35
Shift 2 B Total P/C: 37.85

**Week 4: Nov 4**
Shift 2 A Total LF: 31
Shift 2 A Total GPM: 7.5
Shift 2 A Total P/C: 7.5

Shift 2 B Total LF: 32.5
Shift 2 B Total GPM: 9
Shift 2 B Total P/C: 8.5
Scale Specifications Sheet
Software information link here

**Highlights**

All CPWplus scales utilize the same versatile indicator which features 4 weighing modes (lb, kg, oz, lb/oz), a crisp backlit display, color coded buttons with positive click feel, and simple, quick operation. The indicator can be mounted where you need it: on the scale, on a wall, or seated on a desk giving total flexibility for the best viewing position.

A bi-directional RS-232 interface allows connection to printers or computers. Using standard commands users can request gross, net and tare weights be sent automatically. The optional Adam data collection software collects scale data and can produce charts and statistics, or export raw data to Microsoft® Excel or Word for further analysis.

With the right power options the CPWplus lets you work where you need to. The basic CPWplus and CPWplus-P run on 6 x AA batteries. CPWplus-W, -M and -L offer rechargeable batteries with over 60 hours of use before needing to be recharged. To save battery life, the backlit display can be set to always on, off or automatically on for 10 seconds when a weight is placed on the platform.

**General Features**
- Battery and AC operation
- Crisp backlit LCD
- Removable stainless steel platforms
- RS-232 interface
- Display Hold function
- Dynamic weighing
- lb, kg, oz, lb/oz

**CPWplus-M**

**Features**
- 19.7” x 19.7” stainless steel platform
- Adjustable non-slip feet for leveling
- Rechargeable battery pack and AC adaptor both included

**CPWplus-L**

**Features**
- 35.4” x 23.6” stainless steel platform
- Adjustable non-slip feet for leveling
- Rechargeable battery pack and AC adaptor both included
- Wheels and handle
- Optional rubber non-slip mat

www.adamequipment.com
## Technical Specifications

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| Repeatability (S.D.) | 2g / 0.005lb | 5g / 0.01lb | 10g / 0.02lb | 20g / 0.05lb | 50g / 0.1lb | 50g / 0.1lb |
| Linearity (+/-) | 4g / 0.01lb | 10g / 0.02lb | 20g / 0.04lb | 40g / 0.1lb | 100g / 0.2lb | 100g / 0.2lb |

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| Power Option | 12 VAC, 150 mA power supply supplied | ■ | ■ | ■ | ■ | ■ |
|              | 6 x AA size batteries | ■ | ■ | ■ | ■ | ■ |

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<tr>
<th>Other Specifications</th>
<th>CPWplus</th>
<th>CPWplus - P</th>
<th>CPWplus - W</th>
<th>CPWplus - M</th>
<th>CPWplus - L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tare</td>
<td>Full range tare by subtraction</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Weighing Units</td>
<td>lb, kg, oz, lboz</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Applications</td>
<td>Weighing, Dynamic / Animal weighing, Display hold</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Stabilization Time</td>
<td>2 - 3 seconds</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Interface</td>
<td>Bi-directional RS-232</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Calibration</td>
<td>Automatic External - user selectable cal weight</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Display</td>
<td>1.0” / 25mm Backlit LCD digits</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Humidity</td>
<td>Up to 90%RH non-condensing</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>32°F - 104°F / 0°C to 40°C</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Indicator Dimensions (wxdxh)</td>
<td>8.7” x 3.7” x 1.7” / 220 x 95 x 43mm</td>
<td>■</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
</tbody>
</table>

### Accessories
- Item No. 7954 - Hard carry case (CPWplus basic model only)
- Item No. 8023 - Printer
- Item No. 9014 - RS-232 cable
- Item No. 9061 - AdamDU - Data collection program
- Item No. 9013 - Rubber non-slip mat for CPWplus - L
AdamDU (Data Utility) software lets you easily capture data from Adam Equipment balances and scales for immediate analysis or export to other applications. Keep tighter control of weighing operations and integrate weighing tasks into processes with this comprehensive data collection utility.

AdamDU offers several useful functions such as graphing, statistical analysis, and data export to XML, CSV, HTML and Text files, or directly to Windows® applications including Microsoft® Excel®, Microsoft® Word® or the Windows® Clipboard.

With support to accept and manage up to 8 balances or scales simultaneously, AdamDU is the best choice in data collection software for a range of applications.
Easy setup and intuitive operation make the feature-packed AdamDU an exceptional choice for collecting balance and scale data.

Practical Functionality – Smart Features
- Monitor and collect data readings for up to 8 balances or scales simultaneously.
- Record custom data or notations along with readings using up to 6 user-defined fields.
- Log calibration reports to file for maintaining complete calibration records.
- Collect date and time with readings.
- Collect balance serial number with readings for unique identification. (Feature may not be available with all balances and scales).
- Configure AdamDU to remember individual session settings and file names.

Statistics and Graphing
- View statistics including Min, Max, Median, Mean, Variance, and Standard Deviation.
- Graph readings in real time. Print results and graphs from within the AdamDU application.
- Quickly search for a specific reading, min, or max readings.

Easy Data Management
- Dynamically export readings in several file formats (text, CSV, HTML, XML) for importing to other systems or applications.
- Export captured readings automatically to Microsoft® Excel¹ or Microsoft® Word¹ for further analysis or reporting.
- Export captured readings to Windows® Clipboard for quick pasting in Windows® applications.

Quick Setup and Installation
Designed to connect with Adam balances, AdamDU setup is quick and easy:
1. Install the software on your PC
2. Connect the balance to the PC with an RS-232 cable. For USB-only PC’s an RS-232 to USB converter is required.
3. Start the AdamDU application, select the balance or scale model from the pull down menu, and start collecting data.

Adam Balances and Scales Supported
- ACBplus Compact Balances
- ADK Precision Balances
- AE 401 Indicator
- AE 202 Indicators
- A2Extra Price Computing Retail Scales
- BFW Platform Scales
- CBC Bench Counting Scales
- CBD Counting Scales
- CBK Bench Scales
- CBK M Approved Bench Scales
- CFC Floor counting Scales
- CFW Check Weighing Floor Scales
- CPWplus Weighing Scales
- GFK Weighing Scales
- GFK M Weighing Scales (EC Approved)
- GK Indicator
- GK-M Indicator (EC Approved)
- HCB Compact Balances
- PGL Precision Balances
- PGW Precision Balances
- PMB Moisture Analyser
- PW Analytical Balances

¹You need a licensed copy of Microsoft® Word and Microsoft® Excel to use this facility.

Microsoft Word, Microsoft Excel, Microsoft and Windows are registered trademark of Microsoft Corporation in the United States and other countries.

Full information and a trial download at: www.AdamDU.com

Adam Equipment follows a policy of continuous improvement and reserves the right to change specification and pricing without notice. Adam Equipment’s standard terms and conditions of sale apply. Errors and omissions excepted. ©Adam Equipment 2008-2010.