The Final Environmental Impact Statement (FEIS) For Training Range and Garrison Support Facilities Construction and Operation



Fort Stewart, Georgia

Volume II



Comprehensive Traffic Engineering Study

The intersection was analyzed under all-way stop conditions, which resulted in an intersection LOS F during the Midday peak hour with moderate delay. LOS for the AM and PM peak hours is B and does not indicate the need for signalization. However, the intersection should be monitored to determine any future signalization needs.

15th Street at 6th Street

Construction of the AU4 barracks and shops will result in increased traffic demand at the intersection. Analysis indicates that the addition of turn lanes at each of the approaches will not be sufficient to improve the poor LOS. All-way stop conditions analysis at the intersection resulted in an unacceptable LOS for each of the peak hours. Based on the future traffic projections, analysis indicates the need for signalization at this location.

Hero Road at McNeely Road

Based on the proposed widening of Frank Cochran Drive to a four-lane facility terminating at Hero Road and poor LOS at the intersection of Hero Road at McNeely Road, it's recommended that the westbound McNeely Road approach intersect Frank Cochran Drive at a plus intersection. The resulting intersection realignment will essentially combine the two intersection traffic volumes. Based on the future traffic projections, analysis indicates the need for signalization at this location.

Hero Road at Bundy Avenue

Analysis indicates the addition of left turn lanes on the Hero Road approaches to Bundy Avenue, and a right turn lane on westbound Bundy Avenue, will not eliminate the poor approach LOS on Bundy Avenue for the AM, Midday, and PM peak hours based on future conditions. Therefore, the intersection was analyzed under signalized conditions, which results in acceptable LOS for the intersection.

Assessment of Future Transportation Deficiencies

Future traffic conditions at Fort Stewart were evaluated to assess if the existing infrastructure of internal roadways, access control points, and parking facilities will meet the needs of planned development and future increases in military personnel. The purpose of this assessment is to identify areas where future concerns may occur including potential safety issues, roadway deficiencies, parking and traffic control. The assessment of future conditions, combined with our understanding of existing traffic operations, will aid us better to ensure the transportation infrastructure meets the future needs of the installation. The following paragraphs summarize the assessment of future traffic operating conditions of the installation's transportation infrastructure and identify future deficiencies.

Future Access Points Deficiencies

Hero Gate, Troupe Gate and Frank Cochran Gate will continue to experience heavy traffic volumes during peak periods throughout the day. Traffic entering and exiting the gates will continue to increase due to future increases in military personnel stationed at Fort Stewart. During the AM and Midday peak periods, inbound traffic will frequently experience long delays and queuing entering the installation due to the sheer volumes over a short period of time. The increase in military personnel (an estimated 3,000) stationed on the Fort and construction of additional RCI housing will increase the internal traffic volumes on Fort Stewart. A large portion of the new trips may be captured within the cantonment area during the AM and PM peak hours because of the proximity of the AU4 Barracks to the AU4 shops. The Midday peak is characterized by trips to eating establishments out of the cantonment area in Hinesville and as a result the gates adjacent to that area may experience increased traffic volumes. The reconstruction of the checkpoint facilities at Fort Stewart should increase the ability to efficiently process more traffic volume.

The construction of the new access control point on Diamond Head Avenue will help alleviate Harmon Avenue Gate operations. In addition, the Harmon Avenue roadway realignment improvements currently under construction will improve operations at the gate. The improved operation of the Harmon Avenue checkpoint should help offset any increase in future traffic volumes.

Internal Roadway Deficiencies

The results of the assessment of future traffic conditions have identified several locations within the installation that will experience future deficiencies. The following future roadway deficiencies have been identified.

Local traffic within the installation will continue to be heavy during the peak periods for areas of the installation with major destinations. The primary and secondary roadways within the installation will service the majority of the additional traffic generated by planned development and increases in personnel on the installation.

The internal roadways providing access to the PX, Commissary, Credit Union, and Troop and Family Care Medical Clinic will experience significant growth in traffic as future development occurs. Gulick Avenue, Hero Road, Hase Road and Harmon Avenue are the main roadways used to access these destinations, creating congestion during the AM, Midday, and PM peak periods. Military and civilian personnel and visitors (e.g. retired military, spouses) will continue to enter through Main Gate to use Fort Stewart's facilities.



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The construction of 680 residential units will increase traffic significantly on Austin Road, Hase Road, Ricker Avenue and Hero Road. Hero Road and Hase Road will experience the majority of the growth in traffic volumes. Hero Road will accommodate in excess of 16,000 vehicles per day, which is approaching the capacity of a two-lane roadway. Left turn lanes on Hero Road and Hase Road will need to be added at all major intersections along the corridor in order to achieve acceptable operating conditions. In addition, signalization of all major intersections along Hero Road will be necessary to improve the intersection operations.

Circulation Deficiencies

As the installation continues to develop the need for better east-west circulation will increase. The growth along 15th Street, in the area of the AU4 barracks and shops, will increase demand to access the support facilities between Hase Road and Hero Road. The widening of Frank Cochran Drive to a four-lane facility would be a good location to improve east-west connectivity by providing a connection east to McNeely Road and the new Soldier Service Center.

Existing Parking Deficiencies

Based on the parking inventory additional parking will be required on William Wilson Avenue and McFarland Avenue between 18th Street and Sigma Street, south of 6th Street. The existing parking facilities within close walking distance to the major destinations on William Wilson Avenue are insufficient to meet the future parking demand. The construction of the Troop and Family Care Medical Clinic, and the recommended additional parking facilities for the Winn Army Community Hospital, will alleviate the parking shortage at the facility.

Pedestrian Deficiencies

There are limited existing pedestrian facilities on Fort Stewart. Sidewalks are primarily present around the Headquarters and along 6th Street. Future planned developments should be evaluated for the need of additional pedestrian facilities, including sidewalks and crosswalks. Pedestrian sidewalks and crosswalks should be incorporated into the site plans for the new Troop and Family Care Medical and AU4 barracks and shops. Additional mid-block crossings should also be considered on 15th Street between the proposed barracks and shops.

Summary of Findings

The overall existing transportation network will accommodate the future growth as shown in Fort Stewart's Master Plan (Figure 3-1) with the exception of a few isolated areas. The majority of the existing roadway network and traffic control will continue to operate at an acceptable level of service based on future development plans and increases in personnel. This assessment of future conditions used future traffic projections and analyses to evaluate the existing transportation network, and identify areas requiring improvements to meet the future demands of the installation.

Future Deficiencies

The Assessment of Future Conditions identified deficiencies requiring improvements to mitigate future traffic congestion and possible safety concerns. Table 3-3 summarizes the locations and types of deficiencies identified.

Table 3-3
Future Transportation Deficiencies

Loc	cation	Type of Deficiency
1	McFarland Avenue at 15 th Street	Congestion and lane geometrics
2	15 th Street at 6 th Street	Congestion and lane geometrics
3	Hero Road at McNeely Road *	Congestion and lane geometrics
4	Hero Road at Bundy Avenue *	Congestion and traffic control
5	Hase Road at McNeely Road	Congestion and traffic control
6	15 th Street from William Wilson Avenue to Gulick Avenue	Circulation and access
7	6 th Street from 15 th Street to McFarland Avenue	Circulation and access
8	Hero Road from Gulick Avenue to 6 th Street	Circulation and access

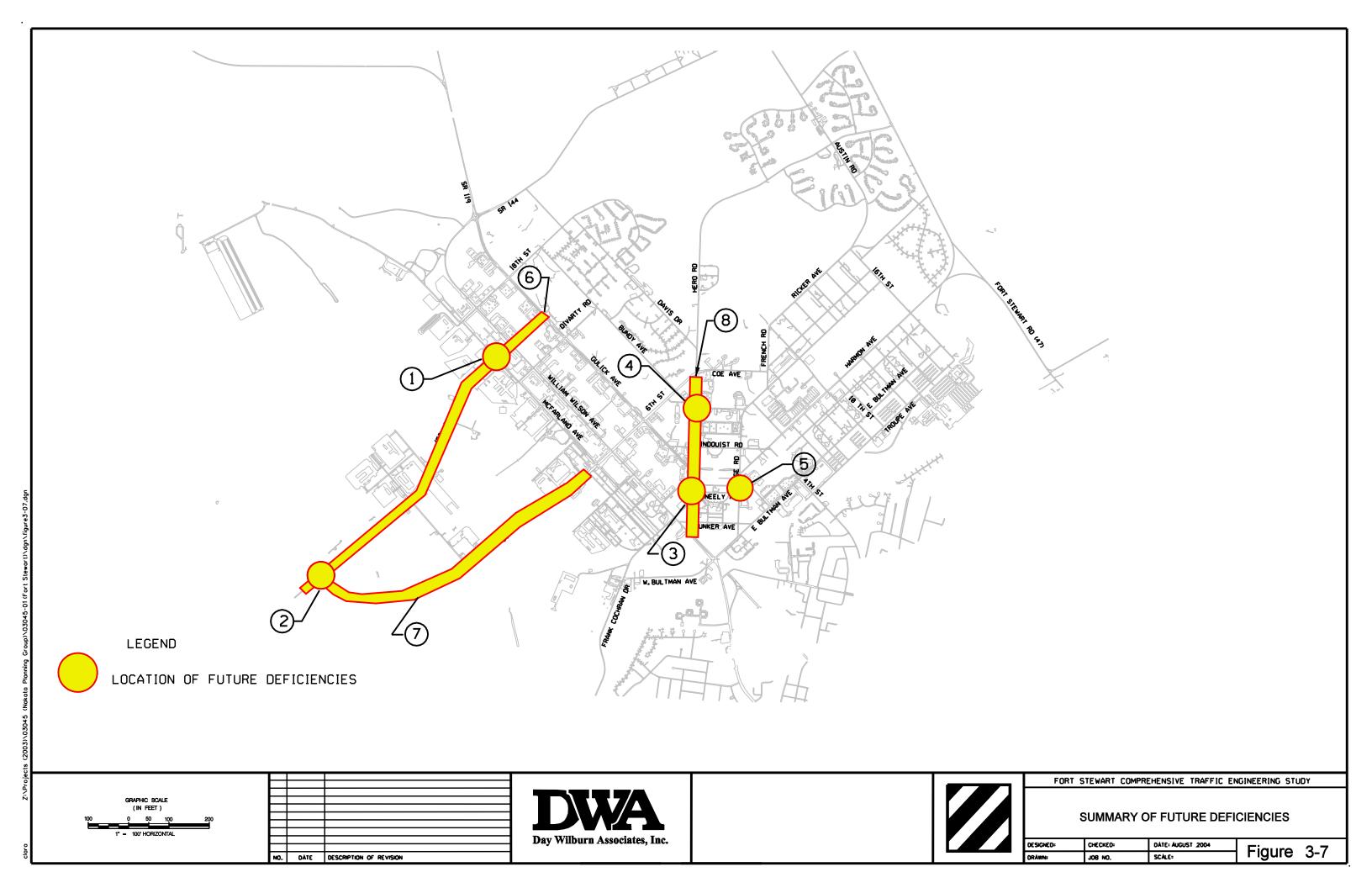
^{*} Location indicates an existing deficiency

Figure 3-7 summarizes the location of the future deficiencies identified in the Assessment of Future Conditions.

Conclusion

The Assessment of Future Conditions identified potential deficiencies with the existing transportation network. These locations will require modifications to minimize future traffic congestion, safety issues, and parking requirements in order to meet the future needs of the installation.







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SECTION 4 – IMPLEMENTATION OF RECOMMENDED IMPROVEMENTS

This section of the study summarizes recommended improvement projects for mitigating the deficiencies identified in the first two elements of the study; Assessment of Existing Conditions and Assessment of Future Conditions. This section discusses implementation of recommended transportation improvement projects relating to traffic control, pedestrian facilities, roadway improvements, parking, and signing and markings. Detailed conceptual drawings are presented for each of the recommendations.

Projects are prioritized into one of three categories short-range, mid-range or long-range projects for implementation according to need for the improvement. In addition, preliminary construction cost estimates have been prepared for each alternative and are summarized in this section.

RECOMMENDED IMPROVEMENT PROJECTS

Recommended improvement projects were developed based on the existing transportation deficiencies identified in Section 2 Assessment of Existing Conditions and the future needs determined in Section 3 Assessment of Future Conditions of this study. These deficiencies and future needs require modifications of the existing transportation system to improve traffic congestion, safety, circulation, access, and parking requirements in order to meet the needs of the installation.

The recommended improvement projects are divided into the following eight categories based on the type of improvement being recommended. Several projects may fall under more than one category. The recommended projects are categorizes as follows:

- Intersection Improvements
- Access and Circulation Improvements
- Parking Improvements
- Signing and Markings Improvements
- Traffic Control Improvements
- Roadway improvements
- Pedestrian Improvements

Estimated construction costs were developed for each of the recommended improvement projects. The cost estimates were based on estimated quantities of materials determined from the conceptual improvements. Actual itemized costs are based on the Georgia Department of Transportation's (GDOT) mean item summary for 2004 projects. Cost estimates assume a 15 percent engineering

and contingency to account for unforeseen construction items and inflation. Detailed cost estimates are included in Appendix E. The total cost also includes the engineering design cost.

Although a large number of transportation improvements have been recommended, it is not feasible or desirable to implement all of the projects at one time. A phasing plan was developed to provide decision makers with a starting point to use in prioritizing the recommended improvement projects for implementation based on need for the improvement and cost. The priority of the projects is based on the following criteria:

- Safety
- Operational deficiencies
- Does not meet current design standards
- Construction costs
- Future need
- Difficulty in construction

The recommended improvement projects were grouped into three implementation time periods based on level of priority, estimated cost and difficulty of implementation from a design and construction perspective. The three implementation periods are:

Short-Range (2005 - 2007): Improvements that are of high priority based on existing deficiencies related to safety and traffic congestion.

Mid-Range (2008 – 2010): Improvements that are not as high priority based on existing deficiencies and require longer term design and construction.

Long-Range (2011 +): Improvements that are not currently needed, but are anticipated with future conditions. Improvement projects intended to bring existing facilities up to current design standards. Projects with a high construction cost and or difficulty in construction.

Table 4-1 summarizes the recommended improvement projects and estimated construction costs according to priority of implementation. Figure 4-1 shows the location of each of the recommended improvement projects.



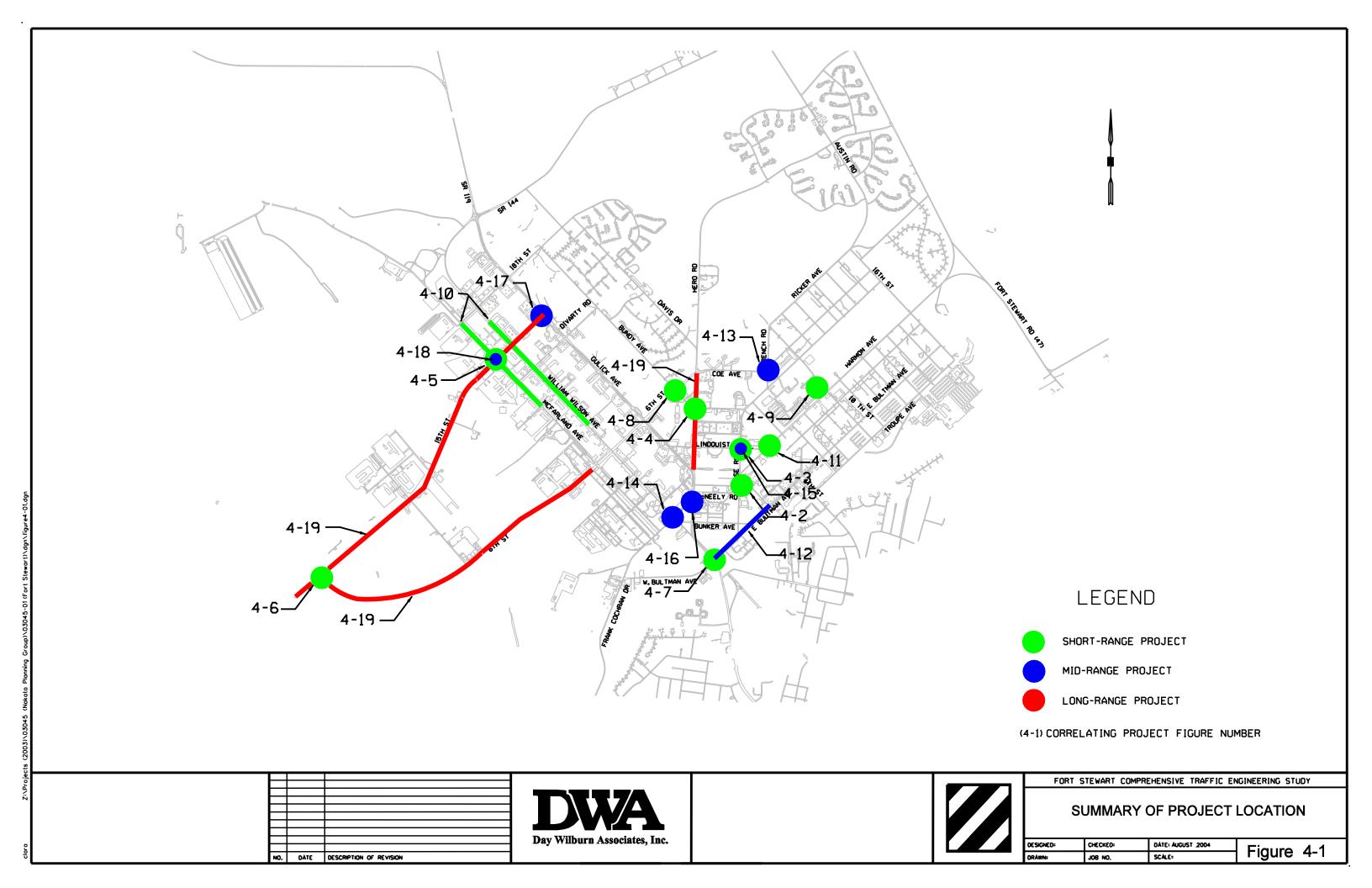
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Table 4-1 Summary of Recommended Improvements

Recon	nmended Improvement	Type of Improvement	Cost Estimate
Short	-Range Projects (2005 – 2007)	Improvement	Estillac
4-2	Hase Road at McNeely Road	Intersection	\$277,400
4-3	Hase Road at Lindquist Avenue	Intersection	\$218,400
4-4	Hero Road at Bundy Avenue	Intersection	\$78,700
4-5	15 th Street at McFarland Avenue	Intersection	\$35,400
4-6	15 th Street at 6 th Street	Intersection	\$124,000
4-7	Hero Road at Bultman Avenue	Traffic Control	\$8,200
4-8	6 th Street at Bundy Avenue	Traffic Control	\$87,300
4-9	Winn Army Community Hospital	Parking	\$529,500
4-10	William Wilson Avenue at McFarland Avenue	Parking	\$2,855,000
4-11	Harmon Avenue at Lindquist Avenue	Roadway	\$178,800
Mid-F	Range Projects (2008 – 2010)		
4-12	Bultman Avenue (Hero Road to Pony Soldier Avenue)	Intersection	\$130,160
4-13	Coe Avenue at French Road	Intersection	\$88,500
4-14	William Wilson Avenue at Frank Cochran Drive	Intersection	\$237,700
4-15	Hero Road at Bundy Avenue	Traffic Control	\$89,700
4-16	Hero Road at McNeely Road/Frank Cochran Drive	Roadway	\$1,117,000
4-17	15 th Street between McFarland Avenue and Gulick	Roadway	\$269,800
4-18	Avenue		
Long-	Range Projects (2011 +)		
4-19	6 th Street, 15 th Street, Hero Road	Roadway	\$3,068,000







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SHORT – RANGE PROJECTS (2005 – 2007)

Projects included in this phase of implementation were determined based level of existing need determined from the deficiencies identified in Section 2. Table 4-2 summarizes the recommended short-range improvement projects and associated construction costs.

Figure 4-2 Summary of Short-Range Projects

Recon	nmended Improvement	Type of Improvement	Cost Estimate
Short-	Range Projects (2005 – 2007)	-	
4-2	Hase Road at McNeely Road	Intersection	\$277,400
4-3	Hase Road at Lindquist Avenue	Intersection	\$218,400
4-4	Hero Road at Bundy Avenue	Intersection	\$78,700
4-5	15 th Street at McFarland Avenue	Intersection	\$35,400
4-6	15 th Street at 6 th Street	Intersection	\$124,000
4-7	Hero Road at Bultman Avenue	Traffic Control	\$8,200
4-8	6 th Street at Bundy Avenue	Traffic Control	\$87,300
4-9	Winn Army Community Hospital	Parking	\$529,500
4-10	William Wilson Avenue at McFarland Avenue	Parking	\$2,855,000
4-11	Harmon Avenue at Lindquist Avenue	Roadway	\$178,800

Intersection Improvements

Hase Road at Pony Soldier Avenue/Harmon Avenue (Total Cost is associated with two projects adjacent to this improvement)

The intersection of Hase Road at Pony Soldier Avenue/Harmon Avenue is a four lane intersection with the Pony Soldier Avenue and Harmon Avenue legs on the east side on the intersection. The intersection configuration is confusing and is a safety concern and with increase traffic volumes will operate poorly.

Both the Harmon Avenue and the Pony Soldier legs of the intersection should be closed to traffic. Traffic flow will be facilitated by improvements to the intersection of Hase Road at Lindquist Avenue and Hase Road at McNeely. Improvements and approach closures should be performed in conjunction with one another.

Hase Road at McNeely Road (Total Cost: \$277,400)

Figure 4-2 shows the conceptual improvements at the intersection. The intersection of Hase Road at McNeely Road will experience poor LOS on the minor street approaches (McNeely Road) throughout the peak periods of the day. The increased traffic volumes at the intersection are attributed to the new Soldier Service Center and the recommended closure of Pony Soldier Avenue at the intersection with Hase Road will further degrade the operation of the intersection.

In order to improve operations at the intersection the McNeely Road approaches should be realigned to the north to improve the alignment. Right turn lanes should be constructed on the McNealy Road approaches and left turn lanes on Hase Road. The intersection should also be signalized to improve the operation of the intersection.

The recommended improvements may have moderate impacts to existing water utilities. Environmental impacts should be minimal.

Hase Road at Lindquist Avenue (Total Cost: \$218,400)

Figure 4-3 shows the conceptual improvements at the intersection. The future traffic volumes generated by the new Troop and Family Care Medical Clinic, the proposed realignment of Harmon Avenue to Lindquist Avenue, and the new RCI housing causes the intersection to operate poorly based on stop sign control.

In order to improve operations at the intersection all approaches to the intersection should be constructed with left turn lanes. Additionally a traffic signal should be installed at the intersection.

The recommended improvements may have high impacts to existing water and sewer utilities. Environmental impacts should be minimal.

Hero Road at Bundy Avenue (Total Cost: \$78,700)

Figure 4-4 shows the conceptual improvements at the intersection. The intersection experiences moderate congestion as a result of the inability of the left turning vehicles to pull out of traffic flow on Hase Road. Left turn lane should be constructed on Hero Road to improve the operation along Hero Road. Two way eastbound traffic flow on the channelized lanes should be limited to the eastbound right turning movement. The additional lane width should be stripped out.

The recommended improvements may have moderate impacts to existing sewer utilities as well as the overhead and underground power lines. Environmental impacts should be minimal.





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McFarland Avenue at 15th Street (Total Cost: \$35,400)

Figure 4-5 shows the conceptual improvements at the intersection. 15th Street at McFarland Avenue will experience poor LOS during the Midday peak hour for the eastbound 15th Street and northbound McFarland approach. The additional traffic generated by the new AU4 TAC shops and barracks will increase the traffic volumes along 15th Street, degrading the operating conditions at the intersection.

In order to improve operations at the intersection right turn lanes should be constructed on the southbound McFarland Avenue and eastbound 15th Street approaches. A left turn lane should be constructed to the northbound McFarland Avenue approach. Due to the heavy traffic volumes the intersection should be placed under all-way stop control to improve its operation. Future traffic volumes do not currently meet the warrants for a traffic signal but the intersection should be monitored to evaluate the impacts of the additional troupe build up.

The recommended improvements may have moderate impacts to existing sewer utilities and overhead power lines. Environmental impacts should be minimal.

6th Street at 15th Street (Total Cost: \$124,000)

Figure 4-6 shows the conceptual improvements at the intersection. 6th Street at 15th Street will experience poor LOS during the all peak hours of the day the additional traffic generated by the new AU4 TAC shops and barracks will increase the traffic volumes along 15th Street, degrading the operating conditions at the intersection.

In order to improve operations at the intersection right turn lanes should be constructed on the northbound 6th Street and eastbound 15th Street approaches. A left turn lane should be constructed to the westbound 15th Street approach. Due to the heavy traffic volumes the intersection did not operate adequately under all-way stop control and a traffic signal should be installed at this location.

The recommended improvements may have moderate impacts to existing overhead power lines. Environmental impacts should be minimal.

Traffic Control Improvements

Hero Road at Bultman Avenue (Total Cost: \$8,200)

Figure 4-7 shows the conceptual improvements at the intersection. There are protected only phases for the left turn movements that extend the overall cycle length of the signal timing.

Vehicles arriving at the intersection after the protected only phase have to wait a long time until they receive green time to get through the intersection. The delay causes long queues to build and spill back through the left turn phase. There is adequate sight distance to permit the left turn movement to continue through the approach signal phase.

The traffic signal timing should be adjusted to allow for protected/permitted left turns. Additionally, the northbound Hero Road signal heads are out of alignment and should be adjusted to provide better visibility.

6th Street at Bundy Avenue (Total Cost: \$87,300)

Figure 4-8 shows the conceptual improvements at the intersection. The intersection of 6^{th} Street at Bundy Avenue will experience poor LOS attributed to the heavy volumes on 6^{th} Street. Signal warrant analysis was performed which indicates the need for signalization at this location. A two phase traffic signal with no alteration to the existing lane geometry should be installed at this location.

The recommended improvements may have moderate impacts to utilities. Environmental impacts should be minimal.

Parking Improvements

Winn Army Community Hospital (Total Cost: \$529,500)

Figure 4-9 shows the conceptual parking improvements at Winn Army Community Hospital. Due to the troop build up on the fort the parking capacity has been exceeded. Vehicles are now parking on the internal parking lot roadways causing congestion. In order to provide additional parking, two new surface lots should be constructed along the driveway to the hospital. This will provide an additional 225 spaces.

The recommended improvements may have moderate impacts to existing utilities. In addition, the project may have minimal environmental impacts.

William Wilson Avenue and McFarland Avenue (Total Cost: \$2,855,000)

Figure 4-10 shows the conceptual parking improvements on William Wilson Avenue and McFarland Avenue. Due to a lack of parking capacity additional surface parking lots and off-street parking should be constructed. Two additional surface lots should be constructed on William Wilson Avenue shown in figure 4-9. There is sufficient distance between the travel lanes and the motor pools in many locations along McFarland Avenue to construct off-street angle parking. Drainage will need to be closed at these locations to provide adequate space. The additional parking will provide an additional 300 spaces along William Wilson Avenue and 945





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spaces along McFarland Avenue. A typical cross section of the off-street angle parking in provided on figure 4-9. Enforcement of parking violations should be performed after additional parking spaces have been provided to allow clear zones on the sides of the roadways to be maintained.

The recommended improvements may have major impacts to existing utilities, including sewer line, water and overhead power lines. In addition, the project may have moderate environmental impacts involving contamination from underground storage tanks.

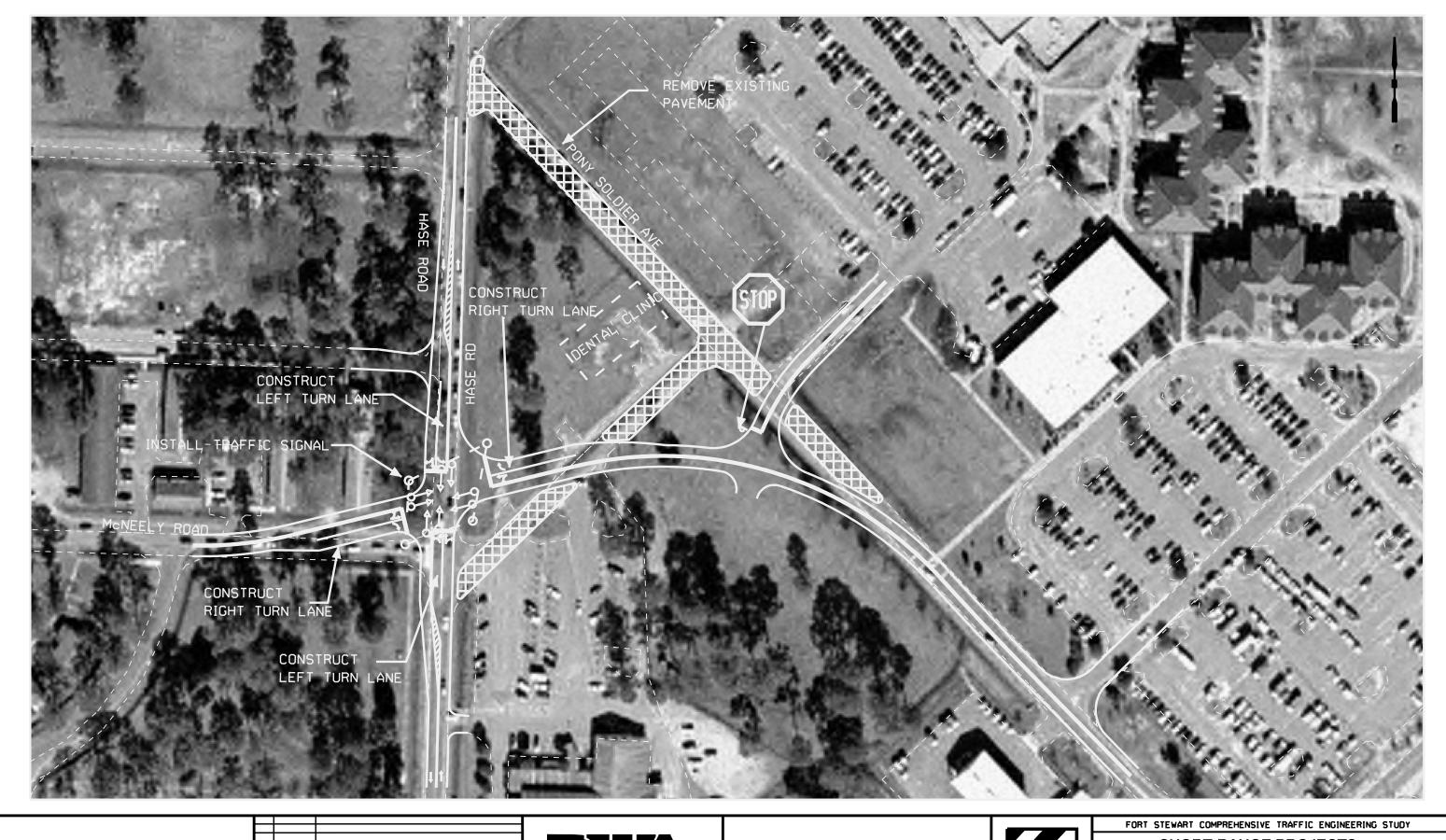
Roadway Improvements

Harmon Avenue at Lindquist Avenue (Total Cost: \$178,800)

Figure 4-11 shows the conceptual roadway improvements for Harmon Avenue in the vicinity of Lindquist Avenue. With the recommended closure of the intersection of Harmon Ave and Hase Road, the alignment of Harmon Avenue should be shifted slightly to the north to better align with to the intersection of Hase Avenue and Lindquist Avenue. The northern West Harmon Avenue leg should intersect Harmon Avenue at a 90-degree angle under stop control.

The recommended improvements may have impacts to existing utilities, including water, telephone, and overhead power. Environmental impacts should be minimal.





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SHORT-RANGE PROJECTS
INTERSECTION IMPROVEMENTS
HASE ROAD AT MCNEELY ROAD

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GRAPHIC SCALE
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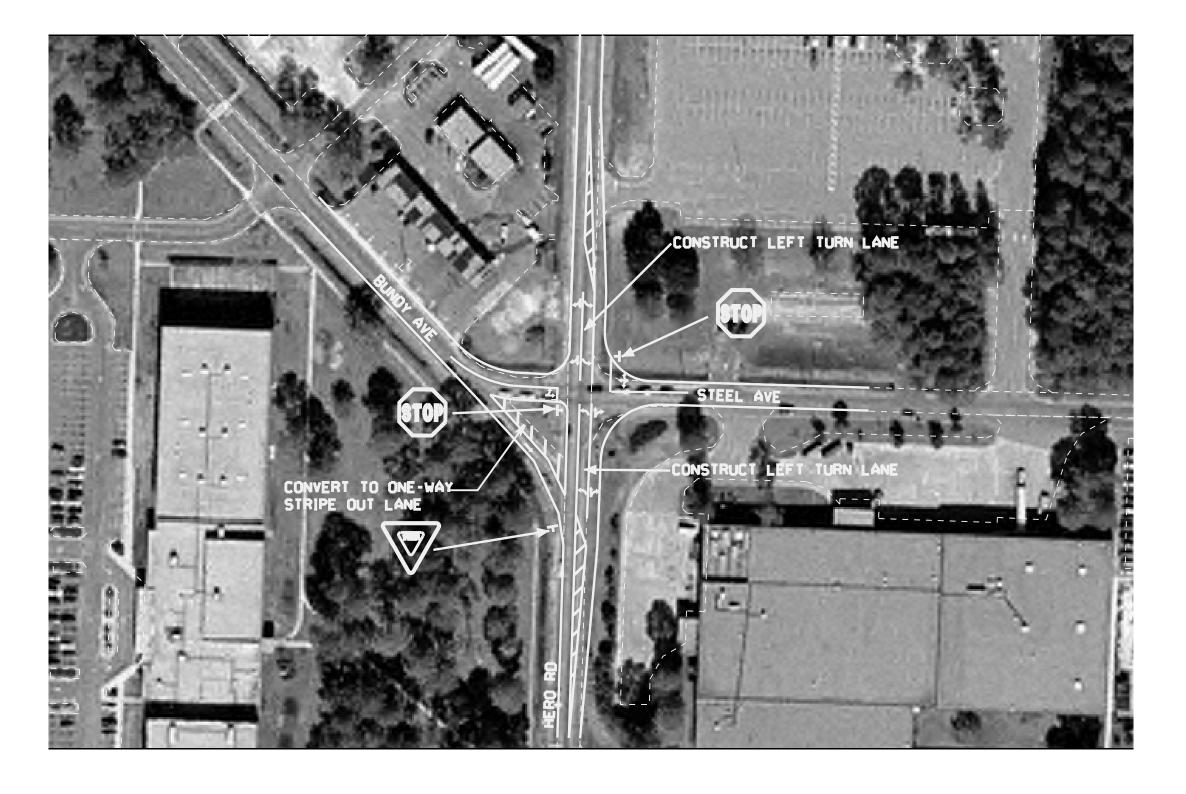


FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

SHORT-RANGE PROJECTS

INTERSECTION IMPROVEMENTS HASE ROAD AT LINDQUIST ROAD

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FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

SHORT-RANGE PROJECTS

INTERSECTION IMPROVEMENTS
HERO ROAD AT BUNDY AVENUE/STEEL AVENUE

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FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

SHORT-RANGE PROJECTS
ROADWAY IMPROVEMENTS
15TH STREET AT MCFARLAND AVENUE

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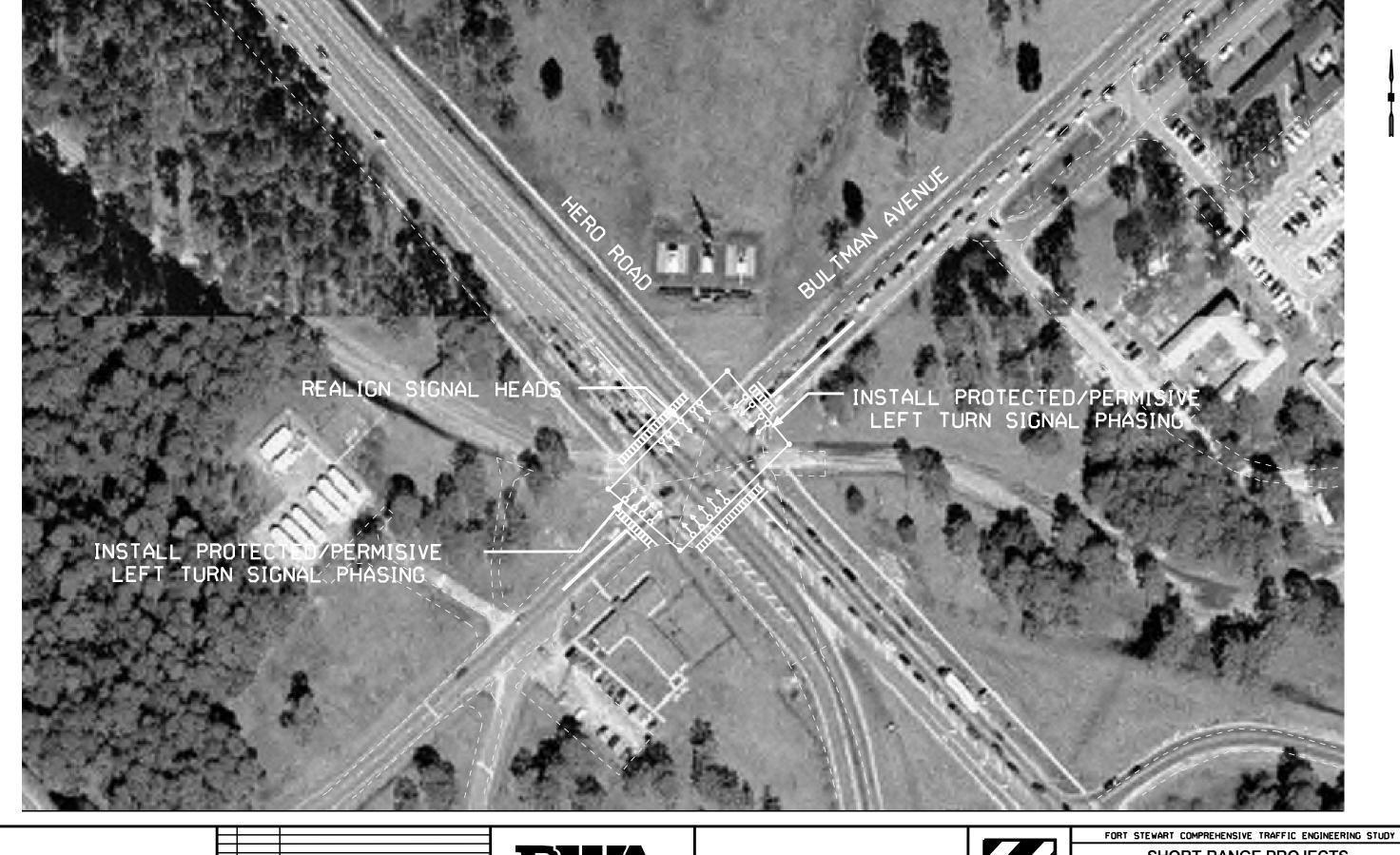


FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

SHORT-RANGE PROJECTS

INTERSECTION IMPROVEMENTS
15TH STREET AT 6TH STREET

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SHORT-RANGE PROJECTS

TRAFFIC CONTROL IMPROVEMENTS HERO ROAD AT BULTMAN AVENUE

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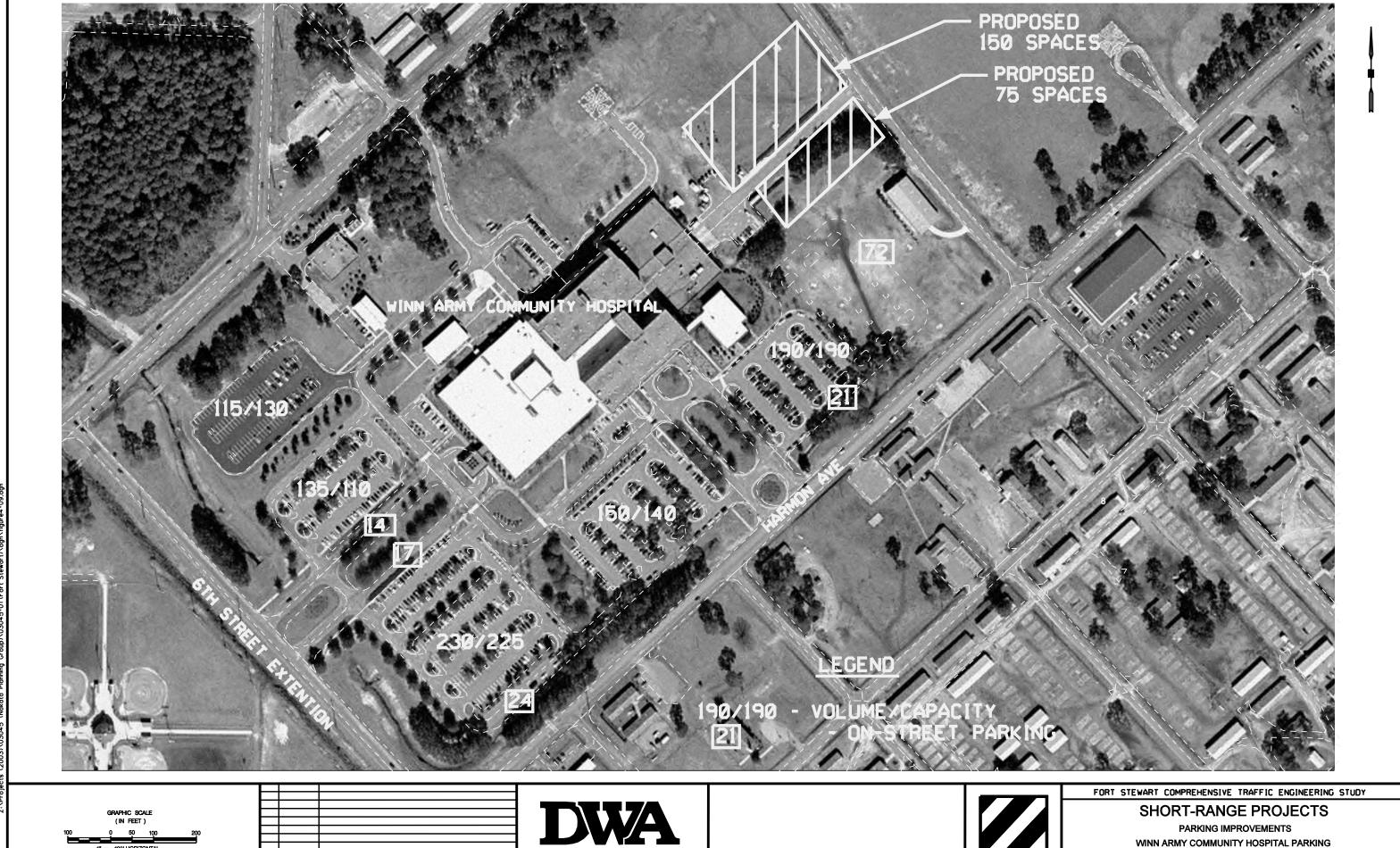


FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

SHORT RANGE PROJECTS

TRAFFIC CONTROL IMPROVEMENTS 6TH STREET AT BUNDY AVENUE

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SCALE

Figure 4-9

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OFF-STREET PARKING



PROPOSED SURFACE PARKING LOT

TYPICAL OFF-STREET ANGLE PARKING SECTION SIDEWALK TRAVEL LANE

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SHORT RANGE PROJECTS

PARKING IMPROVEMENTS

WILLIAM WILSON AVENUE AND McFARLAND AVENUE PARKING

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FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

SHORT-RANGE PROJECTS

ROADWAY IMPROVEMENTS HARMON AVENUE AT LINDQUIST AVENUE

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Comprehensive Traffic Engineering Study

MID – RANGE PROJECTS (2005 – 2007)

Projects included in this phase of implementation were determined based on level of existing need determined from the deficiencies identified in Section 2 and future needs identified in Section 3. Table 4-3 summarizes the recommended mid-range projects and associated construction costs.

Table 4-3 Summary of Mid-Range Projects

Recommended Improvement		Type of Improvement	Cost Estimate
Mid-H	Range Projects (2008 – 2010)		
4-12	Bultman Avenue (Hero Road to Pony Soldier Avenue)	Intersection	\$130,160
4-13	Coe Avenue at French Road	Intersection	\$88,500
4-14	William Wilson Avenue at Frank Cochran Drive	Intersection	\$237,700
4-15	Hero Road at Bundy Avenue	Traffic Control	\$89,700
4-16	Hero Road at McNeely Road/Frank Cochran Drive	Roadway	\$1,117,000
4-17	15 th Street between McFarland Avenue and Gulick	Roadway	\$269,800
4-18	Avenue		

Intersection Improvements

Bultman Avenue at Hero Road, Hase Avenue, and Pony Soldier Avenue (Total Cost: \$130,160)

Figure 4-12 shows the conceptual improvements at the intersection. An increase in traffic volumes at the intersection of Bultman Avenue at Hase Road and Bultman and Avenue Pony Soldier Avenue can be attributed to the new Soldier Service Center. A left turn lane should be added to the eastbound Bultman Avenue approach at Hase Road to allow left turning traffic to pull out of the traffic flow on Bultman Avenue. Additionally, the left turn storage should be lengthened for the eastbound Bultman Avenue approach at Pony Soldier Avenue (total 250-feet) and westbound Bultman Avenue approach at Hero Road (total 300-feet).

The recommended improvements may have minimal impacts to existing utilities. Environmental impacts should be minimal.

Environmental impacts could be high depending on the location of the underground storage tank.

Coe Avenue at French Road (Total Cost: \$88,500)

Figure 4-13 shows the conceptual improvements at the intersection. French Road intersects with three other roadways within approximately 250-feet; Coe Avenue, E. 7th Street, and Murray Ave.

Although the relatively light traffic volumes at the intersections do not cause significant operational difficulties during the peak hours realignment of the intersections should be considered. The realignment of the intersections will improve their operation and provide additional connectivity to the Winn Army Community Hospital from 6th Street. Murray Avenue should be realigned to intersect French Road at a 90-degree angle to the north. East 7th Street should be realigned to the south to intersect French Road at a 90-degree angle and form a plus intersection with Coe Avenue. All approaches to French Road will be under stop control.

The recommended improvements may have minimal impacts to existing utilities. Environmental impacts could be high depending on the location of the underground storage tank.

William Wilson Avenue at Frank Cochran Drive (Total Cost: \$237,700)

Figure 4-14 shows the conceptual improvements at the intersection. The planned widening of Franck Cochran Drive to a four lane facility is planned to end at the intersection of William Wilson Avenue at Frank Cochran Drive. Although the intersection currently operates at an acceptable LOS during the peak hours left turn lanes should be constructed to improve traffic flow along William Wilson Avenue. Additionally, a right turn lane should be constructed at the westbound Frank Cochran Drive approach.

The recommended improvements may have moderate impacts to existing gas and sewer utilities. Environmental impacts should be minimal

Traffic Control Improvements

Hero Road at Bundy Avenue (Total Cost: \$89,700)

Figure 4-15 shows the conceptual improvements at the intersection. The intersection of Hero Road at Bundy Avenue will operate at a poor LOS during the AM, Midday and PM peak periods. The Bundy Avenue approaches experience long delays due to the heavy amount of future traffic projected on Hero Road. Signalization of the intersection will improve its operation to acceptable levels.

The recommended improvements may have moderate impacts to existing sewer utilities as well as the overhead and underground power lines. Environmental impacts should be minimal.

Roadway Improvements

Hero Road at McNeely Road/Frank Cochran Drive (Total Cost: \$1,117,000)

Figure 4-16 shows the conceptual improvements at the intersection. As previously discussed, Franck Cochran Drive is planned to be widened to a four lane facility extending to the intersection





of William Wilson Avenue at Frank Cochran Drive. The 2-lane section of Frank Cochran Drive terminates at Hero Road, just to the north, with a closed median. Additionally, the intersection of Hero Road and McNeely Avenue experiences unacceptable LOS during all peak of the day. McNeely is very close to the signalized intersection of Hero Road and Gulick Avenue and as a result is a poor candidate for signalization. To facilitate better east-west connection and to improve the operation at Hero Road and McNeely the construction of the of 4-lane Frank Cochran Drive should extend to Hero Road. The McNeely Road westbound approach to Hero Road should be shifted to the south to form a plus intersection with Frank Cochran Drive. The new intersection location would allow adequate distance from the adjacent signalized intersections to provide a signal. The realignment would also allow for the closure of Bunker Road between Hero Road and

The closure of the western Bunker Road approach would allow the signal at the intersection of Bunker Road and Hero Road to be removed, provided that the Bunker Road eastern approach is converted to a right-out approach to Hero Road. The closure of the western Bunker Road approach would reduce the amount of traffic volumes in the proximity of the Command Center using Bunker Road as a cut-through.

The recommended improvements may have moderate impacts to existing sewer utilities as well as the overhead and underground power lines. Environmental impacts should be minimal.

15th Street between McFarland and Gulick Avenue (Total Cost: \$269,800)

Frank Cochran Drive, alleviating the confusion in the area.

Figure 4-17 and 4-18 shows the conceptual improvements at the intersections and the roadway on 15th Street between McFarland and Gulick Avenue. The additional traffic generated by the new AU4 TAC shops and barracks will increase the traffic volumes along 15th Street. Additional traffic demands to future development west of the 15th Street Gate, outside the cantonment area, will add additional traffic on 15th Street. 15th Street should be extended from McFarland and Gulick Avenue to improve the east-west connection to access Gulick Avenue. The extension of 15th Street should be a 4-lane section to provide for any future widening of 15th Street west of McFarland Avenue.

In order to improve operations at the intersection of 15th Street and McFarland Avenue, right turn lanes should be constructed on the southbound McFarland Avenue and eastbound 15th Street approaches. A left turn lane should be constructed to the northbound McFarland Avenue approach. Due to the heavy traffic volumes the intersection should be placed under all-way stop control to improve its operation. Future traffic volumes do not meet the warrants for the installation of a traffic signal but the intersection should be monitored to evaluate the impacts of any additional troop build up.

Comprehensive Traffic Engineering Study

The 15th Street intersection with and Gulick Avenue and William Wilson Avenue should operate adequately with 15th Street under stop control. As shown in figure 4-16 and 4-17, channelized right turn lanes should be provide at each location.

The recommended improvements may have high impacts to existing water utilities and overhead power lines. Environmental impacts should be minimal.



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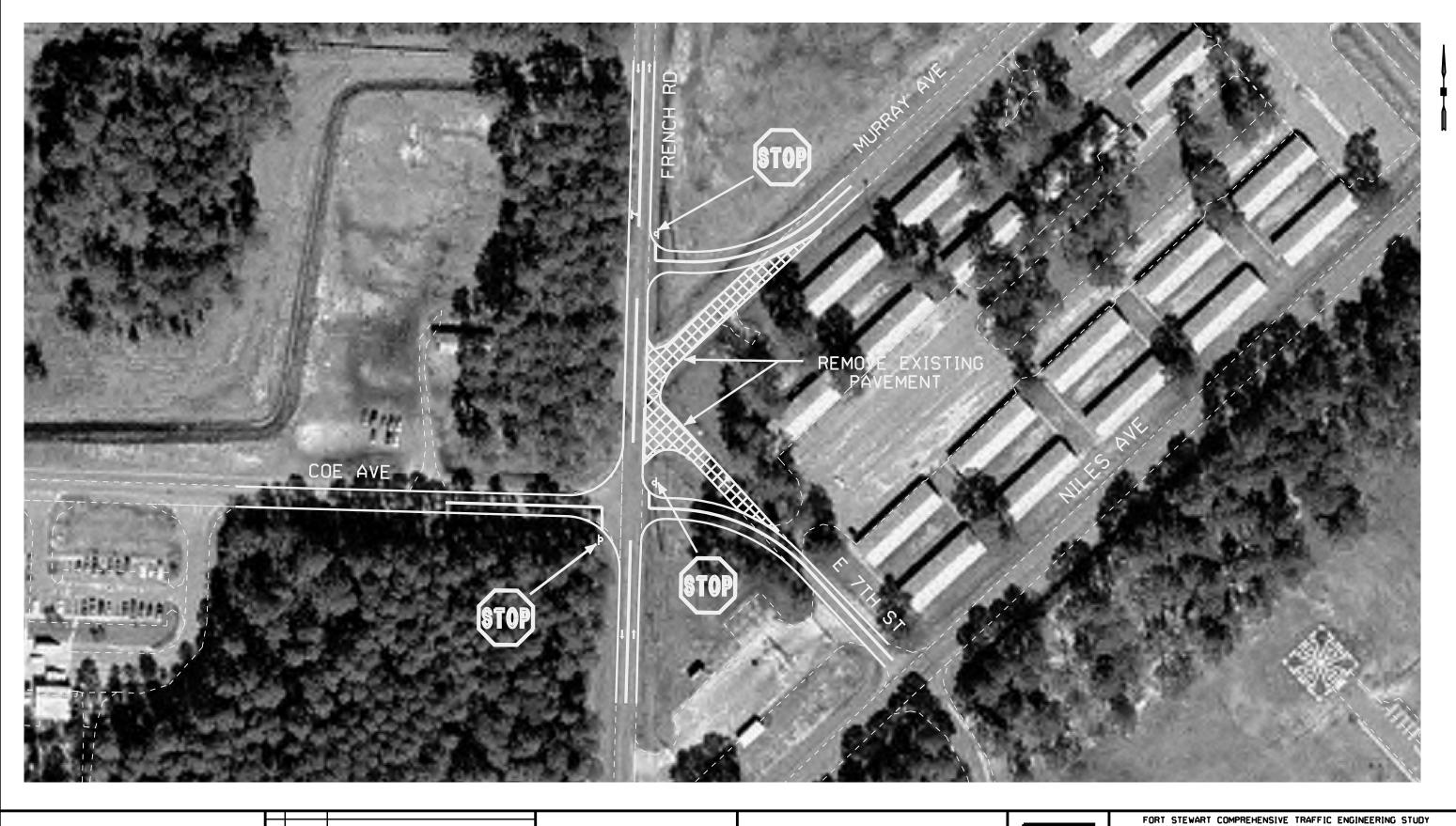


MID-RANGE PROJECTS

INTERSECTION IMPROVMENTS

E. BULTMAN AVENUE (BETWEEN HERO AVENUE AND PONY SOLDIER AVENUE)

DESIGNED:	CHECKED:	DATE: AUGUST 2004	Eiguro 4 12
DRÁWN#	JOB NO.	SCALE:	Figure 4-12



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MID-RANGE PROJECTS

INTERSECTION IMPROVEMENTS

COE AVENUE AT MURRAY AVENUE / 7TH STREET

DESIGNED:	CHECKED:	DATE: AUGUST 2004	Figure 4-13	
DRÁWN#	JOB NO.	SCALE:	Figure 4-13	

GRAPHIC SCALE
(IN FEET)
50 0 25 50 100
1" = 50'HORIZONTAL

NO. DATE DESCRIPTION OF REVISION

Day Wilburn Associates, Inc.



FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

MID-RANGE PROJECTS

INTERSECTION IMPROVEMENTS

WILLIAM WILSON AVENUE AT FRANK COCHRAN DRIVE

DESIGNED:	CHECKED:	DATE: AUGUST 2004	Figure 4-14
DRÁWN#	JOB NO.	SCALE:	rigure 4-14



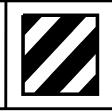
GRAPHIC SCALE
(IN FEET)

50 0 25 50 100

1" = 50' HORIZONTAL

Day Wilburn Associates, Inc.

NO. DATE DESCRIPTION OF REVISION



FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

MID-RANGE PROJECTS

TRAFFIC CONTROL IMPROVEMENTS
HERO ROAD AT BUNDY AVENUE/STEEL AVENUE

ESIGNED:	CHECKED:	DATE: AUGUST 2004	Eiguro 4 15
RÁWN#	JOB NO.	SCALE:	Figure 4-15

GRAPHIC SCALE
(IN FEET)

100 0 50 100 20

1" = 100' HORIZONTAL

NO. DATE DESCRIPTION OF REVISION

Day Wilburn Associates, Inc.



FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

MID-RANGE PROJECTS

ROADWAY IMPROVEMENTS McNEELY ROAD AT HERO ROAD

SIGNED	CHECKED:	DATE: AUGUST 2004	Figure 4-16
Awn:	JOB NO.	SCALE:	Figure 4-16



GRAPHIC SCALE (IN FEET) 75 0 75 160 1" = 75'HORIZONTAL

NO. DATE DESCRIPTION OF REVISION

Day Wilburn Associates, Inc.

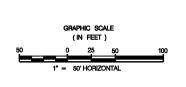


FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

MID-RANGE PROJECTS

ROADWAY IMPROVEMENTS 15TH STREET AT GULICK AVENUE

ESIGNED:	CHECKED:	DATE: AUGUST 2004	Figure 4-17
RÁWN#	JOB NO.	SCALE:	rigure 4-17



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FORT STEWART COMPREHENSIVE TRAFFIC ENGINEERING STUDY

MID-RANGE PROJECTS

ROADWAY IMPROVEMENTS

15TH STREET (McFARLAND AVENUE TO GULICK AVENUE)

DESIGNED	CHECKED:	DATE: AUGUST 2004	Figure 4-18	
DRÁWN#	JOB NO.	SCALE:		



Comprehensive Traffic Engineering Study

LONG - RANGE PROJECTS (2011 +)

Long-range projects are improvements that are not currently required due to safety issues or traffic congestion, but are anticipated based on future development plans, operations and shift in military personnel. These improvement projects are intended to bring existing facilities up to current design standards and improve circulation and access within the installation. The majority of these projects have a high construction cost and/or difficulty in construction. Table 4-4 summarizes the long-range projects and associated construction costs.

Table 4-4
Summary of Long-Range Projects

Recommended Improvement		Type of Improvement	Cost Estimate
Long	-Range Projects (2011 +)		
	6 th Street	Roadway	
4-19	15 th Street	Roadway	\$3,068,000
	Hero Road	Roadway	

Access and Circulation Improvements

6th Street, 15th Street, Hero Road (Total Cost: \$3,068,000)

Figure 4-19 shows the conceptual improvements to the roadways. Cost estimation includes the additional pavement to widening the roadway, signing and marking, and grading. The relocation of utilities, closing drainage, and construction of curb and gutter were not included in the cost.

As the installation continues to expand, the need for better circulation between the major activity areas within the installation will become more critical. The UA4 TAC shops, barracks, and future development outside of the cantonment area adjacent to 15th Street will increase the need to improve the capacity along 15th Street and 6th Street. Widening 15th Street from the 15th Street Gate (ACP 7) to Gulick Avenue to a 4-lane facility would improve the circulation around the northwest quadrant of the cantonment area, by connecting internal arterial roadways. The improved circulation would alleviate some of the pressure along McFarland Avenue and William Wilson Avenue. Improvements to the 15th Street Gate would need to be implemented to accommodate the increased lane width. Additionally, 6th Street should be widened to a 4-lane facility between 15th Street and McFarland Avenue. 6th Street is currently a 4-lane facility with major signalized intersections from McFarland Avenue to Hero Road providing a major east-west

connection through the fort. Widening the entirety of 6^{th} Street would improve the circulation along this east-west corridor.

Hero Road provides access to many of the major shopping, medical, and recreational destinations on the fort. The roadway connects to the 4-lane terminus of 6^{th} Street the north and 4-lane Gulick Avenue to the south. Future traffic volumes are approaching the limits a 2-lane roadway has the capacity to operate at acceptable levels. The widening of Hero Road to 4-lanes should be added to the long range improvements for the fort. The widening to 4-lanes would enable the roadway to operate with a greater volume of vehicles while providing a 4-lane connection between 6^{th} Street and Gulick Avenue.

The recommended improvements may impact existing overhead power lines, water and sewer lines, and underground phone lines. The realignment may have environmental impacts to existing wetlands and flood plain.

GENERAL IMPROVEMENT RECOMMENDATIONS

Roadway Improvements

Based on an inventory of the existing roadway network and the buildup of troops on the fort, several secondary roadways within the installation should be upgraded and widened to 4-lanes to provide additional access, primarily in the east-west orientation, between major destinations. The following locations should be widened under the long range projects:

- 6th Street
- 15th Street
- Hero Road

Signing and Markings

A sign inventory was conducted at each of the access control points to the installation. The existing signage at the access control points includes a combination of regulatory, informational and warning signs. The number and size of the signs at the access control point were confusing and often un-readable due to the amount of information and size of the text on the signs. Signing at the entry approaches to the access control points should be limited to regulatory and informational signs necessary for entry into the installation. Signs conveying U.S codes and post regulations not related to entry into the installation should be conveyed through other methods or once inside the installation.





Comprehensive Traffic Engineering Study

Pedestrian Facilities

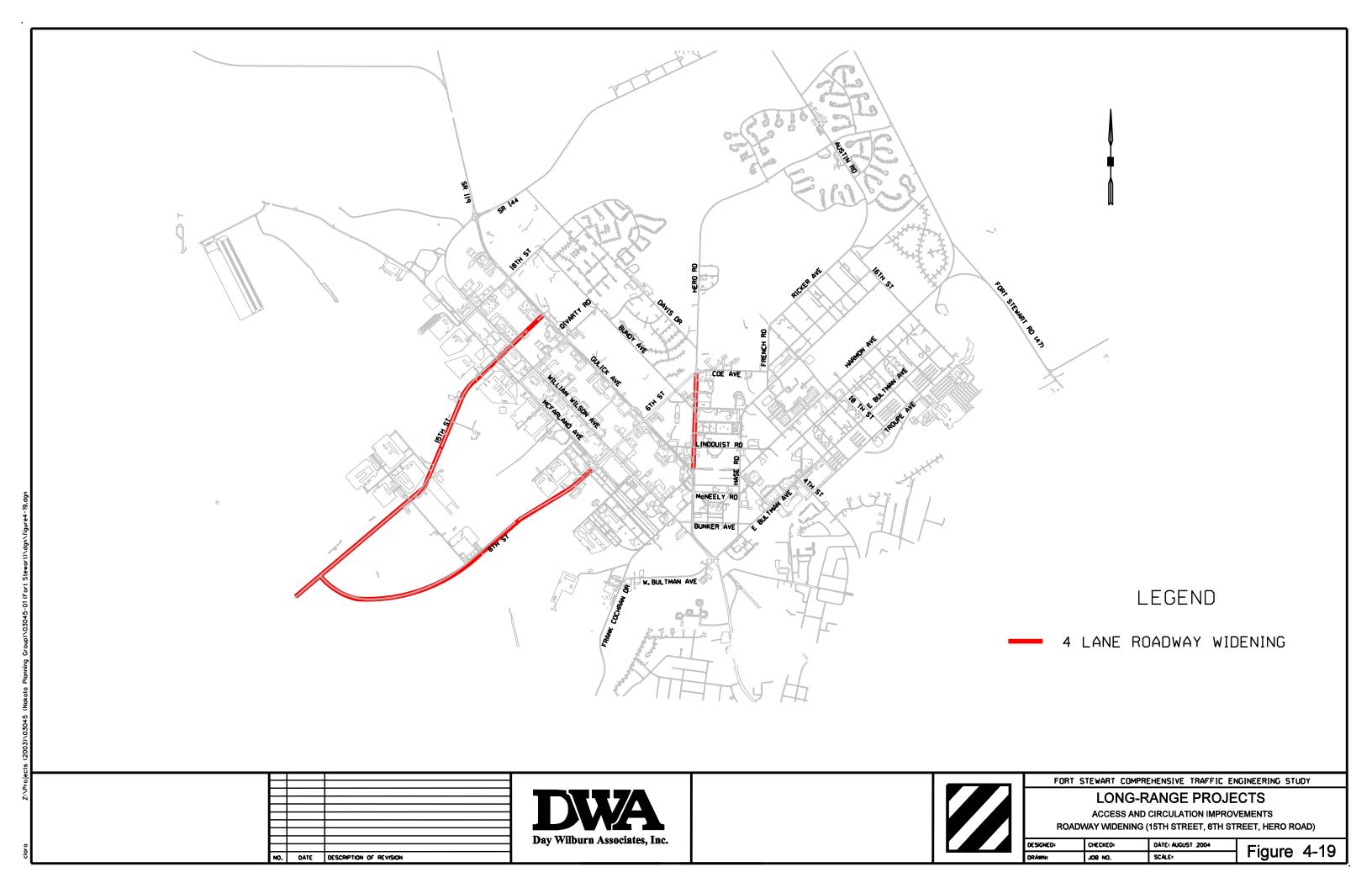
The majority of the existing roadway facilities do not have adequate sidewalks and crosswalks. As new development occurs on the installation new pedestrian facilities should be constructed to provide better connectivity between adjacent land uses.

Pedestrian facilities along William Wilson Avenue and McFarland Avenue are not up to current MUTCD standards and should be updated. Pedestrian cross walks should be perpendicular to the roadway and connect to some other pedestrian facility, crosswalk of sidewalk.

There is an overabundance of pedestrian crosswalk signs along the two corridors which causes clutter. As a result of the number of signs the location of the pedestrian crossing becomes blurred to the driver and essentially provides no benefit. Advanced crosswalk warning signs should be limited in such an area where midblock crossings are so frequent.

Sidewalk should also be constructed within the cantonment area along corridors that experience significant pedestrian activity. Particular attention should be given to William Wilson Avenue, McFarland Avenue, Gulick Avenue and Hase Road because of the high pedestrian activity along the major traffic volume corridors.







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www.daywilburn.com

Transportation Improvement Program

For the Hinesville Area Metropolitan Planning Organization

Fiscal Years 2010-2013



Prepared by the Hinesville Area Metropolitan Planning Organization in cooperation with the Federal Highway Administration, Federal Transit Administration, and the Georgia Department of Transportation.

- Section 324 of title 23 U.S.C. regarding the prohibition of discrimination IX. based on gender
 - o The MPO adheres to the Act on Equality between women and men and prohibits both direct and indirect discrimination based on gender.
 - The MPO adheres to the Equal Pay Act of 1963 (EPA), which protects men and women who perform substantially equal work in the same establishment from sexbased wage discrimination;
- X. Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794) and 49 CFR part 27 regarding discrimination against individuals with disabilities.
 - o The MPO adheres to Title I and Title V of the Americans with Disabilities Act of

1990 (ADA), which prohibits employment discrimination agains individuals with disabilities in the private sector, and in state and	
ABSU T	4/28/2015
Sonny Timmerman, Director	Date
Hinesville-Liberty Planning Commission	
Matthew Fowler, Assistant State Transportation Planning Administrator Georgia Department of Transportation, Office of Planning	vil 29, 2009 Date
Angela T. Alexander, State Transportation Planning Administrator	4/30 /09
Georgia Department of Transportation, Office of Planning	Bate
Steven J. Kish, Transit Program Manager Georgia Department of Transportation, Division of Intermodal Programs	5-8-09 Date
~// ~)	
Mirvey Styr Cr	5/21/09
Harvay D. Kaanlar Administrator	Date

Georgia Department of Transportation, Division of Intermodal Programs

(Space Holder)

Hinesville Area Metropolitan Planning Organization I/Y 2008 - 2011 Transportation Improvement Program (TIP)

POLICY COMMITTEE ENDORSEMENT OF HAMPO FY 2008 - 2011 TRANSPORTATION IMPROVEMENT PROGRAM

WHEREAS, federal regulations for urban transportation planning issued in October 1993, require that the Metropolitun Planning Organization, in cooperation with participants in the planning process, develop and annually update the Transportation Improvement Program (TIP); and

WHEREAS, the Hinesville Area Metropolitan Planning Organization has been designated by the Governor as the Metropolitan Planning Organization of the Hinesville urbanized area; and

WHEREAS, the Hinesville Area Metropolitan Planning Organization, in accordance with federal requirements for a Transportation Improvement Program, has developed a four-year integrated program of federally-funded highway and transit projects for the Hinesville urbanized area; and

WHEREAS, the TIP is consistent with all plans, goals, and objectives of the Hinesville Area. Metropolitan Planning Organization, and shall be updated at least annually with revision to reflect changes in program emphasis and funding availability; and

WHEREAS, the urban transportation planning regulations require that the TIP be a product of a planning process contified as in conformance with all applicable requirements of law and regulations; and

WHEREAS, the urban transportation planning regulations provide for the certification of the process by the Federal Highway Administration and the Federal Transit Administration; and

WHEREAS, the staff of the Liberty Consolidated Planning Commission, the Federal Highway Administration and the Federal Transit Administration have reviewed the organization at activities of the planning process and certified them to be in conformance with the requirements of law and regulations; and

WHEREAS, the locally developed and adopted process for private sector participation has been followed in the development of the FY 2008-2011 TIP.

NOW, THEREFORE BE IT RESOLVED, that the Hinesville Area Metropolitan Planning Organization Policy Committee endorses the attached four-year Transportation Improvement Program for the period 2008 - 2011.

CERTIFICATION

I hereby certify that the above is a true and correct copy of a Resolution adopted by the Hinesville Area Metropolitan Planning Organization Policy Committee at a meeting held on June 20², 2007.

John D. McIver, CHAIRMAN

Hipesville Area Metropolitan Planning Organization

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Policy Committee:

Chairman John McIver Chairman Liberty County Board of Commissioners

Gary Gillard

Commissioner, Liberty County Board of Commissioners

Randall Wilson

Chairman, Long County Board of Commissioners

Lily Baker

Chairwoman, Liberty County Board of Education

Don Hartley

Chairman, Liberty Consolidated Planning Commission

Colonel Kevin W. Milton Garrison Commander, Fort Stewart

Thomas Hines Mayor, City of Allenhurst

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Sandra Martin

Mayor, City of Flemington

Richard Strickland

Mayor, City of Gum Branch

James Thomas Jr.

Mayor, City of Hinesville

Bobby Ryon

Councilman, City of Hinesville

Don Emmons

Mayor, City of Midway

William Austin

Mayor, City of Riceboro

Daisy Pray

Mayor, City of Walthourville

Todd Long Director of Planning, GDOT

Allen Brown Chairman, Liberty County Development Authority

PC Advisory Non-Voting Members

Joey Brown County Administrator, Liberty County

Billy Edwards City Manager, City of Hinesville

Sonny Timmerman
Executive Director, Liberty Consolidated Planning Commission (PC Secretary)

Technical Coordinating Committee:

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County Administrator, Liberty County

Vacant

County Administrator, Long County

Trent Long
County Engineer, Liberty County

Billy Edwards City Manager, City of Hinesville

Paul Simonton
City Engineer, City of Hinesville

Paul Hawkins Representative, City of Flemington

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David Miller Representative, City of Riceboro

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City of Allenhurst

Rene Harwell

City of Flemington

Vacant City of Gum Branch

Curtis Velasco City of Hinesville

Dr. Bonita Smith City of Hinesville

Roscoe Stanley City of Hinesville

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Steven Berg City of Midway

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Steve Emmons City of Walthourville

Julian Hodges Liberty County

Harry Rodgers Liberty County

Robert Glenn Liberty County

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Frankie Brost Representative, Fort Stewart

Terri Oliver Representative, Savannah Technical College

Ron Collins

Representative, Armstrong Atlantic State University, Hinesville Campus

Metropolitan Planning Organization Staff:

Sonny Timmerman, MPO Director Rachel Hatcher, Transportation and Land Use Planner Donna Shives, Staff Support Alissa Davis, Staff Support



INTRODUCTION

The Hinesville Area Metropolitan Planning Organization (HAMPO) is the designated Metropolitan Planning Organization (MPO) for the Hinesville urbanized area and all of Liberty County and part of Long County. The Governor in cooperation with the major local governments designates MPO's in urbanized areas with a population over 50,000 to administer the federally required transportation planning process. HAMPO develops and administers the urban transportation study, which is a comprehensive, cooperative and continuing process. HAMPO is the forum for decision making on transportation issues. HAMPO is responsible for developing the 20 year Long Range Transportation Plan (LRTP) and the four-year Transportation Improvement Program (TIP). The HAMPO FY 2010 - 2013 Transportation Improvement Program consists of federally funded highway and transit projects programmed for fiscal years 2010 to 2013. The TIP is designed to address the transportation needs of Hinesville and Liberty County and consists of programmed improvements recommended in the Long Range Transportation Plan. The TIP identifies transportation improvements recommended for advancement during the program period, groups the projects into appropriate staging periods and includes realistic estimates of total costs and anticipated funding sources.

It should be emphasized that the TIP is an expression of intent to implement the identified projects and not a final commitment of funds from any agency. All transportation projects must appear in an approved TIP before they may receive federal funds for implementation. The TIP is based on a reasonable estimate of the amount of federal funds expected to be available to Hinesville and Liberty County in the next four fiscal years. The TIP is required to be financially constrained by year over the four year period of FY 2010 to FY 2013.

The HAMPO Technical Coordinating Committee (TCC) is responsible for reviewing the TIP and recommending it for endorsement to the HAMPO Policy Committee (PC). In addition, the Citizens Advisory Committee (CAC) as well as the general public is also invited to review and comment on the proposed TIP.

Through endorsement by the Policy Committee, this document becomes the official TIP for the Hinesville Metropolitan area. Project-by-project review and approval by the Georgia Department of Transportation (GDOT), the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) is also necessary before federal funds become available. It should be understood that the TIP is a flexible program which may be modified in accordance with the procedures outlined in the adopted Public Involvement Plan (PIP) and Participation Plan (PP) by resolution of the Policy Committee if priorities, area goals or funding levels change.

OVERVIEW

The format of this document should be easy to follow, but if you have any questions, please contact the transportation planning staff of the Hinesville Area Metropolitan Planning Organization (HAMPO) at (912) 408-2030 for assistance.

The table of contents provides a summary of the format, sections and structure of the HAMPO FY 2010 - 2013 TIP. The TIP introduction and the subsequent sections include a summary description of the transportation improvement program, the HAMPO FY 2010 - 2013 TIP development and public involvement process. The TIP project description starts with a project index showing programmed highway and bridge projects in Liberty County for FY 2010 - 2013, followed by individual project pages providing more detailed project descriptions. The individual highway and bridge projects are grouped according to their sources of federal funding, followed by the transit section (programming of Title 49 U.S.C. Section 5307 Urbanized Area Formula Program). Examples of the types of projects being funded over the next three fiscal years include new roadways, road widening and reconstruction projects, interchange and intersection reconstruction projects, traffic operational improvements and safety projects, bridge projects and transportation enhancements projects. The individual page descriptions for the highway and other projects include several important items. The HAMPO TIP Number is assigned for administrative use by the staff of the Liberty Consolidated Planning Commission. The State Project Identification (PI) Number is assigned to a project by the GDOT Office of Programming. Preliminary engineering (PE) includes field surveys, project concepts and designs. Right-of-way (ROW) involves land and property acquisition. GDOT directly administers the lump sum program. All the public involvement materials related to the HAMPO FY 2010 - 2013 TIP development process, and the entire TIP amendment documents are included.

STATE TRANSPORTATION IMPROVEMENT PROGRAM (STIP)

AND

TRANSPORTATION IMPROVEMENT PROGRAM

(TIP)

AMENDMENT PROCESS



Statewide Transportation Improvement Program (STIP) and Transportation Improvement Program (TIP) Amendment Process

April 2008

The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) issued the Final Rule to revise the Statewide and Metropolitan Transportation Planning regulations incorporating changes from the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users on February 14, 2007 with an effective date of March 16, 2007. The revised regulations clearly define administrative modifications and amendments as actions to update plans and programs. 23 Code of Federal Regulations (CFR) Part 450.104 defines administrative modifications and amendments as follows:

- Administrative modification "means a minor revision to a long-range statewide or metropolitan transportation plan, Transportation Improvement Program (TIP), or Statewide Transportation Improvement Program (STIP) that includes minor changes to project/project phase costs, minor changes to funding sources of previously-included projects, and minor changes to project/project phase initiation dates. Administrative Modification is a revision that does not require public review and comment, redemonstration of fiscal constraint, or a conformity determination (in nonattainment and maintenance areas)."
- Amendment "means a revision to a long-range statewide or metropolitan transportation plan, TIP, or STIP that involves a major change to a project included in a metropolitan transportation plan, TIP, or STIP, including the addition or deletion of a project or major change in project cost, project/project phase initiation dates, or a major change in design concept or design scope (e.g., changing project termini or the number of through traffic lanes). Changes to projects that are included only for illustrative purposes do not require an amendment. An amendment is a revision that requires public review and comment, redemonstration of fiscal constraint, or a conformity determination (for metropolitan transportation plans and TIPs involving "non-exempt" projects in nonattainment and maintenance areas). In the context of a long-range statewide transportation plan, an amendment is a revision approved by the State in accordance with its public involvement process."

The following procedures have been developed for processing administrative modifications and amendments to the STIP and Metropolitan Planning Organizations (MPOs) TIPs and Long Range Transportation Plans (LRTPs). Processes described below detail procedures that are to be used to update an existing approved STIP or TIP and associated plan, if applicable. A key element of the amendment process is to assure that funding balances are maintained.

Administrative Modification

The following actions are eligible as Administrative Modifications to the STIP/TIP/LRTP:

- A. Revise a project description without changing the project scope, conflicting with the environmental document or changing the conformity finding in nonattainment and maintenance areas (less than 10% change in project termini). This change would not alter the original project intent.
- B. Splitting or combining projects.
- C. Federal funding category change.
- D. Minor changes in expenditures for transit projects.
- E. Roadway project phases may have a cost increase less than \$2,000,000 or 20% of the amount to be authorized. The 20% scenario amount may not exceed \$10,000,000.
- F. Shifting projects within the 4-year STIP.
- G. Projects may be funded from lump sum banks as long as they are consistent with category definitions.

An administrative modification can be processed in accordance with these procedures provided that:

- 1. It does not affect the air quality conformity determination, nor the network conformity years found in the travel demand model and the plan for nonattainment and maintenance areas.
- 2. It does not impact financial constraint.
- 3. It does not require public review and comment.

The administrative modification process consists of a monthly list of notifications from GDOT to all involved parties, with change summaries sent on a monthly basis to the FHWA and FTA by the GDOT.

The GDOT will submit quarterly reports detailing projects drawn from each lump sum bank with remaining balance to the FHWA.

Amendment

The following actions are eligible as Amendments to the STIP/TIP/LRTP:

- A. Addition or deletion of a project.
- B. Addition or deletion of a phase of a project.
- C. Roadway project phases that increase in cost over the thresholds described in the Administrative Modification section.
- D. Addition of an annual TIP.
- E. Major change to scope of work of an existing project. A major change would be any change that alters the original intent i.e. a change in the number of through lanes, a change in termini of more than 10 percent.
- F. Shifting projects within the 4-year STIP which require redemonstration of fiscal constraint.

Amendments to the STIP/TIP/LRTP will be developed in accordance with the provisions of 23 CFR Part 450. This requires public review and comment and responses to all comments, either individually or in summary form. For amendments in MPO areas, the public review process should be carried out in accordance with the procedures outlined in the Participation Plan. The GDOT will assure that the amendment process and the public involvement procedures have been followed. Cost changes made to the second, third and fourth years of the STIP will be balanced during the STIP yearly update process. All amendments should be approved by FHWA and/or FTA.

Notes:

- 1. The date a TIP becomes effective is when the Governor or his designee approves it. For nonattainment and maintenance areas, the effective date of the TIP is based on the date of U.S. Department of Transportation's positive finding of conformity.
- 2. The date the STIP becomes effective is when FHWA and FTA approve it.
- 3. The STIP is developed on the state fiscal year which is July 1-June 30.
- 4. Funds for cost increases will come from those set aside in the STIP financial plan by the GDOT for modifications and cost increases. Fiscal Constraint will be maintained in the STIP at all times.

TRANSPORTATION IMPROVEMENT PLAN

2010-2013

LUMP SUM PROJECTS



Lump Sum Funding



A portion of the STIP funding is set aside for eight groups of projects that do not affect the capacity of the roadway. Funds are set up in lump sum categories to undertake projects that are developed after the STIP is approved. These lump sums are listed in a number of funding types for each year for the Department's convenience in managing and accounting for the funding. Funds are drawn from these lump sums during the year and individual projects are programmed. The individual projects may include work at one or several locations for letting and accounting purposes. Listed below are these eight groups and information about them. Except for groups for preliminary engineering and rights of way protective buying, the total available funds are shown as construction for easy accounting but preliminary engineering and rights-of-way may be drawn from this amount when needed in that category.

Group: maintenance

Criteria: existing system maintenance only

This group has six funding/work types: two are for bridge painting/maintenance and the other four are for roadway maintenance. Major types of work undertaken are: resurfacing, pavement rehabilitation, median work, impact attentuators, signing, fencing, pavement markings, landscaping, rest areas, walls, guardrail and shoulder work. Also included is preliminary engineering necessary to prepare plans and rights-of-way needed for work such as landslide repair, sewer hookups and erosion control.

Group: safety

Criteria: work qualifying for the High Hazard Safety Program and other safety projects

This group includes the following work types: signal installation/upgrades, guardrail installation, sign installation, railroad protection devices, operational improvements, railroad crossing hazard elimination, roadway hazard elimination and special safety studies and programs.

Group: preliminary engineering

Criteria: planning, management systems and consultant design services

This group has two funding/work types: planning/management systems and consultant design services



Group: wetland mitigation

Criteria: site restoration for projects already under construction/complete and wetland

banks

This group is a single item.

Group: roadway/interchange lighting

Criteria: lighting

This group is a single item.

Group: rights of way - protective buying and hardship acquisitions

Criteria: purchase of parcel(s) of rights of way (RW) for future projects that are in jeopardy of development and for hardship acquisition. Qualifying projects are those that have preliminary engineering (PE) underway or have a PE, RW or construction phase in the STIP. For counties that are not in conformance for air quality the only qualifying projects are those that have a RW phase in the STIP. This group is a single item.

Group: transportation enhancement

Criteria: projects qualifying for the Transportation Enhancement program (TEA)

TEA projects shown in the STIP will be funded on a first come first served basis. When a project is funded it is drawn down from the lump sum. When all funds are gone, no other projects can be funded until the next fiscal year, which begins on July 1.

This group is a single item.

Group: safe routes to schools

Criteria: To enable and encourage children, including those with disabilities, to walk and bicycle to school; to make walking and bicycling to school safe and more appealing; and to facilitate the planning, development and implementation of projects that will improve safety, and reduce traffic, fuel consumption, and air pollution in the vicinity of schools.

This group has two items; Infrastructure & non-infrastructure.

MPO Lump Sum Projects Hinesville

Fineswille 2010-2013	
MPC	
Date: 8/10/09	
Processed	
Processed Date	

PROJECT	PROJECT NUMBER	TIP ND.	DESCRIPTION		34	ROW	M		5	715
0007258	CSSTP-0007-00(258)		EDGE LINE RUMBLE STRIPS @ SEVERAL SR LOCATIONS IN DISTRICTS	35	AUTHORIZED			CST	ALTH-PENDING	
LIBERTY										
PROJECT	PROJECT NUMBER	TIP NO.	DESCRIPTION		34	ROW	W	Ü	CST	UIL
0007408	CSSTP-0007-00(408)		SR 38 @ 3 LOCS; SR 38 CONN @ 1 LOC & SR 144 @ 2 LOCS	34	AUTHORIZED	MOH	PRECST	153	PRECST	
0007432	CSSTP-0007-00(432)		CR 45/CASSELS RDAD @ CSX # 6373448	2	PRECST	MOH	PRECST	CST	PRECST	

TRANSPORTATION IMPROVEMENT PLAN 2010-2013

AUTHORIZED PROJECTS

The following chart includes Federal or State funded projects that were authorized and/or completed during the years 2007 - 2010. This list is not comprehensive and excludes projects from other funding sources.

Listing of all funding authorized by GDOT in the Hinesville MPO area during the period of FY 2007 through FY 2010 (as of 10/2/09)

This list contains all project phases authorized for funding by the Georgia Department of Transportation during the period of FY 2007 through FY 2010 and is accurate as of 10/2/09. 'PID' and 'Project No.' are identification numbers used by GDOT and FHWA for reference. The 'TIP No.' is how the project is identified in the Hinesville Transportation Improvement Program (TIP). Note that not all projects are required to be in the TIP and therefore are not assigned a number. The 'Description' is the title of the project; 'Phase' indicates 'PE' for Preliminary Engineering, 'ROW' for Right of Way acquisition and 'CST' for Construction. The 'Auth Date' indicates the fiscal year in which the phase was authorized and the 'Auth Amt' is the the amount of funds authorized.

Roadway,	Bridge and	Safety	Improvements
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PID	PROJECT NO.	TIP NO.	DESCRIPTION	PHASE	AUTH DATE	AUTH AMT
0007038	CSBRG-0007-00(038)	2005-Z-1	SR 119 @ RUSSELL SWAMP	PE	2008	\$300,000.00
0008168	CSTEE-0008-00(168)	2005-G-1	HINESVILLE STREETSCAPE ENHANCEMENT ON MEMORIAL DRIVE	CST	2009	\$625,000.00
0008399	CSNHS-0008-00(399)		I-95 @ SR 25/US 17/OCEAN HIGHWAY INTERCHANGE - LIGHTING	CST	2007	\$896,174.27
0008862	CSSFT-0008-00(862)		OFF-SYSTEM SAFETY IMPROVEMENTS @ 6 LOCS IN LIBERTY COUNTY	CST	2010	\$101,000.00
0008566	CSSFT-0008-00(566)		CR 41 @1 LOC &CR 111 @1 LOC - OFF-SYSTEM SAFETY IMPROVEMENTS	CST	2008	\$83,419.00
0007258	CSSTP-0007-00(258)		EDGE LINE RUMBLE STRIPS @ SEVERAL SR LOCATIONS IN DISTRICT 5	CST	2010	\$1,218,123.50
Intermoda	d (Transit Planning and	d Capital)				
PID	PROJECT NO.	TIP NO.	DESCRIPTION	PHASE	AUTH DATE	AUTH AMT
T001531	MTA00-T001-00(531)		FY 2007 SECTION 5310 CAPITAL FOR HINESVILLE	CST	2007	\$21,039.00
T001532	MTA00-T001-00(532)		FY 2008 SECTION 5310 CAPITAL FOR HINESVILLE	CST	2008	\$22,091.00
T001752	MTG00-0148-00(005)		FY 2009 SECTION 5310 CAPITAL FOR HINESVILLE	CST	2009	\$24,000.00
T002508	MG600-0148-00(004)		FY 2009 SECTION 5307 CAPITAL BUS FOR HINESVILLE	CST	2009	\$220,000.00
T002511	MTG00-0148-00(017)		FY 2008 SECTION 5307 OPERATING CONTRACT FOR HINESVILLE	CST	2009	\$716,661.00
T002513	MTG00-0146-00(010)		FY 08 SECTION 5303 CAPITAL PLANNING CONTRACT - HINESVILLE	CST	2009	\$31,250.00
T002586	AP090-9013-07(179)		HINESVILLE-RWY EXT FEASIBILITY STUDY, ALP, ENGR DESIGN SRVS	CST	2009	\$209,745.75
T002613	MTG00T00200613		ARRA SECTION 5307 CAPITAL FOR HINESVILLE	CAP	2009	\$885,852.00
T002800			FY 2010 SECTION 5303 PLANNING CONTRACT - HINESVILLE	TPLN	2009	\$31,250.00
T002895			ARRA SECTION 5307 CAPITAL FOR HINESVILLE	TCAP	2009	\$885,852.00
T002562	MTG00-0143-00(140)		GA-18-X029 5311 CAPITAL COASTAL RDC	CST	2009	\$1,105,515.00
T002563	MTĠ00-0143-00(141)		GA-18-X029 5311 CAPITAL COASTAL RDC	CST	2009	\$344,200.00
Maintenar	nce Improvements					
PID	PROJECT NO.	TIP NO.	DESCRIPTION	PHASE	AUTH DATE	AUTH AMT
M 003676	CSNHS-M003-00(676)		SR 119 & SR 144 FROM TAYLOR CREEK TO TRINITY ROAD	CST	2008	\$2,278,622.88
State Aid	Projects					
PID	PROJECT NO.	TIP NO.	DESCRIPTION	PHASE	AUTH DATE	AUTH AMT
S009380	PRC10-S009-00(380)		MEMORIAL DRIVE (PHASE 1) IN HINESVILLE	CST	2008	\$320,000.00
S009381	PRC10-S009-00(381)		MEMORIAL DRIVE (PHASE II)	CST	2007	\$320,000.00
Transport	ation Planning					
PID	PROJECT NO.	TIP NO.	DESCRIPTION	PHASE	AUTH DATE	AUTH AMT
0008506	PL000-0008-00(506)		PL HINESVILLE - 2008	PLN	2008	\$121,250.00
0008790	PL000-0008-00(790)		PL HIMESVILLE - 2009	PLN	2009	\$153,381.26
0007984	PL000-0007-00(984)		PL HINESVILLE 2007	PLN	2007	\$121,250.00
0009241	PL000000900241		PL HINESVILLE - 2010	PLN	2010	\$130,303.76

TRANSPORTATION IMPROVEMENT PLAN

2010 - 2013

EXPECTED HIGHWAY STIP FUNDS

Expected Highway STIP Funds

												7/10/2009
						VA						hine sville_t
				HINI	ESVI	LLE						
				TOTAL EXPE	CTE	D HIGHWAY						
				STIF	FUI	NDS						
				(MA	TCH	ED)						
				FY 201								
FUND	CODE	LUMP DESCRIPTION		2010	ī	2011		2012		2013		TOTAL
Bridge	L1C0		\$	-	\$	-	S	80.289	\$		S	80.289
STP	L200		\$	-	\$	6.039.000	S	20,200	\$	-	\$	6.039.000
HPP	LY 10		\$	-	\$	-	S	1.891.000	\$	-	\$	1.891.000
HPP	LY20		\$		\$	1.961.000	\$	-	\$		\$	1,961,000
NHS	L050	ROAD MAINT	\$	248,000	S	248,000	S	248,000	\$	248,000	\$	992,000
NHS	L050	RDWY LIGHT	\$	-	\$	6,000	\$	6,000	\$	6,000	\$	18,000
SRS	LU10	SAFE RT SCH PROG	\$	2,000	\$	2.000	\$	2,000	\$	2,000	\$	8,000
SRS	LU20	SAFE RT SCH INFR	\$	50,000	5	15,000	S	15,000	\$	15,000	\$	95,000
SRS	LU30	SAFE RT SCH ANY	\$	6,000	S	3.000	S	3,000	\$	3,000	S	15,000
SFT	LS20	HWY RISK RURAL RDS	\$	19,000	S	19.000	S	19.000	\$	19,000	\$	76,000
SFT	LS30	SAFETY LUMP	\$	186,000	S	167.000	S	167,000	S	167.000	S	687,000
STP	L220	ENHANCE LUMP	\$	161,000	S	161,000	S	161,000	\$	161,000	\$	644.000
STP	L240	OPERATIONAL	\$	31.000	\$	31,000	S	31,000	S	31,000	S	124,000
STP	L240	ROAD MAINT	\$	887.000	S	620.000	\$	620,000	\$	620,000	\$	2.747.000
STP	L240	BRIDGE PAINT	\$	31,000	\$	31,000	\$	31,000	\$	31,000	\$	124,000
STP	L240	SIGNALS	\$	105,000	S	93,000	S	93,000	S	93,000	\$	384,000
STP	L240	PLAN/MGT	\$	6,000	\$	6.000	\$	19,000	S	19,000	\$	50,000
STP	L240	FA MAINT	\$	93,000	5	93,000	\$	93,000	\$	93,000	\$	372,000
STP	L240	WETLAND MITIG	\$	112,000	S	50,000	\$	50,000	S	50,000	\$	262,000
STP	L240	RW PROTECTIVE BUY	\$	16,000	5	16,000	S	16,000	\$	16,000	\$	64,000
STP	LS40	RRX HAZ	\$	25,000	\$	25,000	\$	25,000	\$	25,000	\$	100,000
STP	LS50	RRX PROT	\$	25,000	S	25,000	\$	25,000	\$	25,000	\$	100.000
STP	LZ20	CST MGMT	\$	189,000	S	180,000	\$	-	\$	-	\$	369,000
DNR	L940	DNR REC TRAILS	\$	-	\$	8,000	S	8,000	\$	8,000	\$	24,000
TOTAL			S	2,192,000	S	9.799.000	S	3,603,289	S	1,632,000	S	17,226,289

TRANSPORTATION IMPROVEMENT PLAN 2010 – 2013 HINESVILLE PROJECT COST DETAILS STATE AND FEDERALLY APPROVED FUNDS

7/10/2009

Hinesville Project Cost Detail FY 2010 thru FY 2013

#	MPO TIP ID	Description	Prim Work Type	Prog Date	Phase	Fund	Federal	State	Other	Total
0004917	2005-D-1	SR 119/AIRPORT ROAD FROM US 84 TO SR 196 IN HINESVILLE	Widening	2011	ROW	1200	\$4,831,200	\$1,207,800	SO	\$6,039,000
0004917	2005-D-1	SR 119/AIRPORT ROAD FROM US 84 TO SR 196 IN HINESVILLE	Widening	2011	ROW	LY20S	\$1,568,800	\$392,200	SO	\$1,961,000
					FY 2011 Totals:	Totals:	\$6,400,000	\$1,600,000	0\$	\$8,000,000
0007038	2005-Z-1	SR 119 @ RUSSELL SWAMP	Bridges	2012	ROW	L1C0	\$64,231	\$16,058	0\$	\$80,289
522570-	2005-E-1	US 84 CONN FM 1 MI S SR 196/US 84 INT TO US 84 S FLEMINGTON	Roadway Project	2012	ROW	LY10S	\$1,512,800	\$378,200	SO	\$1,891,000
					FY 2012 Totals:	Totals:	\$1,577,031	\$394,258	\$0	\$1,971,289
					Hinesville Totals:	Totals:	\$7,977,031	\$1,994,258	\$0	\$9,971,289

Overall Highway Project Locations

The maps and project pages below depict most of the highway projects programmed for FY 2010 - 2013 in Liberty County except the lump sum and other miscellaneous improvement projects that cannot be displayed in maps.

Maps show where each project is located and what types of improvements are programmed. For detailed project information and funding source, please refer to the tables of individual projects that follow.



			P.I. #: 0004917		
Project Name: Airport Rd W	idening		TIP #:2005-D-1		
			COUNTY: Liberty		
Project Description: Wideni	ng of Airport Rd i	from 2 lanes to 4 lanes.	PROJ. #: STP-0004-00(917)		
From: US 84 To: SR 196	From: US 84 To: SR 196 W				
			GDOT DISTRICT: 5		
TRAFFIC VOL. 2006 ADT: 7,660		YEAR 2030: 17,100	CONG. DISTRICT: 1		
NO. OF LANES EXISTING: 2		PLANNED: 4 lane divided	RDC: CGRDC		
LOCAL ROAD #:	STATE/US ROAD #	#: SR 119	LENGTH (MI): 3.3		

COMMENTS/REMARKS: County has PMA with DOT to do PE and Utilities (local cost in Const is for utilities). The total local cost for preliminary engineering is \$680,441. Also note: HAMPO Policy Committee voted (June 21, 2006) to include traffic signalization improvement at the Airport Rd/US 84, Airport Rd/SR 196 W intersections. This should be completed in advance of the project.

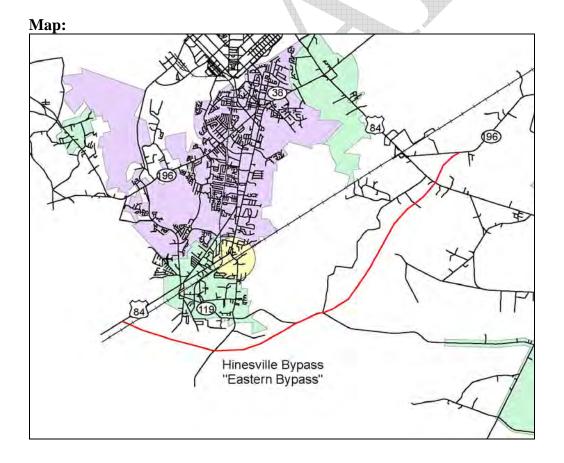
PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	Authorized	\$0	\$0	\$0	\$0	\$0	\$680,441
RIGHT-OF-WAY	Fed/State	\$0	\$ 8,000,000	\$0	\$0	\$8,000,000	\$8,000,000
CONSTRUCTION	Fed/State	\$0	\$0	\$0	\$0	\$0	\$14,331,256
PROJECT COST		\$0	\$8,000,000	\$0	\$0	\$8,000,000	\$23,011,697
FEDERAL COST		\$0	\$6,400,000	\$0	\$0	\$6,400,000	\$17,865,004
STATE COST		\$0	\$1,600,000	\$0	\$0	\$1,600,000	\$4,466,251
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$680,441

Airport Rd Widening Teyesour no. Teyesour no. Airport Rd Widening Teyesour no. Airport Rd Widening Teyesour no. Te

P.I. #: 522570 TIP #: 2005-E-1 Project Name: Hinesville Bypass Project COUNTY: Liberty Project Description: "US 84 Conn from 1 mile s of SR 196/US 84 int to PROJ. #: NH-026-3(56)SP US 84 S Flemington (Hinesville Bypass Project)" FUND: LY10S, L050, From: US 84/SR 196 To: US 84 **GDOT DISTRICT: 5** TRAFFIC VOL. 2006 ADT: NA YEAR 2030: 13,590 CONG. DISTRICT: 1 NO. OF LANES EXISTING: NA PLANNED: new 4 lane divided RDC: CGRDC LOCAL ROAD #: NA STATE/US ROAD #: NA LENGTH (MI): 12.4 miles (+/-) COMMENTS/REMARKS: County has PMA with DOT to do PE and Utilities (local cost in Const is for utilities). The total local cost for

preliminary engineering is \$1,500,000. Also note: HAMPO Policy Committee voted (June 21, 2006) to include traffic signalization improvement at the Airport Rd/US 84, Airport Rd/SR 196 W intersections. This should be completed in advance of the project. The construction estimate is based on a two lane development. All cost estimates are based on the YOE report.

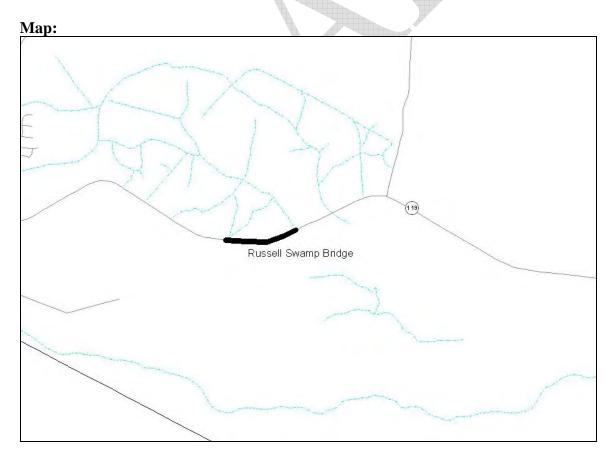
PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	Authorized	\$0	\$0	\$0	\$0	\$0	\$1,500,000
RIGHT-OF-WAY	Fed/State	\$0	\$0	\$1,891,000	\$0	\$1,891,000	\$18,045,063
CONSTRUCTION	-	\$0	\$0	\$0	\$0	\$0	\$33,036,071
PROJECT COST		\$0	\$0	\$1,891,000	\$0	\$1,891,000	\$52,581,134
FEDERAL COST		\$0	\$0	\$1,512,800	\$0	\$1,512,800	\$26,428,856
STATE COST		\$0	\$0	\$378,200	\$0	\$378,200	\$6,607,214
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$1,500,000



			P.I. #: 0007038			
			TIP #: 2005-Z-1			
			COUNTY: Liberty			
Project Name: SR 119 @	Russell Swamp		PROJ. #:CSBRG-0007-00(038)			
Project Description: Bridg	ne replacement.	FUND: L1C0				
	,		GDOT DISTRICT: 5			
TRAFFIC VOL. 2006 ADT: 3,310	YEA	AR 2030: 8,150	CONG. DISTRICT: 1			
NO. OF LANES EXISTING: 2	PLA	NNED: 2	RDC: CGRDC			
LOCAL ROAD #:	STATE/US ROAD #: SR	119	LENGTH (MI): 0.4			

COMMENTS/REMARKS:

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	Authorized	\$0	\$0	\$0	\$0	\$0	\$300,000
RIGHT-OF-WAY	Fed/State	\$0	\$0	\$80,289	\$0	\$80,289	\$80,289
CONSTRUCTION	Fed/State	\$0	\$0	\$0	\$0	\$0	\$6,234,901
PROJECT COST				\$80,289		\$80,289	\$6,315,190
FEDERAL COST				\$64,231		\$64,231	\$5,052,152
STATE COST				\$16,058		\$16,058	\$1,563,038
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$0



Local and Unfunded TIP Projects

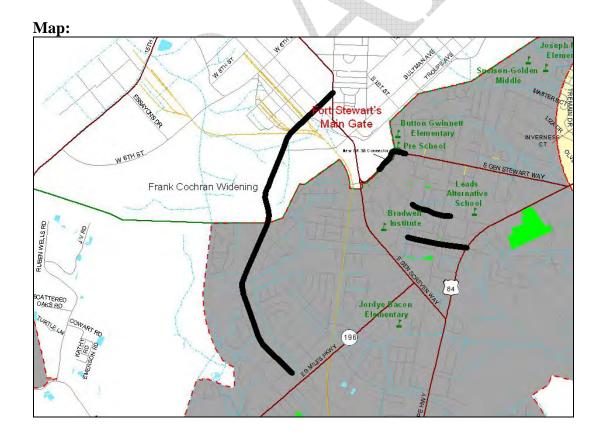
*all projects listed are in the current LRTP



Project Name: Frank Cochra	Project Name: Frank Cochran Drive Widening			
	COUNTY: Liberty			
Project Description: Widen	Project Description: Widening on Frank Cochran from 2 lanes to 4 lanes			
From: SR 196 W To: Ha	se Road (Fort Stewart)	FUND: L200, LOC		
	, , , , , , , , , , , , , , , , , , , ,	GDOT DISTRICT: 5		
TRAFFIC VOL. 2006 ADT: 13,120	YEAR 2030: 24	4,010 CONG. DISTRICT: 1		
NO. OF LANES EXISTING: 2	PLANNED: 4 la	ane divided RDC: CGRDC		
LOCAL ROAD #:	STATE/US ROAD #:	LENGTH (MI): 2.7 miles		

COMMENTS/REMARKS: PMA with the City of Hinesville to do PE and ROW - PE is UW; ROW is scheduled for CY 2007 DOT scheduled let date is FY 2012.

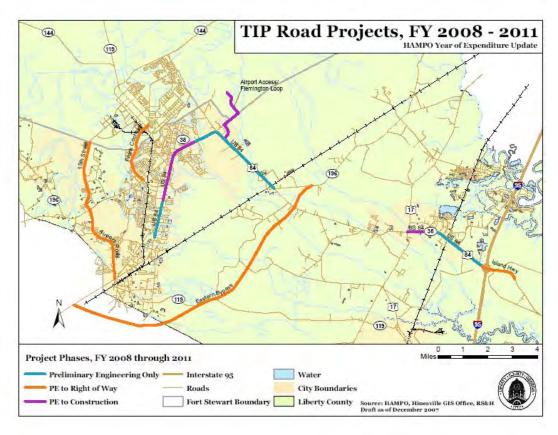
PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	Authorized	\$0	\$0	\$0	\$0	\$0	\$598,030
RIGHT-OF-WAY	Local	\$4,000,000	\$0	\$0	\$0	\$0	\$4,000,000
CONSTRUCTION	State/Fed	\$0	\$0	\$0	\$0	\$0	\$11,935,262
PROJECT COST	-	\$4,000,000	\$0	\$0	\$0	\$0	\$16,533,292
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$9,548,209
STATE COST		\$0	\$0	\$0	\$0	\$0	\$2,387,052
LOCAL COST		\$4,000,000	\$0	\$0	\$0	\$4,000,000	\$4,598,030



Project Name: US 84	Safety Improvem	ents	P.I. #:
Trojoce Hamo. Co or	carety improvem	TIP #:2007-B-1	
Project Description: 7		COUNTY: Liberty	
84 corridor study comp	leted in 2007.	PROJ. #:	
FROM: East of General	al Stewart Wav	FUND: TBD	
	•	10101110	GDOT DISTRICT: 5
TRAFFIC VOL. 2006 ADT: 2	3,120	YEAR 2030:	CONG. DISTRICT: 1
NO. OF LANES EXISTING: 4	1	PLANNED:4 w/ median	RDC: CGRDC
LOCAL ROAD #:	STATE/US I	ROAD #: 38/84	LENGTH (MI): 3.78 mi
			om General Stewart Way to SR 196. Of the five all and state funding for this project as those

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	-	\$0	\$0	\$0	\$0	\$0	\$866,847
RIGHT-OF-WAY	-	\$0	\$0	\$0	\$0	\$0	\$0
CONSTRUCTION	-	\$0	\$0	\$0	\$0	\$0	\$6,651,847
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$7,518,694
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$6,014,955
STATE COST		\$0	\$0	\$0	\$0	\$0	\$1,503,738
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$866,847

Map:

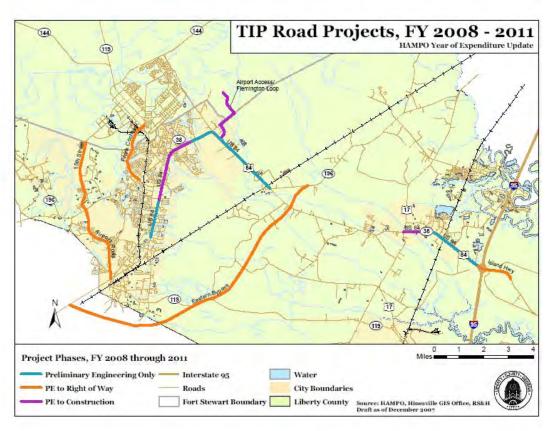


Project Name: US 84 Safety	Improvements		P.I. #:					
Troject Name: 00 04 Calety	Tojot Namo: 33 3 1 Saloty Improvements							
Project Description: To inco	COUNTY: Liberty							
84 corridor study completed in 2007.			PROJ. #:					
FROM: West (south) of Ger	ay TO: Flowers Dr.	FUND: TBD						
,		•	GDOT DISTRICT: 5					
TRAFFIC VOL. 2006 ADT: 29,670		YEAR 2030:	CONG. DISTRICT: 1					
NO. OF LANES EXISTING: 4		PLANNED:4 w/ median	RDC: CGRDC					
LOCAL ROAD #:	STATE/US ROAD #	# : 38/84	LENGTH (MI): 2.93 mi					
COMMENTS/REMARKS: This is an	COMMENTS/REMARKS: This is an unfunded high priority project in the US 84 Corridor, from General Stewart Way to Flowers Dr., Of the							

COMMENTS/REMARKS: This is an unfunded high priority project in the US 84 Corridor, from General Stewart Way to Flowers Dr. Of the five US 84 improvement projects, this ranks as project priority 1A. The MPO will pursue federal and state funding for this project as those resources become available.

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	-	\$0	\$0	\$0	\$0	\$0	\$532,950
RIGHT-OF-WAY	-	\$0	\$0	\$0	\$0	\$0	\$0
CONSTRUCTION	-	\$0	\$0	\$0	\$0	\$0	\$3,762,998
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$4,295,948
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$3,436,759
STATE COST		\$0	\$0	\$0	\$0	\$0	\$859,189
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$532,950

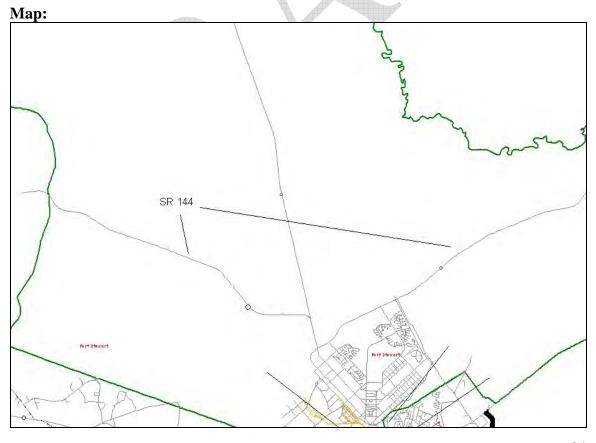
Map:



P.I. #: 532600 Project Name: SR 144 Passing Lanes TIP #:2005-X-1 Project Description: Construction of Passing Lanes thru Fort Stewart COUNTY: Liberty Reservation PROJ. #: STP-147-1(10) FUND: L200 From: SR 144 West: WB mp 5.75 to mp 7.0, EB mp 2.0 to mp 3.25. SR 144 East: EB mp 16.50 to mp 17.70, WB mp 19.10 to 20.50 GDOT DISTRICT: 5 TRAFFIC VOL. 2006 ADT: 7,150 YEAR 2030: 5,780 CONG. DISTRICT: 1 NO. OF LANES EXISTING: 2 PLANNED: 4 (passing lanes) RDC: CGRDC LOCAL ROAD #: STATE/US ROAD #: SR 144 LENGTH (MI): 5.01 miles

COMMENTS/REMARKS: Working on concept, project is in Long Range

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL	
PRELIM. ENGR.	Authorized	\$0	\$0	\$0	\$0	\$0	\$110,000	
RIGHT-OF-WAY	-	\$0	\$0	\$0	\$0	\$0	\$0	
CONSTRUCTION	-	\$0	\$0	\$0	\$0	\$0	\$3,761,877	
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$3,871,877	
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$3,097,501	
STATE COST		\$0	\$0	\$0	\$0	\$0	\$774,375	
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$0	



P.I. #: Project Name: 15th Street Widening TIP #:2005-D-2 **COUNTY: Liberty County** Project Description: Widening of 15th Street from 2 lanes to 4 lanes PROJ. #: FUND: TBD From: SR 196 To: Fort Stewart Boundary **GDOT DISTRICT: 5** TRAFFIC VOL. 2006 ADT: N/A YEAR 2030: 16,870 CONG. DISTRICT: 1 NO. OF LANES EXISTING: 2 PLANNED: 4 lane divided RDC: CGRDC LOCAL ROAD #: 15th Street STATE/US ROAD #: NA LENGTH (MI): 3.2 miles

COMMENTS/REMARKS: County is doing PE w/ local funds. Studies are being coordinated by the same consultant (Thomas & Hutton). MPO intends to seek Federal funding for this local roadway project in the future. Proposed Independence PUD development is planned to occur west of 15th Street. The local cost for preliminary engineering is \$680,441.

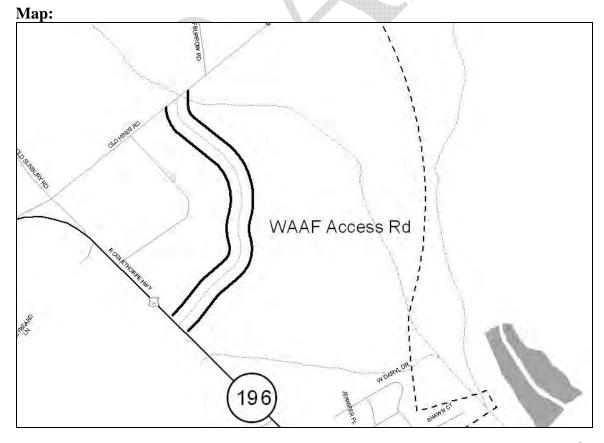
PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	Local	\$0	\$0	\$0	\$0	\$0	\$680,441
RIGHT-OF-WAY	-	\$0	\$0	\$0	\$0	\$0	\$781,060
CONSTRUCTION	-	\$0	\$0	\$0	\$0	\$0	\$14,041,410
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$15,502,911
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$11,233,128
STATE COST		\$0	\$0	\$0	\$0	\$0	\$2,808,282
LOCAL COST		\$0	\$0	\$0	\$0	\$781,060	\$781,060

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P.I. #: Project Name: WAAF access road TIP #:2005-I-1 Project Description: New road construction to access the WAAF COUNTY: Liberty PROJ. #: FUND: Local/DOD/FAA From: Old Hines To: US 84 GDOT DISTRICT: 5 TRAFFIC VOL. 2006 ADT: N/A YEAR 2030: 3,250 CONG. DISTRICT: 1 NO. OF LANES EXISTING: PLANNED: new 2 lane RDC: CGRDC LOCAL ROAD #: STATE/US ROAD #: LENGTH (MI): 2.7 miles

COMMENTS/REMARKS: MPO to seek state aid and DOD funds. Construction of a new terminal and extension of the runway have been completed.

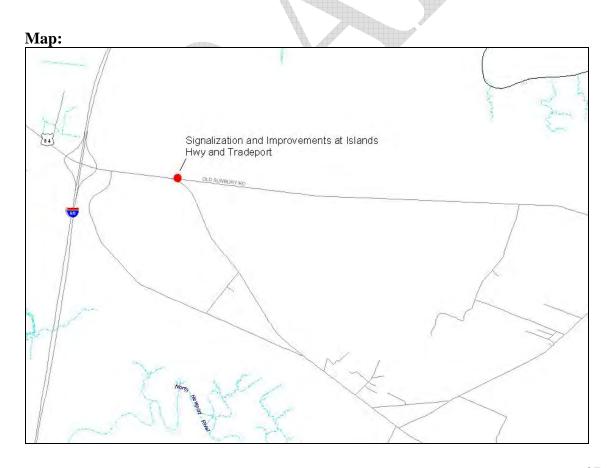
PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	LOCAL	\$0	\$0	\$0	\$0	\$0	\$105,000
RIGHT-OF-WAY	-	\$0	\$0	\$0	\$0	\$0	\$500,000
CONSTRUCTION	-	\$0	\$0	\$0	\$0	\$0	\$1,228,700
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$1,833,700
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$982,960
STATE COST		\$0	\$0	\$0	\$0	\$0	\$245,740
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$605,000



		P.I. #:			
Project Name: Intersection s	TIP #:2005-Y-1				
	Project Description: Signalization and improvements for Islands Hwy at				
Project Description: Signali Tradeport					
Пацероп			FUND: TBD		
			GDOT DISTRICT: 5		
TRAFFIC VOL. 2006 ADT: 2,700		YEAR 2030: 7,700	CONG. DISTRICT: 1		
NO. OF LANES EXISTING: 2		PLANNED:4	RDC: CGRDC		
LOCAL ROAD #: Islands Hwy	LENGTH (MI): NA				

COMMENTS/REMARKS: MPO desires to seek funds for Project.

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.		\$0	\$0	\$0	\$0	\$0	\$0
RIGHT-OF-WAY		\$0	\$0	\$0	\$0	\$0	\$0
CONSTRUCTION		\$0	\$0	\$0	\$0	\$0	\$0
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$0
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$0
STATE COST		\$0	\$0	\$0	\$0	\$0	\$0
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$0

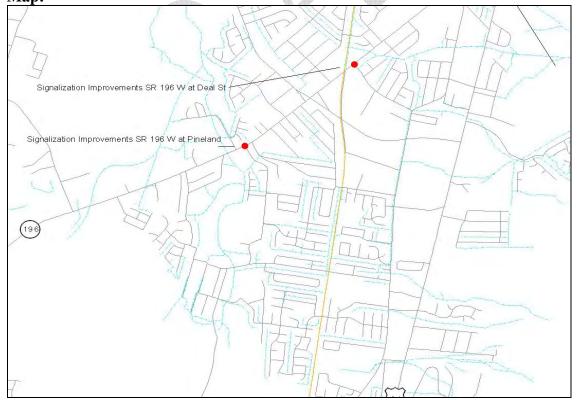


P.I. #: Project Name: Signalization and improvements for SR 196 W at Pineland TIP #:2005-R-1 Ave. COUNTY: Liberty Project Description: Improve the intersection of SR 196 W at Pineland PROJ. #: Ave. FUND: TBD GDOT DISTRICT: 5 TRAFFIC VOL. 2006 ADT: 14,610 YEAR 2030: 17,840 CONG. DISTRICT: 1 NO. OF LANES EXISTING: 4 PLANNED: 4 RDC: CGRDC LOCAL ROAD #: STATE/US ROAD #: SR 196 W LENGTH (MI): NA

COMMENTS/REMARKS: MPO desires to seek funds for Project.

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL	
PRELIM. ENGR.		\$0	\$0	\$0	\$0	\$0	\$0	
RIGHT-OF-WAY		\$0	\$0	\$0	\$0	\$0	\$0	
CONSTRUCTION		\$0	\$0	\$0	\$0	\$0	\$0	
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$0	
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$0	
STATE COST		\$0	\$0	\$0	\$0	\$0	\$0	
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$0	

Map:



P.I. #: Project Name: Signalization and Intersection Improvements on US 84 at TIP #:2005-Q-1 Sandy Run COUNTY: Liberty Project Description: Signalization and intersection improvements on US PROJ. #: 84 at Sandy Run FUND: TBD GDOT DISTRICT: 5 TRAFFIC VOL. 2006 ADT: 26,660 YEAR 2030: 33,000 CONG. DISTRICT: 1 NO. OF LANES EXISTING: 4 PLANNED:4 RDC: CGRDC LOCAL ROAD #: STATE/US ROAD #: US 84 LENGTH (MI): NA

COMMENTS/REMARKS: MPO desires to seek funds for Project.

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.		\$0	\$0	\$0	\$0	\$0	\$0
RIGHT-OF-WAY		\$0	\$0	\$0	\$0	\$0	\$0
CONSTRUCTION		\$0	\$0	\$0	\$0	\$0	\$0
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$0
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$0
STATE COST		\$0	\$0	\$0	\$0	\$0	\$0
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$0

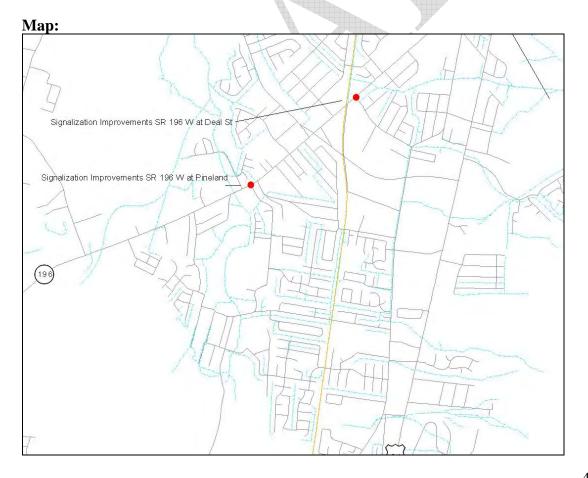


HAMPO FY 2010 – 2013 TIP

P.I. #: TIP #:2005-S-1 **Project Name:** Signalization and improvements for SR 196 W at Deal St. COUNTY: Liberty **Project Description:** Improve the intersection of SR 196 W at Deal St. PROJ. #: FUND: TBD GDOT DISTRICT: 5 TRAFFIC VOL. 2006 ADT:22,940 YEAR 2030: 26,990 CONG. DISTRICT: 1 NO. OF LANES EXISTING: 4 PLANNED: RDC: CGRDC LOCAL ROAD #: STATE/US ROAD #: SR 196 W LENGTH (MI): NA

COMMENTS/REMARKS: MPO desires to seek funds for Project.

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.		\$0	\$0	\$0	\$0	\$0	\$0
RIGHT-OF-WAY		\$0	\$0	\$0	\$0	\$0	\$0
CONSTRUCTION		\$0	\$0	\$0	\$0	\$0	\$0
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$0
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$0
STATE COST		\$0	\$0	\$0	\$0	\$0	\$0
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$0

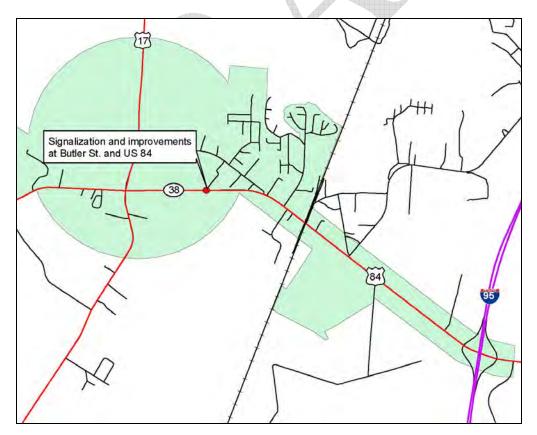


	P.I. #:						
Project Name: Signalization	Project Name: Signalization and improvements for US 84 at Butler St.						
			COUNTY: Liberty				
Project Description: Improv	e the intersection	n of US 84 W at Butler St.	PROJ. #:				
			FUND: TBD				
			GDOT DISTRICT: 5				
TRAFFIC VOL.		YEAR 2030:	CONG. DISTRICT: 1				
NO. OF LANES EXISTING: 4		PLANNED:	RDC: CGRDC				
LOCAL ROAD #:	#: US 84	LENGTH (MI): NA					

COMMENTS/REMARKS: MPO desires to seek funds for Project. This is an unfunded high priority project in the US 84 Corridor.

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.		\$0	\$0	\$0	\$0	\$0	\$0
RIGHT-OF-WAY		\$0	\$0	\$0	\$0	\$0	\$0
CONSTRUCTION		\$0	\$0	\$0	\$0	\$0	\$0
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$0
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$0
STATE COST		\$0	\$0	\$0	\$0	\$0	\$0
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$0

Map:



P.I. #: TIP #:2005-U-1 Project Name: Signalization and improvements for US 17 and SR 119 COUNTY: Liberty Project Description: Improve the intersection of US 17 and SR 119 PROJ. #: FUND: TBD **GDOT DISTRICT: 5** TRAFFIC VOL. YEAR 2030: CONG. DISTRICT: 1 NO. OF LANES EXISTING: 2 PLANNED: RDC: CGRDC LOCAL ROAD #: STATE/US ROAD #: US 84 and US 17 LENGTH (MI): NA

COMMENTS/REMARKS: MPO desires to seek funds for Project. A portion of this improvement project includes the relocation and improvements of Chemtal Industrial Park entrance at a cost of \$275,025 including PE and Construction. This expense is excluded from the calculations shown below and will be borne by Chemtal.

PROJECT PHASE	\$ SOURCE	FY 2010	FY 2011	FY 2012	FY 2013	TIP TOTAL	PROJECT TOTAL
PRELIM. ENGR.	=	\$0	\$0	\$0	\$0	\$0	\$51,600
RIGHT-OF-WAY	İ	\$0	\$0	\$0	\$0	\$0	\$12,500
CONSTRUCTION	-	\$0	\$0	\$0	\$0	\$0	\$450,000
PROJECT COST		\$0	\$0	\$0	\$0	\$0	\$514,100
FEDERAL COST		\$0	\$0	\$0	\$0	\$0	\$0
STATE COST		\$0	\$0	\$0	\$0	\$0	\$0
LOCAL COST		\$0	\$0	\$0	\$0	\$0	\$0

Map:



FY 2010 – 2013 FEDERAL AND STATE FUNDED TRANSIT PROJECTS

FY 2010-2013 Capital Improvement Justification for Liberty Transit

The Hinesville Area Transit program as of this writing is scheduled to be operational by April 2010. The tables below include the programming of American Reinvestment and Recovery Act (ARRA) capital transit assistance as well as the use of Title 49 U.S.C. Section 5307 Urbanized Area Formula Program funds. The tables below show the Liberty Transit system costs.

Project Name: C	apital Assistance Urban Transit							P.1.#					
Project Description: American Recovery and Reinvestment Act (ARRA) and										2008-TI	31		
									TIP#: 2008-TR1 COUNTY: Liberty				
	Section 5307 (Urban Capital) Expe							PROJ. #:					
	Transit system in Hinesville-Fleming	gton-Fort Ste	wart					FUND: AR	RA, 49 USC	5307			
	The state of the s							GDOT DIS	TRICT: 5				
								CONG. DIS	TRICT: 1				
								RDC: CGR	DC				
COMMENTS/REMA	ARKS:												
\$ SOURCE	CAPITAL ITEM / DESCRIPTION	UNIT COST	I	FY 2010		FY 2011		FY 2012		FY 201	13	ТО	TAL
ARRA	24-passenger Transit Bus Vehicles (9)	\$ 117,7	00	\$	1,059,300	\$	=5	s	-	\$	-	\$	1,059,300
ARRA	Preventive Maintenance		VA	S	6,300	\$	- 2	s	-	\$	- 6	s	6,300
ARRA	Bus stop signage (50)	s	35	\$	1,750	\$	- 0	s		s	- 2	\$	1,750
ARRA	Mobility Management (planning studies)	2 _ 4	VA	\$	200,000	\$		s	-	s		\$	200,000
ARRA	Bus shelters (8)		VA.	\$	80,000	s	J	s		\$	2	5	80,000
ARRA	Safety / Security (DriveCam cameras) (9)	s 2,0	00	\$	18,000	\$	- %	s	-1-	\$	-8	s	18,000
ARRA	Other capital items		VA	\$	28,876	\$	28,876	s	28,876	\$	28,876	\$	115,502
ARRA	GPS - Automatic Location Devices System (9)		VÁ.	s	50,000	\$		\$	-	\$	- 3	\$	50,000
ARRA	Operations and Maintenance Facility	\$ 450,0	00	\$	450,000	\$	- 2	s		s	A	\$	450,000
49 USC 5307	Preventive Maintenance	1	VA.	\$	6,615	s	6,946	S	7,293	\$	7,658	5	28,511
49 USC 5307	Mobility Management (planning studies)		NA.	\$	1.	\$	40,000	s	40,000	\$	40,000	s	80,000
49 USC 5307	Support Equipment	1	VA.	\$	14.	S	1,000	s	1,000	S	1,000	S	2,000
TOTAL COST OF	PROJECTS		_	\$	1,900,841	\$	76.821		77 169	\$	77,533	-	2.091,363
FEDERAL COST				\$	-	\$	× 1	\$	-	S	12	S	
STATE COST				\$	19	S	8	S	-	\$	8	5	
LOGAL COST				\$	1+-	\$		S		S		S	-

HAMPO FY 2010 – 2013 TIP

Project Name: Operations Assistance Schedule for Public Transit P.I.#: TIP#; 2008-TR2 Project Description: Section 5307 (Urban Operating) Expenses for the Liberty COUNTY: Liberty Transit system in Hinesville-Flemington-FortStewart. PROJ. #: Funding is estimated to provide for net operating costs. FUND: 49 USC 5307 GDOT DISTRICT: 5 CONG. DISTRICT: 1 RDC: CGRDC COMMENTS/REMARKS: operations. in the state. These funds will be requested by the City of Hinesville. Supplemental funding above the apportionment to the Hinesville Urbanized Area is not guaranteed. 3. Estimated operating revenue is excluded from operations cost estimates. FY 2010 1.2 FY 2011² FY 2013² DESCRIPTION FY 2012 2 \$ SOURCE TOTAL 49 USC 5307 Operations Assistance \$ 866,667 \$ 1,365,000 \$ 1,433,250 \$ 1,504,913 3,664,917 TOTAL COST OF PROJECTS 866,667 \$ 1.365,000 S 1,433,250 \$ 1.504.913 3,664,917 \$ FEDERAL COST \$ 433,333 \$ 682,500 \$ 716,625 \$ 752,456 2,584,915 STATE COST \$ LOCAL COST 2,584,915 433,333 \$ 682,500 \$ 716,625 S 752,456 S \$



FY 2010 – 2013 FEDERAL AND STATE FUNDED AVIATION PROJECTS

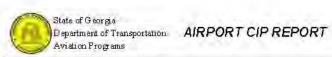
*The following information is non-binding and for informational use only.





10/2/2009

Fiscal Year	FORT STEWART(HINESVILLE) - WRIGHT A Description	Federal Cost	State Cost	Local Cost	Total Cost
2006					
	Rehabilitate Runway 6/24	\$2,505,083	\$659,232	\$65,923	\$3,230,238.00
	Annual Total:	\$2,505,083	\$659,232	\$65,923	\$3,230,238
2009					
	Rwy Ext Feasibility Study, ALP Update; Design Rehabilitaito	\$128,697	\$81,049	\$29,274	\$239,020.00
	Annual Total:	\$128,697	\$81,049	\$29,274	\$239,020
	Grand Total:	\$2,633,780	\$740,281	\$95,197	\$3,469,258



10/2/2009

riscal Year	Description	Federal Cost	State Cost	Local Cost	Total Cost
2010					
221,5	RUNWAY 15/33 AND TAXIWAY "B" REHABILITATION	\$1,912,350	\$50,325	\$50,325	\$2,013,000
	EA - RUNWAY 6/24 EXTENSION	\$33,250	\$875	\$875	\$35,000
	DESIGN - EXTENSION OF RUNWAY 6/24 AND AND TAXI	\$223,250	\$5,875	\$5,875	\$235,000
	2011 DBE PLAN UPDATE	\$7,125	\$188	\$187	\$7,500
	Annual Total:	\$2,175,975	\$57,263	\$57,262	\$2,290,500
2011	Teaching and the second and the second second second second			4.700.400	a Vol. 630
	CONSTRUCT CORPORATE HANGARS (3)	\$0	\$0	\$900,000	\$900,000
	DESIGN - GA HANGAR PHASE 2 AND FENCING	\$64,125	\$1,688	\$1,687	\$67,500
	CONSTRUCT RUNWAY 6/24 1500' EXTENSION & PARTI	\$5,237,350	\$137,825	\$137,825	\$5,513,000
	2012 DBE PLAN UPDATE	\$7,125	\$188	\$188	\$7,500
	Annual Total:	\$5,308,600	\$139,701	\$1,039,700	\$6,488,000
2012	INSTALL SECURITY FENCING - PERIMETER	\$760,000	\$20,000	\$20,000	\$800,000
	2013 DBE PLAN UPDATE	\$7,125	\$188	\$187	\$7,500
	CONSTRUCT GA HANGARS - PHASE 2	\$0	\$0	\$713,000	\$713,000
	DESIGN - GLIDE SLOPE AND MALSR	\$47,500	\$1,250	\$1,250	\$50,000
	Annual Total:	\$814,625	\$21,438	\$734,437	\$1,570,500
2013	Commercial	man (mt)	War Salah		, c/20, a/a
	DESIGN - PARTIAL PARALLEL TAXIVVAYFOR RUNWAY	\$90,250	\$2,375	\$2,375	\$95,000
	GLIDE SLOPE/LOCALIZER AND MALSF	\$1,722,350	\$45,325	\$45,325	\$1,813,000
	Annual Total:	\$1,812,600	\$47,700	\$47,700	\$1,908,000
2014	A service of the serv		22.00	V7V0000	0.7000
	CONSTRUCT PARTIAL PARALLEL TAXIVVAY FOR 15/33	\$0	\$984,750	\$328,250	\$1,313,000
	Annual Total:	\$0	\$984,750	\$328,250	\$1,313,000
	Grand Total:	\$10,111,800	\$1,250,852	\$2,207,349	\$13,570,000

APPENDIX A

PUBLIC INVOLVEMENT MATERIALS

Public Affairs

The following meetings are open to the public.

City of Allenhurst

Allenhurst City Council typically meets at 7:30 p.m. on the first Monday of the month. For information, call 876-2180.

City of Flemington

Flemington City Council typically meets at 4:30 p.m. on the second Tuesday of the month. For information, call 877-3223.

City of Gum Branch

Gum Branch City Council typically meets the third Monday of every month at 7:30 p.m. For information, call 876-5945.

City of Hinesville

Hinesville City Council typically meets at 1 p.m. on the first and third Thursdays of the month in the main council room on the second floor. For more information call 876-3564.

City of Ludowici

Ludowici City Council typically meets at 6 p.m. each second Tuesday at city hall. The meeting is open to the public.

City of Midway

Midway City Council typically meets at 6 p.m. on each second Monday of the month. City hall is open every Monday through Friday from 8 a.m. to 4 p.m. For information, call Gloria at 884-3344.

City of Riceboro

Riceboro City Council typically meets at 6 p.m. on the first Tuesday of the month. For information, call 884-2986.

City of Walthourville

Walthourville City Council typically meets at 6 p.m. on the second and fourth Thursday of the month. For information, call 368-7501.

Coastal Society of Human Resource Management

Coastal Society of Human Resource Management meets on the fourth Thursday of every month. If you are a human resource professional and would like to attend a meeting or receive more information, call Holly Stevens-Brown at 876-3564.

Hinesville Downtown Development Authority

The Hinesville Downtown Development Authority typically meets every fourth Thursday at 1 p.m. in the city hall council room. The public is welcome to attend to gain an understanding of the plans for Hinesville's downtown district. For more information, call Vicki Davis at 368-3473.

Hinesville Planning Committee

Hinesville Area Metropolitan Planning Commission Policy Committee typically meets on the second Thursday of even months at 10 a.m. in city hall. For information, call Brandon Wescott at 408-2030.

Liberty Consolidated Planning Commission

1000

APPENDIX G

AIR QUALITY / AIR INVENTORY



2007 AIR EMISSIONS INVENTORY FORT STEWART, GEORGIA

Prepared for:
Department of the Army
Headquarters 3rd Infantry Division (Mechanical) and Fort Stewart
Directorate of Public Works, Environmental Branch
Fort Stewart, GA 31314-4927

Prepared Under Contract With:
U.S. Army Corps of Engineers, Norfolk District
803 Front Street
Norfolk, VA 23510-1096
Contract Number: W91236-04-D-0083-0110

Prepared by:

Versar, Inc., GEOMET Division 20251 Century Blvd. Germantown, MD 20874

March 2009

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LIST OF ABBREVIATIONS AND ACRONYMS

AAFES Army and Air Force Exchange Service

AEI Air Emissions Inventory
AFFF aqueous film forming foam

AP-42 Compilation of Air Pollutant Emission Factors – Volume 1

AST Aboveground Storage Tank AQCR Air Quality Control Region

atm atmosphere(s)

bbl barrel Bldg. Building

Btu British thermal unit(s)

CAA Clean Air Act

CAAA Clean Air Act Amendments of 1990

CEP Central Energy Plant
CFC chlorofluorocarbon
CO carbon monoxide

COCO Contractor Owned Contractor Operated

CTG cartridge cuft cubic foot CY calendar year

DCAS Directorate of Community Activities and Services

DMMC 3rd Infantry Division

DODIC Department of Defense Identification Code

DOL Directorate of Logistics
DOR Directorate of Readiness
DPW Directorate of Public Works

EG Emission Guideline

EOD Explosive Ordnance Disposal

EPA U.S. Environmental Protection Agency EPD Environmental Protection Division

Eq. Equation

°F degrees Fahrenheit

FIRE Factor Information Retrieval System, Version 6.2

ft feet

ft² square feet ft³ cubic feet g gram(s) gal gallon(s)

GANG Georgia Army National Guard

gmol gram mole(s)

GOV government-owned vehicles

gr grain(s)

HAP hazardous air pollutant
HCFC hydrochlorofluorocarbon
HFC hydrofluorocarbon

hp horsepower hr hour(s)

HVAC heating, venting, and air conditioning

HVLP high volume-low pressure

IC internal combustion ID identification

IWWTP Industrial Wastewater Treatment Plant

JP-8 jet propellant no. 8 (jet fuel) k methane generation rate

°K degrees Kelvin
kg kilogram(s)
kW kilowatt(s)
L liter
lb pound(s)
lb-mol pound mole(s)

Lo methane generation capacity
LPG liquefied petroleum gas

m³ cubic meter(s)

MACT Maximum Achievable Control Technology
MATES Mobilization and Training Equipment Site

Mg Megagrams

MIBK methyl isobutyl ketone

MIDAS Munition Items Disposition Action System

min minute mm millimeter

MM million (in Table 14-1 MM is used to represent millimeters)

MMBtu million British thermal units

mo month

M&O munitions and ordnance

MOGAS motor gasoline

MSDS material safety data sheet(s)
MTBE methyl tert-butyl ether

NAAQS national ambient air quality standards

NESHAP national emission standard(s) for hazardous air pollutants

NEW net explosive weight

NG natural gas

NGTC National Guard Training Center
NMTOC non-methane total organic compounds

No. Number
No. 2 distillate oil
NO_X oxides of nitrogen
NSN national stock number

NSPS new source performance standards

OB open burning OD open detonation

ODC ozone depleting chemical ozone depleting substance

%v percent by volume %w percent by weight

oz ounce Pb lead

PM particulate matter

PM-2.5 particulate matter with an aerodynamic diameter less than 2.5 microns PM-10 particulate matter with an aerodynamic diameter less than 10 microns

POC point of contact

POM polycyclic organic matter
POV privately owned vehicles
ppmv part(s) per million by volume
psi pound(s) per square inch

psia pound(s) per square inch, absolute

PTE potential to emit
Ref Reference

RFMSS Range Facility Management Support System

°R degrees Rankine
RVP Reid vapor pressure
SCL South Central Landfill

SG specific gravity SO_2 sulfur dioxide SO_X oxides of sulfur

TANKS4.0 storage tank emissions calculation software, version 4.0

THC total hydrocarbons
TOC total organic compounds
2,2,4-TMP 2,2,4-trimethylpentane

tpy ton(s) per year

TSP total suspended particulate matter

UST underground storage tank
VOC volatile organic compounds
WAAF Wright Army Airfield

wk week

WWTP wastewater treatment plant

yr year(s) μm micrometer

EXECUTIVE SUMMARY

Versar, Inc. (GEOMET Division) performed an air emission inventory for the year 2007 for Fort Stewart, Georgia. The US Army Corp of Engineers, Norfolk District, awarded the work. The emission inventory is an important tool that can be used to ensure that Fort Stewart's Title V permit is up to date, provides backup to fee payment determinations and can be used as a tool to help comply with air quality regulations.

With respect to environmental regulations, Fort Stewart is located in the Savannah-Beaufort Interstate Air Quality Control Region (AQCR), an area classified as attainment/unclassifiable for all national ambient air quality standards. In an attainment area a facility is considered a major source if its emissions of criteria pollutants (regulated pollutants under the Clean Air Act) exceed 100 tons per year (tpy). This definition may change if the attainment status of the region changes. The source can also become a major if any of the potential emissions of any individual regulated hazardous air pollutant (HAP) is more than 10 tpy or potential emissions of all HAP combined is more than 25 tpy. This inventory verified Fort Stewarts's status as a "major source" for criteria pollutants and for HAP.

Air emission estimates in this inventory are based on the data collected by Versar engineers during two visits that were conducted in the summer and early fall of 2008. Data was also obtained through telephone discussions and email. Emissions have been calculated for different air emission source categories that include Heating Units, Stationary Internal Combustion Engines, Engine Testing, Abrasive Blasting, Storage Tanks, Fueling Operations, Spray Painting Booths, Organic Solvent Cleaning Units, Miscellaneous Product Usage, Landfills, Wastewater Treatment, Prescribed Burning, Ordnance Detonation, Refrigerant Usage, Fire Fighter Training, and Wood Working. Emissions were calculated for criteria pollutants and HAP. Both actual and potential emissions have been estimated and included in this report. In addition, emissions of ozone depleting substances covered under Title VI of the Clean Air Act have been estimated. The following table presents the total (actual and potential) 2007 emissions for criteria pollutants and hazardous air pollutants for Fort Stewart.

Total Facility Wide Emissions* (Actual and Potential)

For the Year 2007

Emission Type	СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC	НАР
Actual (lb/yr) ^a	36,325	49,291	4,066	9,161	5,304	5,271	254,466	29,703
Actual (lb/yr) ^b	18,481,032	353,679	4,124	2,850,508	2,067,050	2,067,017	703,317	35,362
Actual (ton/yr) ^a	18.2	24.6	2.0	4.6	2.7	2.6	127.2	14.9
Actual (ton/yr) ^b	9,240.5	176.8	2.1	1,425.3	1,033.5	1,033.5	351.7	17.7
Potential (lb/yr) ^c	1,089,300	1,340,458	567,788	102,462	64,479	60,689	740,224	179,268
Potential (ton/yr) ^c	544.6	670.2	283.9	51.2	32.2	30.3	370.1	89.6

Table Notes:

- * CO: Carbon Monoxide, NO_X: Oxides of Nitrogen (used to represent NO₂), SO₂: Sulfur Dioxide, PM: Particulate Matter, PM-10: Particulate Matter less than 10 microns, PM-2.5: Particulate Matter less than 2.5 microns, VOC: Volatile Organic Compounds (precursor for ozone formation), HAP: Hazardous Air Pollutant, Lead emissions are included under the HAP category.
- ^a Total without Prescribed Burning and Ordnance Detonation.
- ^b Total with Prescribed Burning and Ordnance Detonation.
- ^c Totals **do not include** criteria pollutants from fugitive emission source categories- Prescribed Burning, Ordnance Detonation, Miscellaneous Product Usage, Wastewater Treatment, Fire Fighting Training Exercises, and Landfills without gas collection device(s). Emissions of criteria pollutants from these fugitive emission source categories are not included in installation-wide Title V potential-to-emit calculations. HAP emission totals reflect emissions from all source categories including the fugitive emission sources.

The pollutant emission rates from the fugitive emission source categories for prescribed burning and, to a much lesser degree, for ordnance detonation with respect to PM are many times/orders of magnitude greater than the emission rates from the point source emission categories. Therefore, relatively small year-to-year changes in these fugitive source categories (particularly prescribed burning) will greatly affect Fort Stewart's total annual emissions, even if the level of activity for all the other point source categories remains relatively consistent from year to year. As a result, for comparison purposes between years for the point source categories and with potential emissions, the actual emission totals are shown with and without ordnance detonation and prescribed burning.

If prescribed burning and ordnance detonation are not considered, the pollutant with the highest emission rate is VOC (127.2 tpy). NO_x had the next highest emission rate (24.6 tpy). All other pollutants had emission rates less than 20 tpy. If prescribed burning is considered, emission rates increase dramatically. For example, VOC emission rate becomes 351.7 tpy and several other pollutants exceed 1,000 tpy. Overall emissions in 2007 were lower than 2006 primarily because of increased use of natural gas at the Central Energy Plant over the use of oil and wood, reduced paint use, less gallons of gasoline dispensed, and less prescribed burning.

Potential emissions were highest for NO_X (670.2 tpy) and CO (544.6 tpy). Since these and the emission rates for VOC and SO₂ are above 100 tons per year, Fort Stewart continues to be a major source for criteria pollutants. Potential combined HAP emissions are estimated to be 89.6 tpy. Therefore, Fort Stewart also continues to be a major source for HAP. As a result, Fort Stewart must comply with Maximum Achievable Control Technology (MACT)/National Emissions Standards for Hazardous Air Pollutants (NESHAP) requirements that apply to major HAP sources.

1.0 Introduction

1.1 BACKGROUND

VERSAR Inc (GEOMET Division), under a contract through the US Army Corps of Engineers, Norfolk District, prepared an emission inventory update for Fort Stewart, Georgia for calendar year 2007. The scope of work included emission estimation for criteria pollutants and hazardous air pollutants (HAP) regulated under Title III of the Clean Air Act Amendments of 1990 (CAAA). The procedures for preparing the emission estimates, and emissions results for both actual and potential emissions are presented.

Results from the inventory provide emission source data that can be used to 1) determine the need for and provide the data for permits/permit update(s) (including Title V), 2) identify sources subject to air pollution control requirements, and 3) provide data that can be used to determine annual emission statement fees.

1.2 AIR PERMITTING STATUS

Fort Stewart is located in the Savannah-Beaufort Interstate Air Quality Control Region (AQCR), an area classified by the U.S. Environmental Protection Agency (EPA) as attainment/unclassifiable for all national ambient air quality standards (NAAQS) for all criteria pollutants. As per Clean Air Act requirements, a source having potential to emit more than 100 tons per year of any of the criteria pollutants is considered a major source. Sources can also become a major if the potential emissions for any single HAP exceed 10 tons per year or combined HAP exceeds 25 tons per year. Fort Stewart is a major source for criteria pollutants and HAP, and thus is subject to Title V permit requirements of the Clean Air Act. As a result, Fort Stewart has obtained a Title V permit.

1.3 METHODOLOGY

This emission inventory is based on the operations during calendar year 2007. The emissions have been estimated for all criteria pollutants and HAP, and are based on the operational data collected during the site visits by Versar. Engineers from Versar visited the installation during July and September of 2008. During the visits, information was obtained from source operators and managers. A list of the persons contacted is given in Table 1.0. Some of the information was obtained through follow-up telephone conversations and email. Other sources of information, such as a recent Title V renewal application and field reports of Versar engineers' monthly site visits, have been used to verify the information. A complete verification of air emission sources through a site inspection was not done, as this was beyond the scope of this effort.

Emissions have been calculated for different emission source categories, including Heating Units, Stationary Internal Combustion (IC) Engines, Engine Testing, Abrasive Blasting, Storage Tanks, Fueling Operations, Spray Painting Booths, Organic Solvent Cleaning Units,

Miscellaneous Product Usage, Landfills, Wastewater Treatment, Prescribed Burning, Ordnance Detonation, Refrigerant Usage, Fire Fighter Training, and Wood Working. Technical data for calculations, such as emission factors or variable values, have been taken from standard reference documents. A list of references has been provided at the end of this report in Section 19.0.

This 2007 update includes all the emission source categories that were included in the previous 2006 inventory.

TABLE 1.0 Points of Contact

Emission Source Category	Point of Contact (POC)	POC Organization	Data Description	Phone Number
Boilers & Heaters	Victoria Post	Griffin Services	DPW 2007 Boiler List	912-767-6828
Boners & Francers	Robert Smith	GANG Maintenance	GANG Boiler Data	912-213-1225
	Robert Woods	J&J Maintenance, Hospital and Dental Clinics	Boiler Fuel Use	912-876-6030
	Billy Todd	GANG	GANG Natural Gas Use	912- 767-9731 or 912- 448-4053
	Denise Kelley	DPW	Fuel Oil Use (Except CEP)	912-767-5027
	David Montano	DPW Environmental	Fort Stewart Rolling Fuel Log (Includes CEP)	912-767-0250
	Randy Parks	CEP/Griffin Services	CEP Boiler Use	912-767-1676
Internal	Victoria Post	Griffin Services	DPW 2007 Generator List	912-767-6828
Combustion Engines	Robert Woods	J&J Maintenance, Hospital and Dental Clinics	Emergency Generator Use	912-876-6030
	Adam Seiler	Willbros Gov't Service	COCO Emergency Generator	912-876-6858
	Robert Smith	GANG Maintenance	Emergency Generator	912-213-1225
Engine Testing	Harry Sikes, Bobby Parker, and Jack Willson	Maint. Div. DOL	Engine Test Data	912-767-2113
Abrasive Blasting	Greg Upperman	Maint. Div. DOL	Blast Media, Bldg. 1170, 1065	912-767-8386
8	Allan Deloach	DOL	Blast Media, Bldg. 1074	912-767-8352 or 2599
	CW5 Leslie Groover	GANG MATES	Abrasive Amount Used	912-448-4277
Fueling Operations & Storage Tanks	Debra Downs	AAFES/Victory Shoppette	Service Station Data/ Fuel Throughput	912-876-8434
a storage ramas	Mary Ann or Lavay Sphar	AAFES/Bryan Village Shoppette	Service Station Data/ Fuel Throughput	912-368-2237
	Denise Kelley	DPW	Fuel/Diesel Fuel Tanks (Except CEP)	912-767-5027
	Glen Golden	GANG Bldg. & Grounds	Fuel Throughput Bldg. 10511 (near Bldg. 10506)	912-448-4082
	Adam Seiler	Willbros Gov't Service	COCO Fuel Storage/Transfer/Dispensing	912-876-6858
	Greg Upperman	Maint. Div. DOL	Fuel Storage/Dispensing Bldg. 1175 & 1171	912-767-8386
	Sam Hunes	DPTMS Range Control (Chief Supply & Maintenance)	Storage Tanks/Fuel Use for Ranges	912- 435-8099

Emission Source Category	Point of Contact (POC)	POC Organization	Data Description	Phone Number
	Cheryl Noel	DPW	Forestry Fuel Use, Bldg. 8064	912-767-1002
	Jim Clapp	DOL	Diesel fuel usage at Bldg. 17003	912-435-0146 (Cell 912-320- 5845)
	Craig Christopher	DPW	Off spec JP-8, Bldg. 1157	912-767-1234
	Steven Gordon	DPW	Fuel Dispensing/Storage at Bldg. 1412	912-767-8242
	Scott Tootle	GANG MATES	Fuel Dispensing /Storage at Bldg. 10522	912-767-5150
	Adrienne T. Freda	DPW Environmental	Golf Course Fuel Use	912-767-7921
	David Montano	DPW Environmental	Bldg 2902 Fuel Use Log	912-767-0250
	Randy Powell-Jones	DPW Environmental	List of Storage Tanks	912 767-3566
Spray Paint Booths	Allan Deloach	DOL	DOL Paint Use, Bldg. 1073	912-767-8352 or 2599
	SGT. Major Hall/ Lt. Boutwell	GANG	Paint Booth, Bldg. 10531	912-448-4282
	Victoria Post	Griffin Services	Verification Rregarding DPW Paint Booth	912-767-6828
	David Montano	DPW Environmental	Paint Logs (MILVAN, Tracks, Bldg. 1073, & 10531)	912-767-0250
Organic Solvent Cleaning Units	Various	Various	Building Walk Through Inspections	N/A
Miscellaneous	Barbra Mize	DOL, Hazmart	Miscellaneous Chemical List	912-767-2950
Product Usage	Mary Smiley	GANG	GANG Miscellaneous Chemical Use	912-448-4284
Landfills	Ron King	DPW Environmental	All Landfills / Capacity Reports	912-767-8880
Wastewater	Stanley Thomas	DPW Environmental	-	912 - 767-4139
Treatment	David Montano	DPW Environmental	Permitted Flows & Actual 2007 Flows	912-767-0250
Prescribed Burning	David Pope	DPW- Forestry Branch	Acres & Vegetation Burned (via email to David Montano)	912- 767-5184
Ordnance	Srgt. Mercer	38th Ord Co (EOD)	Explosive Ordnance Disposal	912- 767-0146
Detonation	James Pearson	Training Division Directorate of Plans, Training, Mobilization and Security	Ordnance Expended	912- 767-8679
	Brenda Higginbotham	Training Ammunition Manager	Ordnance Data	912-767-3888
Refrigerant Use	CW5 Leslie Groover	GANG MATES	Refrigerant Used	912-448-4277
nonigerant osc	James Shepard	GANG MATES	Refrigerant Used	912-448-4301
	Robert Smith	GANG Maintenance	Refrigerant Used	912-213-1225
	Victoria Post	Griffin Services	DPW Refrigerant Used	912-767-6828
Fire Fighter Training	Jackie Goode / Johnny Driggers	Fire Prevention and Protection Division, DPS	Propane Used	912-767-7019
Woodworking	CW5 Leslie Groover	GANG MATES	GANG Carpentry Shop – Bldg 10501	912-448-4277
	Victoria Post	Griffin Services	DPW Carpentry Shop Bldg. 1105	912-767-6828
	Mike Croft	-	Carpentry Shop, Bldg. 1065	-

Emission Source Category	Point of Contact (POC)	POC Organization	Data Description	Phone Number
	Robert Smith	GANG Maintenance	Carpentry Shop, Bldg. 10504	912-213-1225
General Data	David Montano	DPW Environmental	Data Various Air Emission Sources	912-767-0250
	Adrienne T. Freda	DPW Environmental	Data Various Air Emission Sources	912-767-7921
	CW5 Leslie Groover	GANG MATES	GANG Various Emission Sources	912-448-4277
	Leroy Lott	MATES Org. Shop (Bldg. 10501	Data Various Air Emission Sources	912-448-4210

Emissions are reported for criteria pollutants [i.e., air pollutants for which air quality "criteria" have been established under Section 108 of the Clean Air Act (CAA)], HAP (as defined by Section 112 of the CAA), and ozone depleting substances, or ODS (as defined by Title VI of the CAA). Criteria pollutants include carbon monoxide (CO), lead, oxides of nitrogen (NO_x) (used to represent NO₂), particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM-10), particulate matter with an aerodynamic diameter less than or equal to 2.5 microns (PM-2.5) sulfur dioxide (SO₂), and ozone (O₃). Ozone is formed in the troposphere by the reaction of NO_x and volatile organic compounds (VOC) in sunlight; therefore, VOC emissions are reported as a surrogate for ozone.

Sources of emissions described in this report have been designated as "significant," "insignificant," or "trivial," as required by the Georgia EPD. Significant sources are capable of emitting substantial amounts of air pollution and must be described in detail in a Title V permit application. Insignificant sources are capable of emitting moderate amounts of air pollution and must be listed in a Title V permit application, but they do not need to be described in detail. Trivial sources are emission units and activities without specific applicable requirements and typically emit very small amounts of air pollution. Emissions from trivial sources must be included in potential-to-emit (PTE) estimates when determining whether a facility is a major source of air pollution. However, because a determination has already been made that Fort Stewart is a major source, trivial emissions were not quantified, and trivial sources are not discussed further in this report.

In addition, this inventory only includes stationary (including fugitive) sources. Mobile sources of air pollution [e.g., government-owned vehicles (GOV), privately-owned vehicles (POV), aerospace ground equipment (AGE), field ground equipment, and aircraft] are not included in the inventory.

Potential emissions from most source categories were determined. Title 40, Part 70.2 of the *Code of Federal Regulations* (40 CFR 70.2) defines potential to emit (PTE) as:

"...the maximum capacity of a stationary source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design, if the limitation is enforceable by the Administrator..."

The approach to preparing potential emission estimates for each source category is described in the appropriate section of the report.

1.4 FORMAT OF THE REPORT

Sections 2.0 through 17.0 present the emission estimates for each source category. Section 18.0 provides a summary of the results. This section includes a facility-wide rollup of actual and potential emissions for criteria pollutants and combined HAP from all source categories. References are given in Section 19.0.

Each of the source category sections is divided into three (3) subsections. The first subsection provides background information on the air emission sources. The second subsection describes how emissions were estimated for the source category (including sample calculations) and provides an emission summary. The emission summary shows the total actual and potential emissions specific to the source category. Any significant changes from the 2006 inventory are provided after the emissions summary. The final subsection provides the details and emissions of each individual source. Any emission factors used in the emission calculations are also provided in this section.

In Section 18, the facility-wide rollup for potential emissions shows all source categories. However, fugitive criteria emissions are not included in installation-wide Title V potential-to-emit calculations. As a result, potential emissions for the sources categories for prescribed burning, miscellaneous product usage, ordnance detonation, wastewater treatment, fire training exercises, and landfills (inactive landfills without gas collection devices) are not included in the facility-wide potential to emit totals.

2.0 HEATING UNITS

Title V Source Designation(s)

 \underline{X} Significant Heating units with heat inputs ≥ 10 MMBtu/hr firing natural gas

and/or LPG

Heating units with heat inputs ≥5 MMBtu/hr firing distillate oil
Heating units with heat inputs >1 MMBtu/hr firing fuels other than

natural gas, LPG, or distillate oil

X Insignificant Heating units with heat inputs < 10 MMBtu/hr firing natural gas

and/or LPG

Heating units with heat inputs <5 MMBtu/hr firing distillate oil

Heating units with heat inputs ≤1 MMBtu/hr

X Trivial Electric heating units and space heaters

2.1 BACKGROUND

Fort Stewart operates and maintains over 2,000 heating units including boilers, water heaters, furnaces, space heaters, and heat pumps. Data regarding the heating equipment including, heat input capacities, fuel types, and annual fuel usage were obtained from organizations and point of contacts (POCs) shown earlier in Table 1.0. Table 2.1 in Section 2.3 provides a summary of heating fuel consumption data provided by the Fort Stewart POCs and Table 2.2 lists the heating sources identified that qualified as either significant or insignificant sources. Space heaters and electric heaters that qualify as trivial heating units were not included in the table or addressed in this report.

Heating on Fort Stewart is accomplished through the use of a Central Energy Plant (Bldg. 1412) and a distributed network of boilers and heaters. The Central Energy Plant (CEP) consists of four boilers. Two of the boilers (H010 and H011) are new, replacing boilers H002 and H003. Boiler H011 came on line very late in 2006. Boiler H010 installation was completed in 2007 and was operated for the first time in December of 2007. Three of the boilers are dual fired units using natural gas and No. 2 oil. The forth boiler (Unit ID H004-S) is a 140 MMBtu/hr boiler that burns wood/bark. In past years this boiler has provided the majority of the installation's heat (on a British thermal units [Btu] basis) however in 2007 this unit burned no wood. The wood fired boiler is also equipped with a Venturi scrubber. Air pollution control equipment is not installed on any of the other heating units on post. All the CEP boilers along with a 12 MMBtu/hr boiler (Unit ID H008-S) have been classified as significant heating units in Fort Stewarts Title V permit.

Natural gas and distillate oil (No. 2) are the fuels fired by the majority of the installation's distributed heating units. In addition there are a small number of units using liquefied petroleum gas (LPG/propane). The input capacities of the distributed boilers and heaters range from less than 0.3 MMBtu/hr up to 7.0 MMBtu/hr. Table 2.2 shown in Section 2.3, lists all the boilers

identified in 2007. Insignificant boilers with heat input capacities ranging from 1 to less than 10 MMBtu/hr have been assigned a unique Unit ID as shown in the Table. Units less than 1 MMBtu/hr have been grouped together based on heat input capacity and the type of fuel used. The units were further segregated based on whether they belonged to the Georgia Air National Guard (GANG) or Fort Stewart.

During 2007, Fort Stewart maintained logs that recorded the quantities of fuel used by the individual boilers at the CEP. In addition, there were post-wide fuel totals available for the distributed units. However, for a number of distributed units burning oil, records of fuel oil deliveries to storage tanks associated with a boiler/heater were used to estimate the heating unit's fuel consumption. For the remaining fuel oil boilers, facility wide fuel usage (minus fuel used by other sources) was assigned using a proportion based on individual unit input capacities.

With the exception of the post clinics (Bldg. 350, 440, and 2115), for the distributed natural gas and LPG fired boilers there was no fuel consumption data available by individual unit. To obtain fuel consumption for these units the facility wide gas/propane usage was proportioned based on individual unit or grouped unit capacities. The same approach was used to assign natural gas use to the GANG units using data obtained from monthly utility bills and compiled in the Fort Stewart rolling fuel log. For example, the calculation used to estimate the quantity of natural gas consumed in heating unit H104-S is presented below.

Unit/Equipment Identification (ID): H104-S

Rated heat input capacity: 1.26 MMBtu/hr

Rated heat input of all natural gas heating units except

those at the CEP, Clinics, and GANG units: 99.551 MMBtu/hr

Natural gas used in all heating units except

those at the CEP, Clinics, and GANG units: 319,862,000 cuft

Fuel use = [(1.26 MMBtu/hr) / (99.551 MMBtu/hr)] * (319,862,000 cuft) * (1/1,000,000) = 4.05 MMcuft

In the cases where a unit's fuel use was estimated rather than measured, there is some uncertainty concerning the actual emissions per heating unit. However, this methodology accurately estimates the aggregate emissions from these heating units. Fuel consumption data by Permit/Unit ID is shown in Section 2.3, Table 2.2.

Base specific information regarding heating values for the various fuels burned in the heating units was not available. Therefore, the following heating values have been used for the fuels burned at Fort Stewart [All values were obtained from AP-42 (Ref. 1)].

Natural Gas =1,020 Btu/ft³ (AP-42, Section 1.4.1) Distillate Oil (No.2 Fuel Oil) = 140,000 Btu/gal (AP-42, Section 1.3.4.3). Liquid Petroleum Gas (LPG)/propane = 90,500 Btu/gal (AP-42, Section 1.5.1) Wood /Bark = 4,500 Btu/lb* (AP-42, Section 1.6.1) (*only used for potential emission calculations in 2007)

2.2 EMISSION ESTIMATES

The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for all heating units.

Actual Emissions

Actual emissions were estimated by multiplying a unit's fuel usage by standard EPA emission factors. The emission factors used are presented in Section 2.3, Tables 2.7 through 2.10. For example, the calculation used to estimate CO emissions from the combustion of fuel oil by heating unit H101-S is presented below.

Unit/Equipment ID: H101-S

Rated heat input: 2.25 MMBtu/hr Type of fuel: Fuel Oil No. 2 Quantity of fuel consumed: 1,827 gal/yr CO emission factor: 5.0 lb/1,000 gal

Actual CO emissions = (1,827 gal/yr) * (5.0 lb/1000 gal)= 9.14 lb/yr

The estimated criteria pollutant emissions from each heating unit are presented in Section 2.3, Table 2.2 and actual HAP emissions are presented in Tables 2.3 and 2.6.

Potential Emissions

The Title V permit base-wide limit to burn no more than 6.62 million gallons of liquid fuels (including No. 2 fuel oil, diesel fuel, JP-8, and used oil) was considered when determining potential fuel use for estimating potential emissions.

For the distributed heating units firing exclusively No. 2 fuel oil or exclusively natural gas, the potential emissions were estimated assuming each heating unit could operate on those fuels 24 hours per day, 365 days per year (i.e., 8,760 hours per year). The rated heat input capacity of each heating unit was divided by the heating value of the fuel and the resulting quotient was multiplied by 8,760 hr/yr to estimate maximum fuel consumption. However, for dual fuel fired heating units using No. 2 fuel oil and natural gas, the quantity of liquid fuel available was obtained after subtracting out (from the Title V limit of 6.62 million gallons) the sum of potential fuel used by 1) engine testing (JP-8), 2) IC engines (No. 2 fuel oil), and 3) No. 2 fuel fired boiler/heater units. The available potential fuel for dual fuel fired heating units was then distributed to the dual fired (natural gas & oil boilers) in the CEP and at Bldg, 350.

Because of permit limits on annual fuel use for the CEP boilers (422,566 gallons for H009-S and 280,000 gallons for H010 and H011 combined) Fort Stewart did not have the potential to reach the facility wide fuel oil limit of 6.62 million gallons. As a result it was not necessary to assign natural gas use to the non-CEP dual fired boilers and thus their potential emissions were based on fuel oil combustion only. The following summarizes the methodology to assign potential fuel use to the individual CEP boilers.

- Old Boilers H002-S and H003-S (Oil and Natural Gas), have been replaced are no longer included in the inventory.
- H004–S (Wood/Bark Fired), no wood burned in 2007, but boiler still exists. Thus potential wood consumption was based on 8,760 hours of boiler operation.
- H009-S (Oil & Natural Gas), in service for all of 2007. Potentials fuel use was based on the boiler's permit limit of 442,566 gallons per year. Based on a maximum fuel firing rate of 395 gal per hour the boiler would operate 1,120 hours per year. The number of hours the boiler could operate on No. 2 fuel oil was then subtracted from the 8,760 hours to establish the number of hours that the unit could operated on natural gas. The result was used to determine potential natural gas consumption.
- H010-S and H011 (Oil & Natural Gas), installation completed in 2007 for H010 (fist use was December 2007). H011 was used operationally for all of 2007. The total combined fuel use limit for H010 and H011 is 280,000 gallons for fuel oil No. 2 and 80 million cubic feet for natural gas. These limits were divided evenly between the two units for the purpose of assigning potential fuel use.

The potential quantity of fuel consumed was multiplied by the appropriate emission factor to estimate potential emissions. For example, the calculation used to estimate potential CO emissions from the combustion of wood/bark in heating unit H004-S is presented below.

Unit ID: H004-S

Rated heat input capacity: 140 MMBtu/hr Type of fuel: Wood/bark

Fuel heating value: 4,500 Btu/lb [9.00 MMBtu/ton]

Potential hours of operation: 8,760 hr/yr CO emission factor: 0.6 lb/MMBtu

Emission factor (lb/ton) = $(0.6 \text{ lb/}10^6\text{btu}) * [(4,500 \text{ Btu/lb} * 2,000 \text{ lb/ton}) / 10^6]$ = 5.4 lb/ton

Potential wood use = (140 MMBtu/hr) * (1 ton/9 MMBtu) * (8,760 hr/yr) = 136,266.67 ton/yr

Potential CO emissions = (136,266.67 ton/yr) * (5.4 lb/ton)= 735,840 lb/yr

The estimated potential pollutant emissions from each heating unit are presented in Section 2.3, Tables 2.4, 2.5 and 2.6.

Emissions Summary

Table 2.0 below indicates the total emissions of criteria pollutants and combined HAP from heating units at Fort Stewart.

TABLE 2.0 Emissions Summary* – Heating Units

Emission Type	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC	НАР
Actual Emissions (lb/yr)	35,326.37	44,809.23	3,763.22	969.59	924.76	910.99	2,462.15	827.95
Actual Emissions (ton/yr)	17.66	22.40	1.88	0.48	0.46	0.46	1.23	0.41
Potential Emissions (lb/yr)	905,331.69	532,681.21	491,092.75	15,657.39	13,107.78	11,736.59	33,597.52	52,008.95
Potential Emissions (ton/yr)	452.67	266.34	245.55	7.83	6.55	5.87	16.80	26.00

^{*} Criteria pollutant lead is also a HAP and thus is included under the HAP category.

Emission Source Updates

The following updates were made from the 2006 inventory.

Central Energy Plant:

• Deleted Unit ID H003-S. Unit ID H003-S and H002-S (removed in 2006 inventory) have been replaced by Unit ID H010-S and H011-S. Also in 2007 the wood fired boiler (Unit ID H-004-S) was not used.

Fort Stewart Distributed Boilers:

- Deleted H110-S (Bldg. 1056): Building was demolished.
- Added H163-S, (Bldg. 3003: 1.12 MMBtu/hr natural gas water heater.
- Added H164-S and H-165-S (Bldg. 3010 and 3011): 1.02 MMBtu/hr natural gas boilers.
- Added H166-S and H-167-S (Bldg. 7500): 2.0 MMBtu/hr natural gas boilers.
- Included emissions for H153-S through H159-S (New Barracks*): 1.02 MMBtu/hr natural gas boilers
 - *: Units were installed in mid/late 2006 & Barracks were mainly unoccupied until late 2006 and early 2007. No emissions were accounted for in 2006 but they are now included in the 2007 inventory.
- H201-S, H202-S, H203-S (Post-wide Boiler Groups): Updated number of units in each group and total combined capacity. Group H203-S was updated with a JP-8 fired steam cleaner located at Building 1171. Group H201-S updates included a steam cleaner at Building 1065.

GANG Distributed Boilers:

• No updates for 2007.

2.3 DETAILED SOURCE AND EMISSIONS TABLES

Table 2.1 provides an overview of base wide fuel consumption; Tables 2.2 through 2.6 provide heater/boiler details and a breakdown of emissions by individual heating unit. Emission factors used in determining emissions are given in Tables 2.7 through 2.10.

TABLE 2.1
Summary of Base-Wide Fuel Consumption for CY2007

Location	Natural Gas (cubic feet)	No. 2 Fuel Oil (gallons)	LPG (gallons)	Wood (tons)
CEP	81,431,770	3,339	-	0
GANG	26,149,000 b	-	-	-
Bldg. 350	2,729,000	0	-	-
Bldg. 440	86,570	-	-	-
Bldg. 2115	84,110	-	-	-
Post-wide ^a	319,862,000	49,613	78,180	-

^a All sources post-wide, excluding CEP, GANG, and Buildings 350, 440, and 2115.

b Total gas use given on Fort Stewart rolling fuel log.

TABLE 2.2 Source Details and Actual Criteria Pollutant Emissions for Heating Units

н.ч.	Building	Maximum	E JE	Estimated	Units of			Ac	tual Emission	s (lb/yr)		
Unit ID	Number	Capacity (MMBtu/hr)	Fuel Type	Annual Fuel Use	Fuel Usage	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
			Wood	0	lb	0	0	0	0	0	0	0
H004-S ^a	1412	140.00	No. 2 Oil	0	gal	0	0	0	0	0	0	0
			NG	0	MMcuft	0	0	0	0	0	0	0
H008-S ^a	350	12.00	No. 2 Oil	0	gal	0	0	0	0	0	0	0
11008-3 330	12.00	NG	1.72	MMcuft	144.78	172.36	1.03	3.27	3.27	3.27	9.48	
11000 Ca	009-S ^a 1412 55.3	55 20	No. 2 Oil	0	gal	0	0	0	0	0	0	0
П009-3	1412	55.50	NG	50.01	MMcuft	4,200.97	5,001.16	30.01	95.02	95.02	95.02	275.06
H010-S ^a	1412	55.30	No. 2 Oil	729	gal	3.65	14.58	51.76	1.46	0.729	0.182	0.248
пото-8	1412	33.30	NG	0.068	MMcuft	5.71	6.80	0.041	0.129	0.129	0.129	0.374
H011-S ^a	1412	55.30	No. 2 Oil	2,610	gal	13.05	52.20	185.31	5.22	2.61	0.65	0.89
П011-8	1412	33.30	NG	31.352	MMcuft	2,633.58	3,135.22	18.81	59.57	59.57	59.57	172.44
H101-S	1	2.25	No. 2 Oil	1,827	gal	9.14	36.55	129.75	3.65	1.97	1.517	0.621
H103-S	350	7.00	NG	1.01	MMcuft	84.46	100.54	0.603	1.910	1.910	1.910	5.53
H104-S	403	1.26	NG	4.05	MMcuft	340.07	404.85	2.43	7.69	7.69	7.69	22.27
H105-S	419	1.38	No. 2 Oil	12,316	gal	61.58	246.33	874.46	24.63	13.30	10.22	4.19
H106-S	421	1.83	NG	5.88	MMcuft	493.91	587.99	3.53	11.17	11.17	11.17	32.34
H114-S	1073	2.75	NG	8.84	MMcuft	742.22	883.59	5.30	16.79	16.79	16.79	48.60
H115-S	1205	1.00	NG	3.21	MMcuft	269.90	321.31	1.93	6.10	6.10	6.10	17.67
H116-S	1245	1.51	No. 2 Oil	4,836	gal	24.18	96.73	343.38	9.67	5.22	4.01	1.64
H117-S	1630	2.00	No. 2 Oil	2,916	gal	14.58	58.32	207.04	5.83	3.15	2.42	0.991
H118-S	4950	1.48	NG	4.75	MMcuft	398.91	474.89	2.85	9.02	9.02	9.02	26.12
H120-S	19104	2.16	No. 2 Oil	4,481	gal	22.41	89.63	318.18	8.96	4.84	3.72	1.52
H121-S	19225	1.20	No. 2 Oil	4,266	gal	21.33	85.32	302.89	8.53	4.61	3.54	1.45
H125-S	100A	1.26	NG	4.05	MMcuft	340.07	404.85	2.43	7.69	7.69	7.69	22.27

и и п	Building	Maximum	D 17	Estimated	Units of			Ac	tual Emission	s (lb/yr)		
Unit ID	Number	Capacity (MMBtu/hr)	Fuel Type	Annual Fuel Use	Fuel Usage	СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
H126-S	100A	1.26	NG	4.05	MMcuft	340.07	404.85	2.43	7.69	7.69	7.69	22.27
H127-S	439	1.47	NG	4.71	MMcuft	395.94	471.36	2.83	8.96	8.96	8.96	25.92
H128-S	1160	1.50	NG	4.82	MMcuft	404.85	481.96	2.89	9.16	9.16	9.16	26.51
H129-S	1160	1.50	NG	4.82	MMcuft	404.85	481.96	2.89	9.16	9.16	9.16	26.51
H130-S	1215	1.08	NG	3.47	MMcuft	291.49	347.01	2.08	6.59	6.59	6.59	19.09
H131-S	1220	1.00	NG	3.21	MMcuft	269.90	321.31	1.93	6.10	6.10	6.10	17.67
H132-S	1320	2.00	NG	6.43	MMcuft	539.79	642.61	3.86	12.21	12.21	12.21	35.34
H133-S	1320	1.70	NG	5.46	MMcuft	458.82	546.22	3.28	10.38	10.38	10.38	30.04
H134-S	1509	1.70	NG	5.46	MMcuft	458.82	546.22	3.28	10.38	10.38	10.38	30.04
H135-S	1509	1.70	NG	5.46	MMcuft	458.82	546.22	3.28	10.38	10.38	10.38	30.04
H136-S	1720	1.70	NG	5.46	MMcuft	458.82	546.22	3.28	10.38	10.38	10.38	30.04
H137-S	1720	2.00	NG	6.43	MMcuft	539.79	642.61	3.86	12.21	12.21	12.21	35.34
H138-S	4502	1.70	NG	5.46	MMcuft	458.82	546.22	3.28	10.38	10.38	10.38	30.04
H139-S	4502	1.70	NG	5.46	MMcuft	458.82	546.22	3.28	10.38	10.38	10.38	30.04
H140-S	4577	1.70	NG	5.46	MMcuft	458.82	546.22	3.28	10.38	10.38	10.38	30.04
H141-S	4577	1.74	NG	5.59	MMcuft	469.62	559.07	3.35	10.62	10.62	10.62	30.75
H142-S	4578	1.70	NG	5.46	MMcuft	458.82	546.22	3.28	10.38	10.38	10.38	30.04
H143-S	7704	1.01	No. 2 Oil	3,741	gal	18.71	74.82	265.61	7.48	4.04	3.11	1.27
H145-S	1340	1.00	NG	3.21	MMcuft	269.90	321.31	1.93	6.10	6.10	6.10	17.67
H146-S	1509	1.00	NG	3.21	MMcuft	269.90	321.31	1.93	6.10	6.10	6.10	17.67
H147-S	1510	1.00	NG	3.21	MMcuft	269.90	321.31	1.93	6.10	6.10	6.10	17.67
H148-S	1620	1.00	NG	3.21	MMcuft	269.90	321.31	1.93	6.10	6.10	6.10	17.67
H149-S	2916	1.29	NG	4.14	MMcuft	347.90	414.16	2.48	7.87	7.87	7.87	22.78
H150-S	10531	2.54	NG	8.16	MMcuft	685.54	816.12	4.90	15.51	15.51	15.51	44.89
H151-S	5602	1.13	NG	3.64	MMcuft	305.52	363.72	2.18	6.91	6.91	6.91	20.00
H152-S	HQ C&C	1.83	NG	5.87	MMcuft	493.10	587.03	3.52	11.15	11.15	11.15	32.29

н.:и гр	Building	Maximum	E 17	Estimated	Units of			Ac	tual Emission	s (lb/yr)		
Unit ID	Number	Capacity (MMBtu/hr)	Fuel Type	Annual Fuel Use	Fuel Usage	со	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
	Center											
H153-S	3004	1.02	NG	3.28	MMcuft	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H154-S	3005	1.02	NG	3.28	MMcuft	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H155-S	3006	1.02	NG	3.28	MMcuft	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H156-S	3007	1.02	NG	3.28	MMcuft	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H157-S	3008	1.02	NG	3.28	MMcuft	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H158-S	3009	1.02	NG	3.28	MMcuft	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H159-S	3012	1.02	NG	3.28	MMcuft	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H160-S	DFAC	1.13	NG	3.61	MMcuft	303.63	361.47	2.17	6.87	6.87	6.87	19.88
H162-S	1540	1.00	NG	3.21	MMcuft	269.90	321.31	1.93	6.10	6.10	6.10	17.67
H163-S	3003	1.12	NG	3.60	MMCUFT	302.28	359.86	2.16	6.84	6.84	6.84	19.79
H164-S	3010	1.02	NG	3.28	MMCUFT	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H165-S	3011	1.02	NG	3.28	MMCUFT	275.29	327.73	1.97	6.23	6.23	6.23	18.03
H166-S	7560	2.00	NG	6.43	MMCUFT	539.79	642.61	3.86	12.21	12.21	12.21	35.34
H167-S	7560	2.00	NG	6.43	MMCUFT	539.79	642.61	3.86	12.21	12.21	12.21	35.34
H201-S	POST WIDE (0.3-<1)	29.27	NG	94.14	MMcuft	7,907.52	9,413.71	56.48	178.86	178.86	178.86	517.75
H202-S	POST WIDE (<0.3)	6.34	NG	20.46	MMcuft	818.36	1,923.14	12.28	38.87	38.87	38.87	112.52
H203-S	POST WIDE (0.3-<1)	5.50	No. 2 Oil	10,706	gal	53.53	214.11	760.10	21.41	11.56	8.89	3.64
H204-S	POST WIDE (<0.3)	0.68	No. 2 Oil	878	gal	4.39	15.80	62.33	0.35	0.35	0.35	0.626
H205-S	POST WIDE (0.3-<1)	1.42	LPG	51,065	gal	382.99	663.85	2.76	35.75	35.75	35.75	51.07
H206-S	POST WIDE (<0.3)	0.75	LPG	27,115	gal	203.36	352.49	1.46	18.98	18.98	18.98	27.11
H208-S	GANG-9100 (<0.3)	1.54	NG	0.489	MMcuft	19.55	45.95	0.293	0.929	0.929	0.929	2.69

Unit ID	Building	Maximum Capacity	E al T	Estimated	Units of Fuel			Ac	tual Emission	s (lb/yr)		
Unit ID	Number	(MMBtu/hr)	Fuel Type	Annual Fuel Use	Usage	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
	GANG- 9100 (0.3-<1)	1.94	NG	0.614	MMcuft	51.61	61.44	0.369	1.17	1.17	1.17	3.38
H209-S	GANG-9500 (<0.3)	2.74	NG	0.869	MMcuft	34.77	81.72	0.522	1.65	1.65	1.65	4.78
H210-S	GANG-9900 (<0.3)	2.89	NG	0.917	MMcuft	36.66	86.15	0.550	1.74	1.74	1.74	5.04
H211-S	GANG-10100 (<0.3)	1.87	NG	0.592	MMcuft	23.70	55.69	0.355	1.13	1.13	1.13	3.26
H211-8	GANG-10100 (0.3-<1.0)	3.60	NG	1.14	MMcuft	95.92	114.19	0.685	2.17	2.17	2.17	6.28
11212 G	GANG-10200 (<0.3)	2.27	NG	0.721	MMcuft	28.84	67.78	0.433	1.37	1.37	1.37	3.97
H212-S	GANG-10200 (0.3 - <1.0)	3.60	NG	1.142	MMcuft	95.92	114.19	0.685	2.17	2.17	2.17	6.28
11212 G	GANG-10300 (<0.3)	1.79	NG	0.567	MMcuft	22.68	53.31	0.340	1.08	1.08	1.08	3.12
H213-S	GANG-10300 (0.3 -<1.0)	3.60	NG	1.14	MMcuft	95.92	114.19	0.685	2.17	2.17	2.17	6.28
H214-S	GANG-10500 (<0.3)	2.54	NG	0.806	MMcuft	32.23	75.73	0.483	1.53	1.53	1.53	4.43
H215-S	GANG-12700 (<0.3)	1.94	NG	0.615	MMcuft	24.60	57.81	0.369	1.17	1.17	1.17	3.38
11217 6	GANG-12900 (<0.3)	6.51	NG	2.07	MMcuft	82.61	194.15	1.24	3.92	3.92	3.92	11.36
H216-S	GANG-12900 (0.3 to <1.0)	5.60	NG	1.78	MMcuft	149.20	177.62	1.07	3.37	3.37	3.37	9.77
11017 G	GANG-13100 (<0.3)	7.29	NG	2.31	MMcuft	92.55	217.49	1.39	4.40	4.40	4.40	12.73
H217-S	GANG-13100 (0.3 to<1.0)	4.40	NG	1.40	MMcuft	117.23	139.56	0.837	2.65	2.65	2.65	7.68
11210 5	GANG-13300 (<0.3)	5.87	NG	1.86	MMcuft	74.48	175.03	1.12	3.54	3.54	3.54	10.24
H218-S	GANG-13300 (0.3 to<1.0)	5.60	NG	1.78	MMcuft	149.20	177.62	1.07	3.37	3.37	3.37	9.77
H219-S	GANG-13400	3.73	NG	1.18	MMcuft	47.30	111.15	0.709	2.25	2.25	2.25	6.50

11:4 ID	Building	Maximum Capacity (MMBtu/hr)	B .175	Estimated Annual Fuel Use	Units of	Actual Emissions (lb/yr)							
Unit ID	Number		Fuel Type		Fuel Usage	CO	NO _X	SO_2	PM	PM-10	PM-2.5	VOC	
	(<0.3)												
H220-S	GANG-13500 (<0.2)	10.40	NG	3.30	MMcuft	131.95	310.08	1.98	6.27	6.27	6.27	18.14	
H221-S	GANG - 9300 (< 0.3)	0.20	NG	0.063	MMcuft	2.52	5.93	0.038	0.120	0.120	0.120	0.347	
H222-S	GANG - 9700 (<0.3)	2.52	NG	0.799	MMcuft	31.97	75.13	0.480	1.52	1.52	1.52	4.40	
	Total (lb/yr)					35,326.37	44,809.23	3,763.22	969.59	924.76	910.99	2,462.15	
	Total (ton/yr)					17.66	22.40	1.88	0.48	0.46	0.46	1.23	

^a Significant Boiler, NG = Natural Gas Unit IDs in italics are new.

TABLE 2.3
Actual Emissions of Hazardous Air Pollutants for Heating Units

Unit ID	Building. No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
		Wood ^b	0	0	-	0	0	0	0	-	0	-	0	0	0	0	-	0	0	0	0
H004-S ^a	1412	No. 2 Oil	0	-	0	0	0	-	0	-	0	-	0	0	-	0	0	0	-	0	-
		NG	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0
H008-S ^a	350	No. 2 Oil	0	-	0	0	0	-	0	-	0	-	0	0	-	0	0	0	-	0	0
11008-3	330	NG	3.4E-04	0.004	0.000	0.002	0.002	1.4E-04	-	0.002	0.129	3.102	6.5E-04	4.5E-04	0.001	0.004	1.5E-04	4.1E-05	0.006	0.050	8.6E-04
H009-S ^a	1412	No. 2 Oil	0	-	0	0	0	-	0	i	0	-	0	0	-	0	0	0	-	0	0
11009-3	1412	NG	0.010	0.105	0.001	0.055	0.070	0.004	-	0.060	3.751	90.02	0.019	0.013	0.031	0.105	0.004	0.001	0.170	1.450	0.025
H010-S ^a	1412	No. 2 Oil	0	-	0	0	0	-	0	i	0	-	0	0	-	0	0	0	-	0	0
11010-3	1412	NG	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0
H011-S ^a	1412	No. 2 Oil	1.5E-03	-	0.001	0.001	0.002	-	0.002	ı	0.125	-	0.002	0.001	-	0.001	0.009	0.005	-	0.001	0.003
11011-3	1412	NG	0.006	0.066	3.8E-04	0.034	0.044	0.003	-	0.038	2.351	56.434	0.012	0.008	0.019	0.066	0.003	7.5E-04	0.107	0.909	0.016
H101-S	1	No. 2 Oil	0.001	-	7.7E-04	7.7E-04	7.7E-04	-	0.002	ı	0.088	-	0.002	7.7E-04	-	7.7E-04	8.4E-07	0.004	-	0.001	0.002
H103-S	350	NG	2.0E-04	0.002	1.2E-05	0.001	0.001	8.4E-05	ı	0.001	0.075	1.810	3.8E-04	2.6E-04	6.1E-04	0.002	8.8E-05	2.4E-05	0.003	0.029	5.0E-04
H104-S	403	NG	8.1E-04	0.009	4.9E-05	0.004	0.006	3.4E-04	ı	0.005	0.304	7.29	0.002	0.001	0.002	0.009	3.6E-04	9.7E-05	0.014	0.117	0.002
H105-S	419	No. 2 Oil	0.007	-	0.005	0.005	0.005	-	0.010	ı	0.591	-	0.010	0.005	-	0.005	5.7E-06	0.026	ı	0.007	0.016
H106-S	421	NG	1.2E-03	0.012	7.1E-05	0.006	0.008	4.9E-04	1	0.007	0.441	10.58	0.002	0.002	0.004	0.012	5.2E-04	1.4E-04	0.020	0.171	0.003
H114-S	1073	NG	0.002	0.019	1.1E-04	0.010	0.012	7.4E-04	-	0.011	0.663	15.90	0.003	0.002	0.005	0.019	7.8E-04	2.1E-04	0.030	0.256	0.004
H115-S	1205	NG	6.4E-04	0.007	3.9E-05	0.004	0.004	2.7E-04	-	0.004	0.241	5.78	0.001	0.001	0.002	0.007	2.8E-04	7.7E-05	0.011	0.093	0.002
H116-S	1245	No. 2 Oil	0.003	-	0.002	0.002	0.002	-	0.004	-	0.232	-	0.004	0.002	-	0.002	2.2E-06	0.010	-	0.003	0.006
H117-S	1630	No. 2 Oil	0.002	-	0.001	0.001	0.001	-	0.002	-	0.140	-	0.002	0.001	-	0.001	1.3E-06	0.006	-	0.002	0.004
H118-S	4950	NG	9.5E-04	0.010	5.7E-05	0.005	0.007	4.0E-04	-	0.006	0.356	8.55	0.002	0.001	0.003	0.010	4.2E-04	1.1E-04	0.016	0.138	0.002
H120-S	19104	No. 2 Oil	0.003	-	0.002	0.002	0.002	-	0.004	-	0.215	-	0.004	0.002	-	0.002	2.1E-06	0.009	-	0.003	0.006
H121-S	19225	No. 2 Oil	0.002	-	0.002	0.002	0.002	-	0.004	-	0.205	-	0.004	0.002	-	0.002	2.0E-06	0.009	-	0.002	0.005

Unit ID	Building, No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
H125-S	100A	NG	8.1E-04	0.009	4.9E-05	0.004	0.006	3.4E-04	-	0.005	0.304	7.29	0.002	0.001	0.002	0.009	3.6E-04	9.7E-05	0.014	0.117	0.002
H126-S	100A	NG	8.1E-04	0.009	4.9E-05	0.004	0.006	3.4E-04	-	0.005	0.304	7.29	0.002	0.001	0.002	0.009	3.6E-04	9.7E-05	0.014	0.117	0.002
H127-S	439	NG	9.4E-04	0.010	5.7E-05	0.005	0.007	4.0E-04	-	0.006	0.354	8.48	0.002	0.001	0.003	0.010	4.1E-04	1.1E-04	0.016	0.137	0.002
H128-S	1160	NG	9.6E-04	0.010	5.8E-05	0.005	0.007	4.0E-04	-	0.006	0.361	8.68	0.002	0.001	0.003	0.010	4.2E-04	1.2E-04	0.016	0.140	0.002
H129-S	1160	NG	9.6E-04	0.010	5.8E-05	0.005	0.007	4.0E-04	-	0.006	0.361	8.68	0.002	0.001	0.003	0.010	4.2E-04	1.2E-04	0.016	0.140	0.002
H130-S	1215	NG	6.9E-04	0.007	4.2E-05	0.004	0.005	2.9E-04	-	0.004	0.260	6.25	0.001	9.0E-04	0.002	0.007	3.1E-04	8.3E-05	0.012	0.101	0.002
H131-S	1220	NG	6.4E-04	0.007	3.9E-05	0.004	0.004	2.7E-04	-	0.004	0.241	5.78	0.001	8.4E-04	0.002	0.007	2.8E-04	7.7E-05	0.011	0.093	0.002
H132-S	1320	NG	0.001	0.013	7.7E-05	0.007	0.009	5.4E-04	-	0.008	0.482	11.57	0.002	0.002	0.004	0.013	5.7E-04	1.5E-04	0.022	0.186	0.003
H133-S	1320	NG	0.001	0.011	6.6E-05	0.006	0.008	4.6E-04	-	0.007	0.410	9.83	0.002	0.001	0.003	0.011	4.8E-04	1.3E-04	0.019	0.158	0.003
H134-S	1509	NG	0.001	0.011	6.6E-05	0.006	0.008	4.6E-04	-	0.007	0.410	9.83	0.002	0.001	0.003	0.011	4.8E-04	1.3E-04	0.019	0.158	0.003
H135-S	1509	NG	0.001	0.011	6.6E-05	0.006	0.008	4.6E-04	-	0.007	0.410	9.83	0.002	0.001	0.003	0.011	4.8E-04	1.3E-04	0.019	0.158	0.003
H136-S	1720	NG	0.001	0.011	6.6E-05	0.006	0.008	4.6E-04	-	0.007	0.410	9.83	0.002	0.001	0.003	0.011	4.8E-04	1.3E-04	0.019	0.158	0.003
H137-S	1720	NG	0.001	0.013	7.7E-05	0.007	0.009	5.4E-04	-	0.008	0.482	11.57	0.002	0.002	0.004	0.013	5.7E-04	1.5E-04	0.022	0.186	0.003
H138-S	4502	NG	0.001	0.011	6.6E-05	0.006	0.008	4.6E-04	-	0.007	0.410	9.83	0.002	0.001	0.003	0.011	4.8E-04	1.3E-04	0.019	0.158	0.003
H139-S	4502	NG	0.001	0.011	6.6E-05	0.006	0.008	4.6E-04	-	0.007	0.410	9.83	0.002	0.001	0.003	0.011	4.8E-04	1.3E-04	0.019	0.158	0.003
H140-S	4577	NG	0.001	0.011	6.6E-05	0.006	0.008	4.6E-04	-	0.007	0.410	9.83	0.002	0.001	0.003	0.011	4.8E-04	1.3E-04	0.019	0.158	0.003
H141-S	4577	NG	0.001	0.012	6.7E-05	0.006	0.008	4.7E-04	-	0.007	0.419	10.06	0.002	0.001	0.003	0.012	4.9E-04	1.3E-04	0.019	0.162	0.003
H142-S	4578	NG	0.001	0.011	6.6E-05	0.006	0.008	4.6E-04	-	0.007	0.410	9.83	0.002	0.001	0.003	0.011	4.8E-04	1.3E-04	0.019	0.158	0.003
H143-S	7704	No. 2 Oil	0.002	-	0.002	0.002	0.002	-	0.003	-	0.180	-	0.003	0.002	-	0.002	1.7E-06	0.008	-	0.002	0.005
H145-S	1340	NG	6.4E-04	0.007	3.9E-05	0.004	0.004	2.7E-04	-	0.004	0.241	5.78	0.001	0.001	0.002	0.007	2.8E-04	7.7E-05	0.011	0.093	0.002
H146-S	1509	NG	6.4E-04	0.007	3.9E-05	0.004	0.004	2.7E-04	i	0.004	0.241	5.78	0.001	0.001	0.002	0.007	2.8E-04	7.7E-05	0.011	0.093	0.002
H147-S	1510	NG	6.4E-04	0.007	3.9E-05	0.004	0.004	2.7E-04	-	0.004	0.241	5.78	0.001	0.001	0.002	0.007	2.8E-04	7.7E-05	0.011	0.093	0.002
H148-S	1620	NG	6.4E-04	0.007	3.9E-05	0.004	0.004	2.7E-04	-	0.004	0.241	5.78	0.001	0.001	0.002	0.007	2.8E-04	7.7E-05	0.011	0.093	0.002
H149-S	2916	NG	8.3E-04	0.009	5.0E-05	0.005	0.006	3.5E-04	-	0.005	0.311	7.45	0.002	0.001	0.003	0.009	3.6E-04	9.9E-05	0.014	0.120	0.002

Unit ID	Building, No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
H150-S	10531	NG	0.002	0.017	9.8E-05	0.009	0.011	6.9E-04	-	0.010	0.612	14.69	0.003	0.002	0.005	0.017	7.2E-04	2.0E-04	0.028	0.237	0.004
H151-S	5602	NG	7.3E-04	0.008	4.4E-05	0.004	0.005	3.1E-04	-	0.004	0.273	6.55	0.001	0.001	0.002	0.008	3.2E-04	8.7E-05	0.012	0.105	0.002
H152-S	HQ C&C Center	NG	0.001	0.012	7.0E-05	0.006	0.008	4.9E-04	-	0.007	0.440	10.57	0.002	0.002	0.004	0.012	5.2E-04	1.4E-04	0.020	0.170	0.003
H153-S	3004	NG	0.001	0.007	3.9E-05	0.004	0.005	2.8E-04	-	0.004	0.246	5.899	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H154-S	3005	NG	0.001	0.007	3.9E-05	0.004	0.005	2.8E-04	ı	0.004	0.246	5.899	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H155-S	3006	NG	0.001	0.007	3.9E-05	0.004	0.005	2.8E-04	İ	0.004	0.246	5.899	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H156-S	3007	NG	0.001	0.007	3.9E-05	0.004	0.005	2.8E-04	ı	0.004	0.246	5.899	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H157-S	3008	NG	0.001	0.007	3.9E-05	0.004	0.005	2.8E-04	ı	0.004	0.246	5.899	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H158-S	3009	NG	0.001	0.007	3.9E-05	0.004	0.005	2.8E-04	-	0.004	0.246	5.899	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H159-S	3012	NG	0.001	0.007	3.9E-05	0.004	0.005	2.8E-04	-	0.004	0.246	5.899	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H160-S	DFAC	NG	7.2E-04	0.008	4.3E-05	0.004	0.005	3.0E-04	-	0.004	0.271	6.51	0.001	0.001	0.002	0.008	3.2E-04	8.7E-05	0.012	0.105	0.002
H162-S	1540	NG	6.4E-04	0.007	3.9E-05	0.004	0.004	2.7E-04	-	0.004	0.241	5.78	0.001	0.001	0.002	0.007	2.8E-04	7.7E-05	0.011	0.093	0.002
H163-S	3003	NG	7.2E-04	0.008	4.3E-05	0.004	0.005	3.0E-04	-	0.004	0.270	6.48	0.001	0.001	0.002	0.008	3.2E-04	8.6E-05	0.012	0.104	0.002
H164-S	3010	NG	6.6E-04	0.007	3.9E-05	0.004	0.005	2.8E-04	-	0.004	0.246	5.90	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H165-S	3011	NG	6.6E-04	0.007	3.9E-05	0.004	0.005	2.8E-04	-	0.004	0.246	5.90	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.095	0.002
H166-S	7560	NG	0.001	0.013	7.7E-05	0.007	0.009	5.4E-04	-	0.008	0.482	11.57	0.002	0.002	0.004	0.013	5.7E-04	1.5E-04	0.022	0.186	0.003
H167-S	7560	NG	0.001	0.013	7.7E-05	0.007	0.009	5.4E-04	-	0.008	0.482	11.57	0.002	0.002	0.004	0.013	5.7E-04	1.5E-04	0.022	0.186	0.003
H201-S	POST WIDE (0.3-<1)	NG	0.019	0.198	0.001	0.104	0.132	0.008	-	0.113	7.060	169.45	0.036	0.024	0.057	0.198	0.008	0.002	0.320	2.730	0.047
H202-S	POST WIDE (<0.3)	NG	0.004	0.043	2.5E-04	0.023	0.029	0.002	ı	0.025	1.534	36.83	0.008	0.005	0.012	0.043	0.002	4.9E-04	0.070	0.593	0.010
H203-S	POST WIDE (0.3-<1)	No. 2 Oil	0.006	-	0.004	0.004	0.004	-	0.009	-	0.514	-	0.009	0.004	1	0.004	4.9E-06	0.022	-	0.006	0.013
H204-S	POST WIDE (<0.3)	No. 2 Oil	4.9E-04	-	3.7E-04	3.7E-04	3.7E-04	-	0.001	-	0.042	-	0.001	3.7E-04	1	3.7E-04	4.1E-07	0.002	-	4.9E-04	0.001
H205-S	POST WIDE (0.3-<1)	LPG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Unit ID	Building, No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
H206-S	POST WIDE (<0.3)	LPG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H208-S	GANG-9100 (<0.3)	NG	9.8E-05	0.001	5.9E-06	0.001	0.001	4.1E-05	-	0.001	0.037	0.88	1.9E-04	1.3E-04	3.0E-04	0.001	4.3E-05	1.2E-05	0.002	0.014	2.4E-04
H208-S	GANG- 9100 (0.3-<1)	NG	1.2E-04	0.001	7.4E-06	0.001	0.001	5.2E-05	-	0.001	0.046	1.106	2.3E-04	1.6E-04	3.7E-04	0.001	5.4E-05	1.5E-05	0.002	0.018	3.1E-04
H209-S	GANG-9500 (<0.3)	NG	1.7E-04	0.002	1.0E-05	0.001	0.001	7.3E-05	-	0.001	0.065	1.56	3.3E-04	2.3E-04	0.001	0.002	7.7E-05	2.1E-05	0.003	0.025	4.3E-04
H210-S	GANG-9900 (<0.3)	NG	1.8E-04	0.002	1.1E-05	0.001	0.001	7.7E-05	-	0.001	0.069	1.65	3.5E-04	2.4E-04	0.001	0.002	8.1E-05	2.2E-05	0.003	0.027	4.6E-04
H211 G	GANG-10100 (<0.3)	NG	1.2E-04	0.001	7.1E-06	0.001	0.001	5.0E-05	-	0.001	0.044	1.07	2.3E-04	1.5E-04	3.6E-04	0.001	5.2E-05	1.4E-05	0.002	0.017	0.000
H211-S	GANG-10100 (0.3-<1.0)	NG	2.3E-04	0.002	1.4E-05	0.001	0.002	9.6E-05	-	0.001	0.086	2.055	4.3E-04	3.0E-04	0.001	0.002	1.0E-04	2.7E-05	0.004	0.033	0.001
11212 G	GANG-10200 (<0.3)	NG	1.4E-04	0.002	8.7E-06	0.001	0.001	6.1E-05	-	0.001	0.054	1.30	2.7E-04	1.9E-04	4.4E-04	0.002	6.3E-05	1.7E-05	0.002	0.021	3.6E-04
H212-S	GANG-10200 (0.3 - <1.0)	NG	2.3E-04	0.002	1.4E-05	0.001	0.002	9.6E-05	-	0.001	0.086	2.055	4.3E-04	3.0E-04	0.001	0.002	1.0E-04	2.7E-05	0.004	0.033	0.001
H213-S	GANG-10300 (<0.3)	NG	1.1E-04	0.001	6.8E-06	0.001	0.001	4.8E-05	-	0.001	0.043	1.02	2.2E-04	1.5E-04	3.5E-04	0.001	5.0E-05	1.4E-05	0.002	0.016	2.8E-04
H213-8	GANG-10300 (0.3 -<1.0)	NG	2.3E-04	0.002	1.4E-05	0.001	0.002	9.6E-05	-	0.001	0.086	2.055	4.3E-04	3.0E-04	0.001	0.002	1.0E-04	2.7E-05	0.004	0.033	0.001
H214-S	GANG-10500 (<0.3)	NG	1.6E-04	0.002	9.7E-06	0.001	0.001	6.8E-05	-	0.001	0.060	1.45	3.1E-04	2.1E-04	4.9E-04	0.002	7.1E-05	1.9E-05	0.003	0.023	4.0E-04
H215-S	GANG-12700 (<0.3)	NG	1.2E-04	0.001	7.4E-06	0.001	0.001	5.2E-05	-	0.001	0.046	1.11	2.3E-04	1.6E-04	3.8E-04	0.001	5.4E-05	1.5E-05	0.002	0.018	3.1E-04
1121 (G	GANG-12900 (<0.3)	NG	4.1E-04	0.004	2.5E-05	0.002	0.003	1.7E-04	-	0.002	0.155	3.72	0.001	5.4E-04	0.001	0.004	1.8E-04	5.0E-05	0.007	0.060	0.001
H216-S	GANG-12900 (0.3 to <1.0)	NG	3.6E-04	0.004	2.1E-05	0.002	0.002	1.5E-04	-	0.002	0.133	3.197	0.001	4.6E-04	0.001	0.004	1.6E-04	4.3E-05	0.006	0.052	0.001
11217.0	GANG-13100 (<0.3)	NG	4.6E-04	0.005	2.8E-05	0.003	0.003	1.9E-04	-	0.003	0.174	4.16	0.001	0.001	0.001	0.005	2.0E-04	5.6E-05	0.008	0.067	0.001
H217-S	GANG-13100 (0.3 to<1.0)	NG	2.8E-04	0.003	1.7E-05	0.002	0.002	1.2E-04		0.002	0.105	2.512	0.001	3.6E-04	0.001	0.003	1.2E-04	0.000	0.005	0.040	0.001
H218-S	GANG-13300 (<0.3)	NG	3.7E-04	0.004	2.2E-05	0.002	0.003	1.6E-04	-	0.002	0.140	3.35	0.001	4.8E-04	0.001	0.004	1.6E-04	4.5E-05	0.006	0.054	0.001

Unit ID	Building. No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
	GANG-13300 (0.3 to<1.0)	NG	3.6E-04	0.004	2.1E-05	0.002	0.002	1.5E-04	-	0.002	0.133	3.197	0.001	4.6E-04	0.001	0.004	1.6E-04	4.3E-05	0.006	0.052	0.001
H219-S	GANG-13400 (<0.3)	NG	2.4E-04	0.002	1.4E-05	0.001	0.002	9.9E-05	-	0.001	0.089	2.13	4.5E-04	3.1E-04	0.001	0.002	1.0E-04	2.8E-05	0.004	0.034	0.001
H220-S	GANG-13500 (<0.2)	NG	0.001	0.007	4.0E-05	0.004	0.005	2.8E-04	-	0.004	0.247	5.94	0.001	0.001	0.002	0.007	2.9E-04	7.9E-05	0.011	0.096	0.002
H221-S	GANG - 9300 (< 0.3)	NG	1.3E-05	1.3E-04	7.6E-07	6.9E-05	8.8E-05	5.3E-06	-	7.6E-05	0.005	0.11	2.4E-05	1.6E-05	3.9E-05	1.3E-04	5.6E-06	1.5E-06	2.1E-04	0.002	3.2E-05
H222-S	GANG - 9700 (<0.3)	NG	1.6E-04	0.002	9.6E-06	0.001	0.001	6.7E-05	-	0.001	0.060	1.44	3.0E-04	2.1E-04	4.9E-04	0.002	7.0E-05	1.9E-05	0.003	0.023	4.0E-04
	Total (lb/yr)		0.11	0.90	0.03	0.49	0.62	0.04	0.04	0.52	34.64	774.62	0.20	0.13	0.26	0.92	0.05	0.11	1.46	12.51	0.28
	Total (ton/yr)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.39	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01

^a Significant Boiler
^b Additional Hazardous Air Pollutants for the wood fired boiler (Unit ID H004-S) are given in Table 2.6.
Unit IDs in italics are new.

TABLE 2.4
Source Details and Potential Criteria Pollutant Emissions for Heating Units

	Building	Maximum	D 1.77	Estimated	Units of			Pote	ential Emissio	ns (lb/yr)		
Unit ID	Number	Capacity (MMBtu/hr)	Fuel Type	Potential Fuel Use	Fuel Usage	СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
			Wood	272,533,333	lb	735,840.0	269,808.0	306,600.0	6,394.4	6,297.6	6,297.6	20,848.8
H004-S ^a	1412	140.00	No. 2 Oil	0	gal	0	0	0	0	0	0	0
			NG	0	MMcuft	0	0	0	0	0	0	0
H008-S ^a	350	12.00	No. 2 Oil	750,857	gal	3,754.3	15,017.1	53,310.9	1,501.7	750.9	187.7	255.3
11006-3	330	12.00	NG	0	MMcuft	0	0	0	0	0	0	0
H009-S ^a	1412	55.30	No. 2 Oil	442,566	gal	2,212.8	8,851.3	31,422.2	885.1	442.6	110.6	150.5
11009-3	1412	55.50	NG	414.19	MMcuft	34,791.5	41,418.5	248.5	787.0	787.0	787.0	2,278.0
H010-S ^a	1412	55.30	No. 2 Oil	140,000	gal	700.0	2,800.0	9,940.0	280.0	140.0	35.0	47.60
11010-3	1412	55.50	NG	40	MMcuft	3,360.0	4,000.0	24.00	76.00	76.00	76.0	220.0
H011-S ^a	1412	55.30	No. 2 Oil	140,000	gal	700.0	2,800.0	9,940.0	280.0	140.0	35.0	47.60
11011-5	1412	55.50	NG	40	MMcuft	3,360.0	4,000.0	24.00	76.0	76.0	76.0	220.0
H101-S	1	2.25	No. 2 Oil	140,786	gal	703.9	2,815.7	9,995.8	281.6	152.0	116.9	47.87
H103-S	350	7.00	NG	60.12	MMcuft	5,049.9	6,011.8	36.07	114.2	114.2	114.2	330.6
H104-S	403	1.26	NG	10.82	MMcuft	909.0	1,082.1	6.49	20.56	20.56	20.56	59.52
H105-S	419	1.38	No. 2 Oil	86,349	gal	431.7	1,727.0	6,130.7	172.7	93.26	71.67	29.36
H106-S	421	1.83	NG	15.72	MMcuft	1,320.2	1,571.6	9.43	29.86	29.86	29.86	86.441
H114-S	1073	2.75	NG	23.62	MMcuft	1,983.9	2,361.8	14.17	44.87	44.87	44.87	129.9
H115-S	1205	1.00	NG	8.59	MMcuft	721.4	858.8	5.15	16.32	16.32	16.32	47.24
H116-S	1245	1.51	No. 2 Oil	94,483	gal	472.4	1,889.7	6,708.3	189.0	102.0	78.42	32.12
H117-S	1630	2.00	No. 2 Oil	125,143	gal	625.7	2,502.9	8,885.1	250.3	135.2	103.87	42.55
H118-S	4950	1.48	NG	12.69	MMcuft	1,066.2	1,269.3	7.616	24.12	24.12	24.12	69.81
H120-S	19104	2.16	No. 2 Oil	135,154	gal	675.8	2,703.1	9,596.0	270.3	146.0	112.2	45.952
H121-S	19225	1.20	No. 2 Oil	75,086	gal	375.4	1,501.7	5,331.1	150.2	81.09	62.32	25.53
H125-S	100A	1.26	NG	10.82	MMcuft	909.0	1,082.1	6.49	20.56	20.56	20.56	59.52
H126-S	100A	1.26	NG	10.82	MMcuft	909.0	1,082.1	6.49	20.56	20.56	20.56	59.52

П.41В	Building	Maximum	E 17	Estimated	Units of			Pote	ential Emissio	ns (lb/yr)		
Unit ID	Number	Capacity (MMBtu/hr)	Fuel Type	Potential Fuel Use	Fuel Usage	со	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
H127-S	439	1.47	NG	12.60	MMcuft	1,058.3	1,259.9	7.56	23.94	23.94	23.94	69.29
H128-S	1160	1.50	NG	12.88	MMcuft	1,082.1	1,288.2	7.73	24.48	24.48	24.48	70.85
H129-S	1160	1.50	NG	12.88	MMcuft	1,082.1	1,288.2	7.73	24.48	24.48	24.48	70.85
H130-S	1215	1.08	NG	9.28	MMcuft	779.1	927.5	5.57	17.62	17.62	17.62	51.01
H131-S	1220	1.00	NG	8.59	MMcuft	721.4	858.8	5.15	16.32	16.32	16.32	47.24
H132-S	1320	2.00	NG	17.18	MMcuft	1,442.8	1,717.6	10.31	32.64	32.64	32.64	94.47
H133-S	1320	1.70	NG	14.60	MMcuft	1,226.4	1,460.0	8.76	27.74	27.74	27.74	80.30
H134-S	1509	1.70	NG	14.60	MMcuft	1,226.4	1,460.0	8.76	27.74	27.74	27.74	80.30
H135-S	1509	1.70	NG	14.60	MMcuft	1,226.4	1,460.0	8.76	27.74	27.74	27.74	80.30
H136-S	1720	1.70	NG	14.60	MMcuft	1,226.4	1,460.0	8.76	27.74	27.74	27.74	80.30
H137-S	1720	2.00	NG	17.18	MMcuft	1,442.8	1,717.6	10.31	32.64	32.64	32.64	94.47
H138-S	4502	1.70	NG	14.60	MMcuft	1,226.4	1,460.0	8.76	27.74	27.74	27.74	80.30
H139-S	4502	1.70	NG	14.60	MMcuft	1,226.4	1,460.0	8.76	27.74	27.74	27.74	80.30
H140-S	4577	1.70	NG	14.60	MMcuft	1,226.4	1,460.0	8.76	27.74	27.74	27.74	80.30
H141-S	4577	1.74	NG	14.94	MMcuft	1,255.3	1,494.4	8.97	28.39	28.39	28.39	82.19
H142-S	4578	1.70	NG	14.60	MMcuft	1,226.4	1,460.0	8.76	27.74	27.74	27.74	80.30
H143-S	7704	1.01	No. 2 Oil	63,072	gal	315.4	1,261.4	4,478.1	126.1	68.12	52.35	21.44
H145-S	1340	1.00	NG	8.59	MMcuft	721.4	858.8	5.15	16.32	16.32	16.32	47.24
H146-S	1509	1.00	NG	8.59	MMcuft	721.4	858.8	5.15	16.32	16.32	16.32	47.24
H147-S	1510	1.00	NG	8.59	MMcuft	721.4	858.8	5.15	16.32	16.32	16.32	47.24
H148-S	1620	1.00	NG	8.59	MMcuft	721.4	858.8	5.15	16.32	16.32	16.32	47.24
H149-S	2916	1.29	NG	11.07	MMcuft	929.9	1,107.0	6.64	21.03	21.03	21.03	60.89
H150-S	10531	2.54	NG	21.81	MMcuft	1,832.4	2,181.4	13.09	41.45	41.45	41.45	120.0
H151-S	5602	1.13	NG	9.72	MMcuft	816.6	972.2	5.83	18.47	18.47	18.47	53.47
H152-S	HQ C&C Center	1.83	NG	15.69	MMcuft	1,318.0	1,569.1	9.41	29.81	29.81	29.81	86.30

H. 2 ID	Building	Maximum	TE -17E	Estimated	Units of	ł		Pote	ential Emissio	ns (lb/yr)		
Unit ID	Number	Capacity (MMBtu/hr)	Fuel Type	Potential Fuel Use	Fuel Usage	со	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
H153-S	3004	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H154-S	3005	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H155-S	3006	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H156-S	3007	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H157-S	3008	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H158-S	3009	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H159-S	3012	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H160-S	DFAC	1.13	NG	9.66	MMcuft	811.6	966.2	5.80	18.36	18.36	18.36	53.14
H162-S	1540	1.00	NG	8.59	MMcuft	721.4	858.8	5.15	16.32	16.32	16.32	47.24
H163-S	3003	1.12	NG	9.62	MMcuft	808.0	961.9	5.77	18.28	18.28	18.28	52.90
H164-S	3010	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H165-S	3011	1.02	NG	8.76	MMcuft	735.8	876.0	5.26	16.64	16.64	16.64	48.18
H166-S	7560	2.00	NG	17.18	MMcuft	1,442.8	1,717.6	10.31	32.64	32.64	32.64	94.47
H167-S	7560	2.00	NG	17.18	MMcuft	1,442.8	1,717.6	10.31	32.64	32.64	32.64	94.47
H201-S	POST WIDE (0.3-<1)	29.27	NG	251.40	MMcuft	21,117.2	25,139.6	150.8	477.7	477.7	477.7	1,382.7
H202-S	POST WIDE (<0.3)	6.34	NG	54.45	MMcuft	2,178.1	5,118.6	32.67	103.46	103.46	103.46	299.50
H203-S	POST WIDE (0.3-<1)	5.50	No. 2 Oil	344,393	gal	1,722.0	6,887.9	24,451.9	688.8	371.9	285.8	117.1
H204-S	POST WIDE (<0.3)	0.68	No. 2 Oil	42,549	gal	212.7	765.9	3,020.9	17.02	17.02	17.02	30.34
H205-S	POST WIDE (0.3-<1)	1.42	LPG	137,450	gal	1,030.9	1,786.8	7.42	96.21	96.21	96.21	137.45
H206-S	POST WIDE (<0.3)	0.75	LPG	72,984	gal	547.4	948.8	3.94	51.09	51.09	51.09	72.98
11200 5	GANG-9100 (<0.3)	1.54	NG	13.23	MMcuft	529.4	1,244.0	7.94	25.15	25.15	25.15	72.79
H208-S	GANG- 9100 (0.3-<1)	1.94	NG	16.64	MMcuft	1,397.4	1,663.5	9.98	31.61	31.61	31.61	91.49

II:4 ID	Building	Maximum	E. al Tama	Estimated	Units of			Pote	ential Emissio	ns (lb/yr)		
Unit ID	Number	Capacity (MMBtu/hr)	Fuel Type	Potential Fuel Use	Fuel Usage	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
H209-S	GANG-9500 (<0.3)	2.74	NG	23.54	MMcuft	941.6	2,212.7	14.12	44.72	44.72	44.72	129.5
H210-S	GANG-9900 (<0.3)	2.89	NG	24.82	MMcuft	992.7	2,332.8	14.89	47.15	47.15	47.15	136.5
11211 0	GANG-10100 (<0.3)	1.87	NG	16.04	MMcuft	641.7	1,507.9	9.63	30.48	30.48	30.48	88.23
H211-S	GANG-10100 (0.3-<1.0)	3.60	NG	30.92	MMcuft	2,597.1	3,091.8	18.55	58.74	58.74	58.74	170.0
H212-S	GANG-10200 (<0.3)	2.27	NG	19.53	MMcuft	781.0	1,835.4	11.72	37.10	37.10	37.10	107.4
П212-8	GANG-10200 (0.3 - <1.0)	3.60	NG	30.92	MMcuft	2,597.1	3,091.8	18.55	58.74	58.74	58.74	170.0
H213-S	GANG-10300 (<0.3)	1.79	NG	15.35	MMcuft	614.2	1,443.4	9.21	29.17	29.17	29.17	84.45
П213-8	GANG-10300 (0.3 -<1.0)	3.60	NG	30.92	MMcuft	2,597.1	3,091.8	18.55	58.74	58.74	58.74	170.0
H214-S	GANG-10500 (<0.3)	2.54	NG	21.81	MMcuft	872.6	2,050.5	13.09	41.45	41.45	41.45	120.0
H215-S	GANG-12700 (<0.3)	1.94	NG	16.65	MMcuft	666.1	1,565.3	9.99	31.64	31.64	31.64	91.59
H216-S	GANG-12900 (<0.3)	6.51	NG	55.92	MMcuft	2,236.9	5,256.8	33.55	106.25	106.25	106.25	307.6
H210-S	GANG-12900 (0.3 to <1.0)	5.60	NG	48.09	MMcuft	4,039.9	4,809.4	28.86	91.38	91.38	91.38	264.5
11217.6	GANG-13100 (<0.3)	7.29	NG	62.65	MMcuft	2,505.9	5,888.9	37.59	119.0	119.0	119.0	344.6
H217-S	GANG-13100 (0.3 to<1.0)	4.40	NG	37.79	MMcuft	3,174.2	3,778.8	22.67	71.80	71.80	71.80	207.8
11210 0	GANG-13300 (<0.3)	5.87	NG	50.42	MMcuft	2,016.7	4,739.3	30.25	95.79	95.79	95.79	277.3
H218-S	GANG-13300 (0.3 to<1.0)	5.60	NG	48.09	MMcuft	4,039.9	4,809.4	28.86	91.38	91.38	91.38	264.5
H219-S	GANG-13400 (<0.3)	3.73	NG	32.02	MMcuft	1,280.7	3,009.6	19.21	60.83	60.83	60.83	176.1
H220-S	GANG-13500	10.40	NG	89.32	MMcuft	3,572.7	8,395.9	53.59	169.7	169.7	169.7	491.2

н.ч ю	Building	Maximum	E JE	Estimated	Units of			Pote	ential Emissio	ns (lb/yr)		
Unit ID	Number	Capacity (MMBtu/hr)	Fuel Type	Potential Fuel Use	Fuel Usage	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
	(<0.2)											
H221-S	GANG - 9300 (< 0.3)	0.20	NG	1.71	MMcuft	68.4	160.7	1.03	3.25	3.25	3.25	9.40
H222-S	GANG - 9700 (<0.3)	2.52	NG	21.64	MMcuft	865.7	2,034.4	12.99	41.12	41.12	41.12	119.0
		Total (lb/yr)			905,331.7	532,681.2	491,092.8	15,657.4	13,107.8	11,736.6	33,597.5
		Total (t	on/yr)			452.67	266.34	245.55	7.83	6.55	5.87	16.80

^a Significant Boiler Unit IDs in italics are new

TABLE 2.5
Potential Emissions of Hazardous Air Pollutants for Heating Units

		-			_						_										
Unit ID	Building. No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
		Wood ^b	26.98	5,150.9	1.35	5.03	25.75	7.97	60.09	-	5,396.2	-	1,962.2	4.29	119.0	40.47	-	3.43	1,128.3	515.1	58.87
H004-S ^a	1412	No. 2 Oil	0	-	0	0	0	-	0	-	0	-	0	0	-	0	0	0	-	0	0
		NG	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0
11000 Ca	250	No. 2 Oil	0.420	-	0.315	0.315	0.631	-	0.631	-	36.04	-	0.631	0.315	-	0.315	2.48	1.577	-	0.420	0.946
H008-S ^a	350	NG	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0
11000 G3	1.410	No. 2 Oil	0.248	-	0.186	0.186	0.372	-	0.372	-	21.24	-	0.372	0.186	-	0.186	1.46	0.93	-	0.248	0.558
H009-S ^a	1412	NG	0.083	0.870	0.005	0.456	0.580	0.035	-	0.497	31.06	745.5	0.157	0.108	0.253	0.870	0.036	0.010	1.4	12.0	0.207
******		No. 2 Oil	0.078	-	0.059	0.059	0.118	-	0.118	-	6.720	-	0.118	0.059	-	0.059	0.462	0.294	-	0.078	0.176
H010-S ^a	1412	NG	0.008	0.084	4.8E-04	0.044	0.056	0.003	-	0.048	3.00	72.00	0.015	0.010	0.024	0.084	0.004	9.6E-04	0.136	1.160	0.020
***************************************	1.410	No. 2 Oil	0.078	-	0.059	0.059	0.118	-	0.118	-	6.72	-	0.118	0.059	-	0.059	0.462	0.294	-	0.078	0.176
H011-S ^a	1412	NG	0.008	0.084	4.8E-04	0.044	0.056	0.003	-	0.048	3.00	72.00	0.015	0.010	0.024	0.084	0.004	9.6E-04	0.136	1.160	0.020
H101-S	1	No. 2 Oil	0.079	-	0.059	0.059	0.059	-	0.118	-	6.76	-	0.118	0.059	-	0.059	6.5E-05	0.296	-	0.079	0.177
H103-S	350	NG	0.012	0.126	0.001	0.066	0.084	0.005	-	0.072	4.51	108.2	0.023	0.016	0.037	0.126	0.005	0.001	0.204	1.743	0.030
H104-S	403	NG	0.002	0.023	1.3E-04	0.012	0.015	0.001	-	0.013	0.812	19.48	0.004	0.003	0.007	0.023	0.001	2.6E-04	0.037	0.314	0.005
H105-S	419	No. 2 Oil	0.048	-	0.036	0.036	0.036	-	0.073	-	2.59	-	0.073	0.036	-	0.036	4.0E-05	0.181	-	0.048	0.109
H106-S	421	NG	0.003	0.033	1.9E-04	0.017	0.022	0.001	-	0.019	1.18	28.29	0.006	0.004	0.010	0.033	0.001	3.8E-04	0.053	0.456	0.008
H114-S	1073	NG	0.005	0.050	2.8E-04	0.026	0.033	0.002	-	0.028	1.77	42.51	0.009	0.006	0.014	0.050	0.002	0.001	0.080	0.685	0.012
H115-S	1205	NG	0.002	0.018	1.0E-04	0.009	0.012	0.001	-	0.010	0.644	15.46	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.029	0.249	0.004
H116-S	1245	No. 2 Oil	0.053	_	0.040	0.040	0.040	_	0.079	_	4.54	_	0.079	0.040	-	0.040	4.4E-05	0.198	-	0.053	0.119
H117-S	1630	No. 2 Oil	0.070	_	0.053	0.053	0.053	_	0.105	_	6.01	_	0.105	0.053	-	0.053	5.8E-05	0.263	-	0.070	0.158
H118-S	4950	NG	0.003	0.027	0.000	0.014	0.018	0.001	-	0.015	0.952	22.85	0.005	0.003	0.008	0.027	0.001	3.0E-04	0.043	0.368	0.006
H120-S	19104	No. 2 Oil	0.076	-	0.057	0.057	0.057	-	0.114	-	6.49	-	0.114	0.057	-	0.057	6.2E-05	0.284	_	0.076	0.170
H121-S	19225	No. 2 Oil	0.042	-	0.032	0.032	0.032	-	0.063	-	3.60	-	0.063	0.032	-	0.032	3.5E-05	0.158	-	0.042	0.095
					l	l	l	l		l	l	l									l

Unit ID	Building, No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
H125-S	100A	NG	0.002	0.023	1.3E-04	0.012	0.015	0.001	-	0.013	0.812	19.48	0.004	0.003	0.007	0.023	0.001	2.6E-04	0.037	0.314	0.005
H126-S	100A	NG	0.002	0.023	1.3E-04	0.012	0.015	0.001	-	0.013	0.812	19.48	0.004	0.003	0.007	0.023	0.001	2.6E-04	0.037	0.314	0.005
H127-S	439	NG	0.003	0.026	1.5E-04	0.014	0.018	0.001	-	0.015	0.945	22.68	0.005	0.003	0.008	0.026	0.001	3.0E-04	0.043	0.365	0.006
H128-S	1160	NG	0.003	0.027	1.5E-04	0.014	0.018	0.001	-	0.015	0.966	23.19	0.005	0.003	0.008	0.027	0.001	3.1E-04	0.044	0.374	0.006
H129-S	1160	NG	0.003	0.027	1.5E-04	0.014	0.018	0.001	-	0.015	9.7E-01	23.19	0.005	0.003	0.008	0.027	0.001	3.1E-04	0.044	0.374	0.006
H130-S	1215	NG	0.002	0.019	1.1E-04	0.010	0.013	0.001	-	0.011	0.696	16.70	0.004	0.002	0.006	0.019	0.001	2.2E-04	0.032	0.269	0.005
H131-S	1220	NG	0.002	0.018	1.0E-04	0.009	0.012	0.001	-	0.010	0.644	15.46	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.029	0.249	0.004
H132-S	1320	NG	0.003	0.036	2.1E-04	0.019	0.024	0.001	-	0.021	1.29	30.92	0.007	0.004	0.010	0.036	0.002	4.1E-04	0.058	0.498	0.009
H133-S	1320	NG	0.003	0.031	1.8E-04	0.016	0.020	0.001	-	0.018	1.10	26.28	0.006	0.004	0.009	0.031	0.001	3.5E-04	0.050	0.423	0.007
H134-S	1509	NG	0.003	0.031	1.8E-04	0.016	0.020	0.001	-	0.018	1.10	26.28	0.006	0.004	0.009	0.031	0.001	3.5E-04	0.050	0.423	0.007
H135-S	1509	NG	0.003	0.031	1.8E-04	0.016	0.020	0.001	-	0.018	1.10	26.28	0.006	0.004	0.009	0.031	0.001	3.5E-04	0.050	0.423	0.007
H136-S	1720	NG	0.003	0.031	1.8E-04	0.016	0.020	0.001	-	0.018	1.10	26.28	0.006	0.004	0.009	0.031	0.001	3.5E-04	0.050	0.423	0.007
H137-S	1720	NG	0.003	0.036	2.1E-04	0.019	0.024	0.001	-	0.021	1.29	30.92	0.007	0.004	0.010	0.036	0.002	4.1E-04	0.058	0.498	0.009
H138-S	4502	NG	0.003	0.031	1.8E-04	0.016	0.020	0.001	-	0.018	1.10	26.28	0.006	0.004	0.009	0.031	0.001	3.5E-04	0.050	0.423	0.007
H139-S	4502	NG	0.003	0.031	1.8E-04	0.016	0.020	0.001	-	0.018	1.10	26.28	0.006	0.004	0.009	0.031	0.001	3.5E-04	0.050	0.423	0.007
H140-S	4577	NG	0.003	0.031	1.8E-04	0.016	0.020	0.001	-	0.018	1.10	26.28	0.006	0.004	0.009	0.031	0.001	3.5E-04	0.050	0.423	0.007
H141-S	4577	NG	0.003	0.031	1.8E-04	0.016	0.021	0.001	-	0.018	1.12	26.90	0.006	0.004	0.009	0.031	0.001	3.6E-04	0.051	0.433	0.007
H142-S	4578	NG	0.003	0.031	1.8E-04	0.016	0.020	0.001	-	0.018	1.10	26.28	0.006	0.004	0.009	0.031	0.001	3.5E-04	0.050	0.423	0.007
H143-S	7704	No. 2 Oil	0.035	-	0.026	0.026	0.026	-	0.053	-	3.03	-	0.053	0.026	-	0.026	2.9E-05	0.132	-	0.035	0.079
H145-S	1340	NG	0.002	0.018	1.0E-04	0.009	0.012	0.001	-	0.010	0.644	15.46	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.029	0.249	0.004
H146-S	1509	NG	0.002	0.018	1.0E-04	0.009	0.012	0.001	-	0.010	0.644	15.46	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.029	0.249	0.004
H147-S	1510	NG	0.002	0.018	1.0E-04	0.009	0.012	0.001	-	0.010	0.644	15.46	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.029	0.249	0.004
H148-S	1620	NG	0.002	0.018	1.0E-04	0.009	0.012	0.001	-	0.010	0.644	15.46	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.029	0.249	0.004
H149-S	2916	NG	0.002	0.023	1.3E-04	0.012	0.015	0.001	-	0.013	0.830	19.93	0.004	0.003	0.007	0.023	0.001	2.7E-04	0.038	0.321	0.006

Unit ID	Building, No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
H150-S	10531	NG	0.004	0.046	2.6E-04	0.024	0.031	0.002	-	0.026	1.64	39.27	0.008	0.006	0.013	0.046	0.002	0.001	0.074	0.633	0.011
H151-S	5602	NG	0.002	0.020	1.2E-04	0.011	0.014	0.001	-	0.012	0.729	17.50	0.004	0.003	0.006	0.020	0.001	2.3E-04	0.033	0.282	0.005
H152-S	HQ C&C Center	NG	0.003	0.033	1.9E-04	0.017	0.022	0.001	-	0.019	1.18	28.24	0.006	0.004	0.010	0.033	0.001	3.8E-04	0.053	0.455	0.008
H153-S	3004	NG	0.002	0.018	0.000	0.010	0.012	0.001	1	0.011	0.657	15.768	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H154-S	3005	NG	0.002	0.018	1.1E-04	0.010	0.012	0.001	1	0.011	0.657	15.768	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H155-S	3006	NG	0.002	0.018	1.1E-04	0.010	0.012	0.001	ı	0.011	0.657	15.768	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H156-S	3007	NG	0.002	0.018	1.1E-04	0.010	0.012	0.001	ı	0.011	0.657	15.768	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H157-S	3008	NG	0.002	0.018	1.1E-04	0.010	0.012	0.001	ı	0.011	0.657	15.768	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H158-S	3009	NG	0.002	0.018	1.1E-04	0.010	0.012	0.001	ı	0.011	0.657	15.768	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H159-S	3012	NG	0.002	0.018	1.1E-04	0.010	0.012	0.001	-	0.011	0.657	15.768	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H160-S	DFAC	NG	0.002	0.020	1.2E-04	0.011	0.014	0.001	-	0.012	0.725	17.39	0.004	0.003	0.006	0.020	0.001	2.3E-04	0.033	0.280	0.005
H162-S	1540	NG	0.002	0.018	1.0E-04	0.009	0.012	0.001	-	0.010	0.644	15.46	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.029	0.249	0.004
H163-S	3003	NG	0.002	0.020	1.2E-04	0.011	0.013	0.001	-	0.012	0.721	17.31	0.004	0.003	0.006	0.020	0.001	2.3E-04	0.033	0.279	0.005
H164-S	3010	NG	0.002	0.018	1.1E-04	0.010	0.012	0.001	-	0.011	0.657	15.77	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H165-S	3011	NG	0.002	0.018	1.1E-04	0.010	0.012	0.001	-	0.011	0.657	15.77	0.003	0.002	0.005	0.018	0.001	2.1E-04	0.030	0.254	0.004
H166-S	7560	NG	0.003	0.036	2.1E-04	0.019	0.024	0.001	-	0.021	1.288	30.92	0.007	0.004	0.010	0.036	0.002	4.1E-04	0.058	0.498	0.009
H167-S	7560	NG	0.003	0.036	2.1E-04	0.019	0.024	0.001	-	0.021	1.288	30.92	0.007	0.004	0.010	0.036	0.002	4.1E-04	0.058	0.498	0.009
H201-S	POST WIDE (0.3-<1)	NG	0.050	0.528	0.003	0.277	0.352	0.021	ı	0.302	18.85	452.5	0.096	0.065	0.153	0.528	0.022	0.006	0.855	7.290	0.126
H202-S	POST WIDE (<0.3)	NG	0.011	0.114	0.001	0.060	0.076	0.005	-	0.065	4.08	98.02	0.021	0.014	0.033	0.114	0.005	0.001	0.185	1.579	0.027
H203-S	POST WIDE (0.3-<1)	No. 2 Oil	0.193	-	0.145	0.145	0.145	-	0.289	1	16.53	-	0.289	0.145	-	0.145	1.6E-04	0.723	-	0.193	0.434
H204-S	POST WIDE (<0.3)	No. 2 Oil	0.024	-	0.018	0.018	0.018	-	0.036	-	2.04	-	0.036	0.018	-	0.018	2.0E-05	0.089	-	0.024	0.054
H205-S	POST WIDE (0.3-<1)	LPG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	_	-	-	-	-

Unit ID	Building, No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
H206-S	POST WIDE (<0.3)	LPG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11200 G	GANG-9100 (<0.3)	NG	0.003	0.028	1.6E-04	0.015	0.019	0.001	-	0.016	0.993	23.82	0.005	0.003	0.008	0.028	0.001	3.2E-04	0.045	0.384	0.007
H208-S	GANG- 9100 (0.3-<1)	NG	0.003	0.035	2.0E-04	0.018	0.023	0.001	-	0.020	1.25	29.94	0.006	0.004	0.010	0.035	0.001	4.0E-04	0.057	0.482	0.008
H209-S	GANG-9500 (<0.3)	NG	0.005	0.049	2.8E-04	0.026	0.033	0.002	-	0.028	1.77	42.37	0.009	0.006	0.014	0.049	0.002	0.001	0.080	0.683	0.012
H210-S	GANG-9900 (<0.3)	NG	0.005	0.052	3.0E-04	0.027	0.035	0.002	-	0.030	1.86	44.67	0.009	0.006	0.015	0.052	0.002	0.001	0.084	0.720	0.012
11211 6	GANG-10100 (<0.3)	NG	0.003	0.034	1.9E-04	0.018	0.022	0.001	-	0.019	1.20	28.88	0.006	0.004	0.010	0.034	0.001	3.9E-04	0.055	0.465	0.008
H211-S	GANG-10100 (0.3-<1.0)	NG	0.006	0.065	3.7E-04	0.034	0.043	0.003	-	0.037	2.32	55.65	0.012	0.008	0.019	0.065	0.003	0.001	0.105	0.897	0.015
****** G	GANG-10200 (<0.3)	NG	0.004	0.041	2.3E-04	0.021	0.027	0.002	-	0.023	1.46	35.15	0.007	0.005	0.012	0.041	0.002	4.7E-04	0.066	0.566	0.010
H212-S	GANG-10200 (0.3 - <1.0)	NG	0.006	0.065	3.7E-04	0.034	0.043	0.003	-	0.037	2.32	55.65	0.012	0.008	0.019	0.065	0.003	0.001	0.105	0.897	0.015
11212 G	GANG-10300 (<0.3)	NG	0.003	0.032	1.8E-04	0.017	0.021	0.001	-	0.018	1.15	27.64	0.006	0.004	0.009	0.032	0.001	3.7E-04	0.052	0.445	0.008
H213-S	GANG-10300 (0.3 -<1.0)	NG	0.006	0.065	3.7E-04	0.034	0.043	0.003	-	0.037	2.32	55.65	0.012	0.008	0.019	0.065	0.003	0.001	0.105	0.897	0.015
H214-S	GANG-10500 (<0.3)	NG	0.004	0.046	2.6E-04	0.024	0.031	0.002	-	0.026	1.64	39.27	0.008	0.006	0.013	0.046	0.002	0.001	0.074	0.633	0.011
H215-S	GANG-12700 (<0.3)	NG	0.003	0.035	2.0E-04	0.018	0.023	0.001	-	0.020	1.25	29.97	0.006	0.004	0.010	0.035	0.001	0.000	0.057	0.483	0.008
YY216 G	GANG-12900 (<0.3)	NG	0.011	0.117	0.001	0.062	0.078	0.005	-	0.067	4.19	100.7	0.021	0.015	0.034	0.117	0.005	0.001	0.190	1.622	0.028
H216-S	GANG-12900 (0.3 to <1.0)	NG	0.010	0.101	0.001	0.053	0.067	0.004	-	0.058	3.61	86.57	0.018	0.013	0.029	0.101	0.004	0.001	0.164	1.395	0.024
11017.6	GANG-13100 (<0.3)	NG	0.013	0.132	0.001	0.069	0.088	0.005	-	0.075	4.70	112.8	0.024	0.016	0.038	0.132	0.006	0.002	0.213	1.817	0.031
H217-S	GANG-13100 (0.3 to<1.0)	NG	0.008	0.079	4.5E-04	0.042	0.053	0.003	-	0.045	2.83	68.02	0.014	0.010	0.023	0.079	0.003	0.001	0.128	1.096	0.019
H218-S	GANG-13300 (<0.3)	NG	0.010	0.106	0.001	0.055	0.071	0.004	-	0.061	3.78	90.75	0.019	0.013	0.031	0.106	0.004	0.001	0.171	1.462	0.025

Unit ID	Building. No.	Fuel Type	Arsenic	Benzene	Beryllium	Cadmium	Chromium	Cobalt	Copper	Dichlorobenzene	Formaldehyde	Hexane	Manganese	Mercury	Naphthalene	Nickel	POM	Selenium	Toluene	Zinc	Lead
	GANG-13300 (0.3 to<1.0)	NG	0.010	0.101	0.001	0.053	0.067	0.004	-	0.058	3.61	86.57	0.018	0.013	0.029	0.101	0.004	0.001	0.164	1.395	0.024
H219-S	GANG-13400 (<0.3)	NG	0.006	0.067	3.8E-04	0.035	0.045	0.003	-	0.038	2.40	57.63	0.012	0.008	0.020	0.067	0.003	0.001	0.109	0.928	0.016
H220-S	GANG-13500 (<0.2)	NG	0.018	0.188	0.001	0.098	0.125	0.008	-	0.107	6.70	160.8	0.034	0.023	0.054	0.188	0.008	0.002	0.304	2.590	0.045
H221-S	GANG - 9300 (< 0.3)	NG	3.4E-04	0.004	2.1E-05	0.002	0.002	1.4E-04	-	0.002	0.13	3.08	0.001	4.4E-04	0.001	0.004	1.5E-04	4.1E-05	0.006	0.050	0.001
H222-S	GANG - 9700 (<0.3)	NG	0.004	0.045	2.6E-04	0.024	0.030	0.002	-	0.026	1.62	38.96	0.008	0.006	0.013	0.045	0.002	0.001	0.074	0.628	0.011
	Total (lb/yr)		28.85	5,155.3	2.46	8.44	30.42	8.15	62.26	2.54	5,677.3	3,811.1	1,965.2	5.93	120.3	46.00	5.05	8.90	1,135.5	577.9	63.18
	Total (ton/yr)		0.01	2.58	<0.01	<0.01	0.02	<0.01	0.03	<0.01	2.84	1.91	0.98	<0.01	0.06	0.02	< 0.01	<0.01	0.57	0.29	0.03

^a Significant Boiler
^b Additional Hazardous Air Pollutants for the wood fired boiler (Unit ID H004-S) are given in Table 2.6. Unit IDs in italics are new.

TABLE 2.6
Additional Wood Fired Boiler Hazardous Air Pollutants Emissions

D. W. (Act	ual	Poten	tial
Pollutant	lb/yr	ton/yr	lb/yr	ton/yr
Acetaldehyde	0	0	1,017.9	0.51
Acrolein	0	0	4,905.6	2.45
Carbon Tetrachloride	0	0	55.19	0.03
Chlorine	0	0	968.9	0.48
Chlorobenzene	0	0	40.47	0.02
Chloroform	0	0	34.34	0.02
Chloromethane	0	0	28.21	0.01
Dichloromethane	0	0	355.7	0.18
Propylene Dichloride	0	0	40.47	0.02
Ethylbenzene	0	0	38.02	0.02
Hydrogen Chloride	0	0	23,301.6	11.65
Phenol	0	0	62.55	0.03
Propionaldehyde	0	0	74.81	0.04
Styrene	0	0	2,330.2	1.17
2,3,7,8-Tetrachlorodibenzo-p-furans	0	0	1.1E-04	5.5E-08
o-Xylene	0	0	30.66	0.02
Antimony	0	0	9.69	4.8E-03
Totals	0	0	33,294.18	16.65

TABLE 2.7
Emission Factors for Heating Units - Natural Gas Combustion

Dollestont	Emission Facto	or (lb/10 ³ gal) ^{a, b}							
Pollutant	0.3 to 100 MMBtu/hr	<0.3 MMBtu/hr							
	Criteria Pollutant	ts							
СО	84	40							
Lead	5.0x10 ⁻⁴	5.0×10^{-4}							
NO_x	100	94							
PM ^c	7.6	7.6							
PM-10 ^c	7.6	7.6							
PM-2.5°	7.6	7.6							
SO_2	0.6	0.6							
VOC	5.5	5.5							
	Hazardous Air Pollutants ^d								
Arsenic	2.0x10 ⁻⁴	$2.0 \text{x} 10^{-4}$							
Benzene	2.1x10 ⁻³	2.1x10 ⁻³							

Dollartont	Emission Facto	or (lb/10 ³ gal) ^{a, b}
Pollutant	0.3 to 100 MMBtu/hr	<0.3 MMBtu/hr
Beryllium	1.2x10 ⁻⁵	1.2x10 ⁻⁵
Cadmium	1.1x10 ⁻³	1.1×10^{-3}
Chromium	1.4x10 ⁻³	1.4×10^{-3}
Cobalt	8.4x10 ⁻⁵	8.4×10^{-5}
Formaldehyde	7.5x10 ⁻²	7.5×10^{-2}
Hexane	1.8	1.8
Lead	5.0×10^{-4}	5.0×10^{-4}
Manganese	3.8x10 ⁻⁴	3.8×10^{-4}
Mercury	2.6×10^{-4}	2.6×10^{-4}
Naphthalene	6.1x10 ⁻⁴	6.1×10^{-4}
Nickel	2.1x10 ⁻³	2.1×10^{-3}
POM	8.8x10 ⁻⁵	8.8x10 ⁻⁵
Selenium	2.4x10 ⁻⁵	2.4x10 ⁻⁵
Toluene	3.4x10 ⁻³	3.4x10 ⁻³

^a Emission factors from EPA Document AP-42, Section 1.4-9 (Ref. 1).

TABLE 2.8 Emission Factors for Heating Units - Distillate Fuel Oil Combustion

		Emission Fa	actor (lb/10 ³ gal) a, b	
Pollutant	>100 MMBtu/hr	10 to 100 MMBtu/hr	0.3 to <10 MMBtu/hr	<0.3 MMBtu/hr
CO	5	5	5	5
NO _x	24	20	20	18
PM ^c	2	2	2	0.4
PM-10 ^c	1.0	1.0	1.08	0.4
PM-2.5°	0.25	0.25	0.83	0.4
SO ₂ ^e	142(S)	142(S)	142(S)	142(S)
VOCf	0.2	0.2	0.34	0.713
Formaldehyde	0.048	0.048	0.048	0.048
POM	0.0033	0.0033	0.0033	0.0033
	En	nission Factor (lb	/10 ¹² Btu) ^g	
Arsenic	4	4	4	-
Beryllium	3	3	3	-
Cadmium	3	3	3	-
Chromium	3	3	3	-
Copper	6	6	6	-

b Emission factors based on burning NG with a heating value of 1,020 Btu/ft³.
c Emission factor for total particulate matter (condensable and filterable).
d Emission factors are independent of heating unit heat input capacity or firing configuration.

	Emission Factor (lb/10 ³ gal) a, b									
Pollutant	>100 MMBtu/hr	10 to 100 MMBtu/hr	0.3 to <10 MMBtu/hr	<0.3 MMBtu/hr						
Lead	9	9	9	-						
Manganese	6	6	6	-						
Mercury	3	3	3	-						
Nickel	3	3	3	-						
Selenium	15	15	15	-						
Zinc	4	4	4	-						

^a Emission factors from EPA document AP-42, Section 1.3-1 (Ref. 1).

TABLE 2.9
Emission Factors for Heating Units – LPG/Propane Combustion

Pollutant	Emission Factor	(lb/10 ³ gal) ^{a,b}						
ronutant	10 to 100 MMBtu/hr	0.3 -10 MMBtu/hr						
	Criteria Pollutants							
CO	7.5	7.5						
NO _x	13	13						
PM ^c	0.7	0.7						
PM-10 ^c	0.7	0.7						
PM-2.5	0.7	0.7						
SO ₂ ^d	0.10(S)	0.10(S)						
VOC	1	1						

^a Emission factors based on information contained in EPA document AP-42, Section 1.5-3 (Ref. 1).

b Emission factors based on burning No. 2 fuel oil with a heating value of 140,000 Btu/gal.

^c Emission factors for filterable particulate matter only.

Mo factor was provided for <0.3 MMBtu/hr heating units; therefore, the emission factor for 0.3 to <10 MMBtu/hr heating units was used.</p>

^e The variable S in the emission factors equals the sulfur content of the fuel expressed as percent weight. A maximum sulfur content of $0.5\%_w$ was assumed for the distillate oil burned at Fort Stewart; therefore, the SO_2 factors were assumed to equal the values presented times 0.5.

f NMTOC emission factors provided; assumed VOC equals NMTOC.

g Emission factors are independent of heating unit heat input capacity.

^b Emission factors based on a heating value of 90,500 Btu/gal.

^c Emission factors for filterable particulate matter only.

^d The variable S in the emission factor equals the sulfur content of the fuel expressed as gr/100 ft³. The LPG sulfur content was unknown; therefore, the sulfur content for LPG was assumed to be 0.54 gr/100 ft³. The SO₂ factors are equal to the values presented times 0.54.

TABLE 2.10
Emission Factors for Heating Units – Wood/Bark Combustion

Pollutant	Emission Factor (lb/MMBtu) ^{a,b}
Criteria Poll	utants
COc	0.60
NO_x	0.22
PM^d	0.066
PM-10 ^d	0.065
PM-2.5 ^d	0.065
SO ₂ °	0.025
VOC	0.038
Hazardous Air l	Pollutants
Acetaldehyde	8.30E-04
Acrolein	4.00E-03
Benzene	4.20E-03
Carbon Tetrachloride	4.50E-05
Chlorine	7.90E-04
Chlorobenzene	3.30E-05
Chloroform	2.80E-05
Chloromethane	2.30E-05
Dichloromethane	2.90E-04
Propylene Dichloride	3.30E-05
Ethylbenzene	3.10E-05
Formaldehyde	4.40E-03
Hydrogen Chloride	1.90E-02
Naphthalene	9.70E-05
Phenol	5.10E-05
Propionaldehyde	6.10E-05
Styrene	1.90E-03
2,3,7,8-Tetrachlorodibenzo-p-furans	9.00E-11
Toluene	9.20E-04
o-Xylene	2.50E-05
Antimony	7.90E-06
Arsenic	2.20E-05
Beryllium	1.10E-06
Cadmium	4.10E-06
Chromium, total	2.10E-05
Cobalt	6.50E-06
Copper	4.90E-05
Lead	4.80E-05
Manganese	1.60E-03

Pollutant	Emission Factor (lb/MMBtu) ^{a,b}
Mercury	3.50E-06
Nickel	3.30E-05
Selenium	2.80E-06
Zinc	4.20E-04

^a Emission factors from AP-42, Section 1.6 (Ref. 1).
^b Emission factors units are in lb of pollutant/million Btu (MMBtu) of heat input. To convert from lb/MMBtu to lb/ton, multiply by (2,000 HHV), where HHV is the higher heating value (4,500

^c Emission factor for stoker boilers.
^d Emission factor for a heating unit controlled with a wet scrubber/venturi.

3.0 Internal Combustion Engines

Title V Source Designation(s)

Internal Combustion (IC) engines that are not considered insignificant Significant

or trivial, as defined below

<u>X</u>Insignificant IC engines fired with natural gas, gasoline, LPG, and/or diesel fuel

that are used exclusively for emergency power generation

IC engines fired with natural gas, gasoline, LPG, and/or diesel fuel that are used for peaking power generation and are operated

≤200 hr/yr (actual, not potential, hours)

IC engines fired with natural gas, LPG, and/or diesel fuel that have

power output ratings $\leq 298 \, kW \, (\leq 400 \, hp)$ and are operated

 $\leq 2,000 \, hr/yr$ (actual, not potential, hours)

IC engines fired with gasoline that have power output ratings \leq 74.5 kW (\leq 100 hp) and are operated \leq 500 hr/yr (actual, not

potential, hours)

Trivial Hand-carried units

3.1 BACKGROUND

Seventy-three (73) stationary internal combustion (IC) engine units (i.e. emergency generators and pumps) were identified in 2007. Ten of the generators are new. All the units identified are listed in Table 3.1. Three generators (G187-S, G190-S, and Temporary) that were installed after 2007 were included in the Table but were not assigned usage and were not included in the potential emission calculations. They are listed for informational purposes and to aid the development of the 2008 inventory. In addition, two of the new generators (G188-S & G189-S), installed in late 2007 and one (G181-S) installed in 2006 were not operated. See Section 3.3 for a list of all changes since the 2006 inventory.

Power outputs for the engines that operated in 2007 ranged from 11 kW to 500 kW. All of the IC engines identified used diesel fuel.

As per Georgia Air Pollution Control rules (391-2-03) source designations for stationary IC engines are based on the unit's power output, the purpose for which the unit is used, and its potential operating hours. Based on the classification guidelines given in the rules, all of the inventoried units are designated as "insignificant" sources of air pollution in the Title V permit. In addition, the Georgia EPD has designated emergency generators that may be carried by hand as "trivial" sources, and field equipment equipped with IC engines are considered mobile sources of air pollution. As a result, emissions from these units are not addressed in this inventory.

Total 2007 operating hours were available for all of the engines. In addition, fuel use was also available for most of the generators (See Section 1.0, Table 1.0 for data sources/contacts). In the few cases where only operating hours were available, fuel use was estimated based on the size of the engine and its 2007 operating hours. This was also the basis for calculating potential fuel use used in potential emissions calculations as described below.

To calculate potential fuel use and actual fuel use for generators that only had operating hours available, a fuel heating value of 140,000 Btu/gal (Ref. 1, Section 1.3), and brake-specific fuel consumption value of 7,000 Btu/hp-hr (Ref. 1, Section 3.3) were used to convert power output to fuel input. A load factor (the power actually used divided by the power available) of 0.75 was used for actual fuel use estimation. For potential fuel use estimation it was assumed each engine could operate at full load (Load Factor of 1.0).

For example, the calculation used to estimate the potential quantity of fuel consumed by the IC engine located at Building 3 is presented below.

Unit ID: G102-S Type of fuel: Diesel Power output: 275 kW

Hours of operation: 500 hr/yr (see note below)

Load factor: 1.0

Brake-specific fuel consumption: 7,000 Btu/hp-hr Fuel heating value: 140,000 Btu/gal

```
Potential fuel usage = (275 kW) * (500 hr/yr) * (1.0) * (7,000 Btu/hp-hr) * (1.34 hp/kW) 
* (1 gal/140,000 Btu) 
= 9,212.5 gal/yr
```

Note: Emergency power generators were assumed to have the potential to operate at a maximum of 500 hr/yr. The remaining IC engine units (pumps) were assumed to operate a maximum of 1,000 hr/yr.

Actual fuel use data provided by Fort Stewart and potential fuel usage determined using the method above is shown for all IC engines in Section 3.3, Table 3.1.

3.2 EMISSION ESTIMATES

The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for all stationary internal combustion engines.

Actual Emissions

Actual emissions were estimated for each IC engine unit using emission factors from AP-42, Sections 3.3 and 3.4 (Ref. 1). The emission factors (presented in Section 3.3, Table 3.2) are dependent upon the engine power output rating, with a change in emission factors occurring at a power rating of 447 kW. Actual emissions from each IC engine were estimated by multiplying the actual fuel use, the fuel heating value, and the appropriate emission factor. For example, the

calculation used to estimate actual CO emissions from the IC engine located at Building 3 is presented below.

Unit ID: G102-S
Type of fuel: Diesel
Actual fuel use: 352.9 gal/yr

Diesel fuel heating value: 140,000 Btu/gal = 0.14 MMBtu/gal

CO emission factor: 0.95 lb/MMBtu

CO Emissions = (352.9 gal/yr) * (0.14 MMBtu/gal) * (0.95 lb/MMBtu) = 46.94 lb/yr

The estimated actual criteria pollutant emissions for all IC engines are presented in Section 3.3, Table 3.4 presents the estimated actual hazardous air pollutants (HAP) emissions.

Potential Emissions

Potential emissions from each IC engine were estimated by multiplying the potential fuel use (gal/yr) calculated as described in Section 3.1, the fuel heating value, and the appropriate emission factor. The same methodology and emission factors that were used to calculate actual emissions were also used to calculate potential emissions. No potential emissions were calculated for G181-S (Bldg. 1425) as the unit is not operational, and for the two generators (G188-S & G189-S) that were installed very late in 2007.

The estimated potential emissions (criteria pollutants and HAPs) for each emission unit are presented in Tables 3.5 and 3.6 respectively.

Emissions Summary

Table 3.0 given below summarizes actual and potential criteria pollutant and HAP emissions from internal combustion engines at Fort Stewart.

TABLE 3.0 Emissions Summary – Stationary IC Engines

Emission Type		СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC	НАР
Actual	lb/yr	955.15	4,370.93	294.15	293.10	292.96	273.93	341.67	3.73
Actual	ton/yr	0.48	2.19	0.15	0.15	0.15	0.14	0.17	< 0.01
Potential	lb/yr	30,539.05	138,267.74	8,991.41	8,933.25	8,925.28	8,342.36	10,446.13	115.65
rotential	ton/yr	15.27	69.13	4.50	4.47	4.46	4.17	5.22	0.06

Emission Source Updates

The following updates were made from the 2006 inventory.

- Changed capacity of G115-S (Bldg. 4); 17.5 kW generator was replaced by new 350 kW unit.
- Added the following sources: G182-S (Bldg. 10499), G183-S (Gate 1), G184-S (Gate 5/Bldg. 821), G185-S (Gate 7/Bldg. 4501), G186-S Gate 8/Bldg. 1100), G187-S (Next to Bldg. 311), G188-S (Behind Bldg. 9719), G189-S (Bldg. HQ001), G190-S (Bldg. 1727), Temp (Bldg. TFSS2).
- G171-S: Renamed location from SOSS4 to SOSS1.
- G172-S: Renamed location from CRSS5 to CRSS1.

3.3 DETAIL SOURCE AND EMISSION TABLES

Tables 3.1 through 3.6 below provide a breakdown of emissions sources identified, emission factors used when calculating emissions, and a detailed emission summary by each engine unit.

TABLE 3.1
Internal Combustion Engine Information for CY2007

internal compassion Engine information for \$12007										
Unit ID	Bldg. No.	Capacity (kW)	Hours of Operation (hr/yr)	Actual Fuel Usage (gal)	Potential Fuel Usage (gal)					
G102-S	3	275	28	352.9	9,212.5					
G103-S	7	150	26	177.3	5,025.0					
G104-S	9	300	97	1,337.2	10,050.0					
G108-S	350	500	9	301.5	16,750.0					
G109-S	350	500	9	301.5	16,750.0					
G110-S	421	30	37	49.9	1,005.0					
G112-S	456	230	30	320.5	7,705.0					
G113-S	457	22.5	22	21.9	753.8					
G115-S	933	350	4	64.4	11,725.0					
G116-S	899	75	20	68.7	2,512.5					
G117-S	1345	230	32	181.7	7,705.0					
G119-S	1591	50	35	79.3	1,675.0					
G121-S	4420 A	100	20	92.4	3,350.0					
G122-S	4524	125	28	162.7	4,187.5					
G123-S	5018	20	22	20.1	670.0					
G127-S	7000	150	18	123.5	5,025.0					
G129-S ^a	7705	95	12	51.1	6,365.0					
G130-S ^a	7731	125	1	5.7	8,375.0					

Unit ID	Bldg. No.	Capacity (kW)	Hours of Operation (hr/yr)	Actual Fuel Usage (gal)	Potential Fuel Usage (gal)
G131-S	7754	125	34	193.2	4,187.5
G132-S	7761	50	27	62.8	1,675.0
G133-S	7851	60	24	67.1	2,010.0
G134-S ^a	9961	150	2	11.7	10,050.0
G135-S	10504	60	6	24.5	2,010.0
G136-S	15003	45	19	38.3	1,507.5
G139-S	19107	30	32	44.1	1,005.0
G140-S	19222	30	46	63.1	1,005.0
G141-S	19298	11	18	9.3	368.5
G142-S	19501	11	23	11.5	368.5
G144-S	15505	11	22	11.1	368.5
G145-S	16010	25	99	114.3	837.5
G146-S	2916	240	19	210.8	8,040.0
G147-S ^a	2916	136	13	104.4	9,112.0
G148-S	4420 B	60	19	51.3	2,010.0
G149-S	4588	175	15	120.8	5,862.5
G150-S	6599	25	25	21.1	837.5
G151-S	19108	40	20	36.6	1,340.0
G152-S	280	25	30	34.3	837.5
G153-S	939	200	31	287.9	6,700.0
G154-S	5653	13	27	15.9	435.5
G155-S	6875	40	40	53.7	1,340.0
G156-S	7199	25	46	52.8	837.5
G157-S	6800	25	17	19.9	837.5
G158-S	9599	20	32	29.4	670.0
G159-S	19221	50	24	54.5	1,675.0
G160-S	1071	15	79	54.7	502.5
G161-S	203	22	51	51.3	737.0
G163-S	1860	100	26	174.2	3,350.0
G164-S	3000	100	35	160.5	3,350.0
G165-S	7710	80	19	70.7	2,680.0
G166-S	15017	80	30	109.3	2,680.0
G167-S	19231	80	27	98.4	2,680.0
G168-S	LWSS1	50	44	104.4	1,675.0
G169-S	LWSS2	50	18	40.5	1,675.0
G170-S	LWSS3	35	17	28.1	1,172.5
G171-S	SOSS1	35	35	23.3	1,172.5
G172-S	CRSS1	35	35	25.1	1,172.5

Unit ID	Bldg. No.	Capacity (kW)	Hours of Operation (hr/yr)	Actual Fuel Usage (gal)	Potential Fuel Usage (gal)
G174-S	7723	28	0	0	938.0
G176-S	305 (DOIM Next to 306)	80	27	99.3	2,680.0
G177-S	625	80	22	80.2	2,680.0
G178-S	8080 (Rte. 144 DOIM)	80	22	79.5	2,680.0
G179-S	19100	80	21	78.0	2,680.0
G180-S	Gate 3 (next to 7808)	74	19	52.9	2,479.0
G181-S	1412	565	0	0	0.0
G182-S	10499	60	16	43.1	2,010.0
G183-S	Gate 1	60	41	112.6	2,010.0
G184-S	Gate 5 (Bldg. 821)	60	25	69.6	2,010.0
G185-S	Gate 7 (Bldg,4501)	80	25	91.3	2,680.0
G186-S	Gate 8 (Bldg. 1100)	80	84	141.3	2,680.0
G187-S	Next to Bldg. 311	150	0	0	0
G188-S	Behind Bldg. 9719	33	0	0	0
G189-S	HQ Bldg. (HQ001)	1,000	0	0	0
G190-S	1727	35	0	0	0
Temporary	TFSS2	35	0	0	0

^a Pumps Unit IDs in italics are new.

TABLE 3.2 Emission Factors for Stationary IC Engines

	Emission Factor (lb	/MMBtu fuel input) ^a
Pollutant	Diese	el Fuel
	0-447 kW	>447 kW
	Criteria Pollutants	
СО	0.95	0.85
NO _x	4.41	3.2
PM	0.31 ^b	0.0697
PM-10	0.31	0.0573
PM-2.5	0.31 ^b	0.0556
SO ₂ °	0.29	1.01(S) ^d
VOC	0.36 ^e	0.0819 ^{,f}
	Hazardous Air Pollutant	s
Acetaldehyde	7.67x10 ⁻⁴	2.52x10 ⁻⁵
Acrolein	9.25x10 ⁻⁵	7.88x10 ⁻⁶

	Emission Factor (lb/MMBtu fuel input) ^a					
Pollutant	Diesel Fuel					
	0-447 kW	>447 kW				
Benzene	9.33x10 ⁻⁴	7.76x10 ⁻⁴				
1,3-Butadiene	3.91x10 ⁻⁵					
Formaldehyde	1.18x10 ⁻³	7.89x10 ⁻⁵				
Naphthalene	8.48x10 ⁻⁵	$1.30 \text{x} 10^{-4}$				
POM	8.32x10 ⁻⁵	8.20x10 ⁻⁵				
Toluene	4.09x10 ⁻⁴	2.81x10 ⁻⁴				
Xylene	2.85x10 ⁻⁴	1.93x10 ⁻⁴				

^a Emission factors are from EPA document AP-42, Section 3.3, Tables 3.3-1 and 3.3-2 and Section 3.4, Tables 3.4-1 through 3.4-4 (Ref. 1).

TABLE 3.3
Actual Emissions of Criteria Pollutants from Stationary IC Engines

IC Engin	e Details	Emissions (lb/yr)								
Unit ID	Building No.	СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC		
G102-S	3	46.94	217.88	15.32	15.32	15.32	14.33	17.79		
G103-S	7	23.58	109.47	7.69	7.69	7.69	7.20	8.94		
G104-S	9	177.85	825.59	58.03	58.03	58.03	54.29	67.39		
G108-S	350	35.88	135.07	2.94	2.42	2.35	2.13	3.46		
G109-S	350	35.88	135.07	2.94	2.42	2.35	2.13	3.46		
G110-S	421	6.64	30.81	2.17	2.17	2.17	2.03	2.51		
G112-S	456	42.63	197.88	13.91	13.91	13.91	13.01	16.15		
G113-S	457	2.91	13.52	0.950	0.950	0.950	0.889	1.10		
G115-S	933	8.57	39.76	2.79	2.79	2.79	2.61	3.25		
G116-S	899	9.14	42.42	2.98	2.98	2.98	2.79	3.46		
G117-S	1345	24.17	112.18	7.89	7.89	7.89	7.38	9.16		
G119-S	1591	10.55	48.96	3.44	3.44	3.44	3.22	4.00		
G121-S	4420 A	12.29	57.05	4.01	4.01	4.01	3.75	4.66		
G122-S	4524	21.64	100.45	7.06	7.06	7.06	6.61	8.20		
G123-S	5018	2.67	12.41	0.872	0.872	0.872	0.816	1.01		
G127-S	7000	16.43	76.25	5.36	5.36	5.36	5.01	6.22		

 $^{^{}b}$ PM and PM-2.5 factors are equal to the PM-10 factor because all emitted PM are typically $< 1~\mu m$ in diameter.

^c SO_x factor provided; assumed SO₂ equaled SO_x.

^d The variable S in the emission factor equals the sulfur content of the fuel expressed as percent weight. The sulfur content of diesel fuel is limited to 0.05%_w [CAAA of 1990, PL101-549; Section 211(i)(1)]. Therefore, the SO₂ factor was assumed to equal the value presented times 0.05.

^e TOC factor provided; assumed VOC equaled TOC.

^f TOC factor provided and additional data indicated that NMTOC equaled 91% of TOC; therefore, assumed VOC equaled 91% of TOC.

IC Engin	e Details		Emissions (lb/yr)								
Unit ID	Building No.	СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC			
G129-S	7705	6.80	31.55	2.22	2.22	2.22	2.07	2.58			
G130-S	7731	0.76	3.52	0.247	0.247	0.247	0.231	0.287			
G131-S	7754	25.70	119.28	8.38	8.38	8.38	7.84	9.74			
G132-S	7761	8.35	38.77	2.73	2.73	2.73	2.55	3.17			
G133-S	7851	8.92	41.43	2.91	2.91	2.91	2.72	3.38			
G134-S	9961	1.56	7.22	0.508	0.508	0.508	0.475	0.590			
G135-S	10504	3.26	15.14	1.06	1.06	1.06	1.00	1.24			
G136-S	15003	5.09	23.65	1.66	1.66	1.66	1.55	1.93			
G139-S	19107	5.87	27.23	1.91	1.91	1.91	1.79	2.22			
G140-S	19222	8.39	38.96	2.74	2.74	2.74	2.56	3.18			
G141-S	19298	1.24	5.74	0.404	0.404	0.404	0.378	0.469			
G142-S	19501	1.53	7.10	0.499	0.499	0.499	0.467	0.580			
G144-S	15505	1.48	6.85	0.482	0.482	0.482	0.451	0.559			
G145-S	16010	15.20	70.57	4.96	4.96	4.96	4.64	5.76			
G146-S	2916	28.04	130.15	9.15	9.15	9.15	8.56	10.62			
G147-S	2916	13.89	64.46	4.53	4.53	4.53	4.24	5.26			
G148-S	4420 B	6.82	31.67	2.23	2.23	2.23	2.08	2.59			
G149-S	4588	16.07	74.58	5.24	5.24	5.24	4.90	6.09			
G150-S	6599	2.81	13.03	0.916	0.916	0.916	0.857	1.06			
G151-S	19108	4.87	22.60	1.59	1.59	1.59	1.49	1.84			
G152-S	280	4.56	21.18	1.49	1.49	1.49	1.39	1.73			
G153-S	939	38.29	177.75	12.49	12.49	12.49	11.69	14.51			
G154-S	5653	2.11	9.82	0.690	0.690	0.690	0.646	0.801			
G155-S	6875	7.14	33.15	2.33	2.33	2.33	2.18	2.71			
G156-S	7199	7.02	32.60	2.29	2.29	2.29	2.14	2.66			
G157-S	6800	2.65	12.29	0.864	0.864	0.864	0.808	1.00			
G158-S	9599	3.91	18.15	1.28	1.28	1.28	1.19	1.48			
G159-S	19221	7.25	33.65	2.37	2.37	2.37	2.21	2.75			
G160-S	1071	7.28	33.77	2.37	2.37	2.37	2.22	2.76			
G161-S	203	6.82	31.67	2.23	2.23	2.23	2.08	2.59			
G163-S	1860	23.17	107.55	7.56	7.56	7.56	7.07	8.78			
G164-S	3000	21.35	99.09	6.97	6.97	6.97	6.52	8.09			
G165-S	7710	9.40	43.65	3.07	3.07	3.07	2.87	3.56			
G166-S	15017	14.54	67.48	4.74	4.74	4.74	4.44	5.51			
G167-S	19231	13.09	60.75	4.27	4.27	4.27	4.00	4.96			
G168-S	LWSS1	13.89	64.46	4.53	4.53	4.53	4.24	5.26			
G169-S	LWSS2	5.39	25.00	1.76	1.76	1.76	1.64	2.04			
G170-S	LWSS3	3.74	17.35	1.22	1.22	1.22	1.14	1.42			
G171-S	SOSS1	3.10	14.39	1.01	1.01	1.01	0.95	1.17			
G172-S	CRSS1	3.34	15.50	1.09	1.09	1.09	1.02	1.27			

IC Engine	e Details			Emi	issions (lb/y	r)		
Unit ID	Building No.	co	NO _X	SO ₂	PM	PM-10	PM-2.5	voc
G174-S	7723	0	0	0	0	0	0	0
G176-S	305 (DOIM Next to 306)	13.21	61.31	4.31	4.31	4.31	4.03	5.00
G177-S	625	10.67	49.52	3.48	3.48	3.48	3.26	4.04
G178-S	8080 (Rte. 144 DOIM)	10.57	49.08	3.45	3.45	3.45	3.23	4.01
G179-S	19100	10.37	48.16	3.39	3.39	3.39	3.17	3.93
G180-S	Gate 3 (next to 7808)	7.04	32.66	2.30	2.30	2.30	2.15	2.67
G181-S	1412	0	0	0	0	0	0	0
G182-S	10499	5.73	26.61	1.87	1.87	1.87	1.75	2.17
G183-S	Gate 1	14.98	69.52	4.89	4.89	4.89	4.57	5.68
G184-S	Gate 5 (Bldg. 821)	9.26	42.97	3.02	3.02	3.02	2.83	3.51
G185-S	Gate 7 (Bldg,4501)	12.14	56.37	3.96	3.96	3.96	3.71	4.60
G186-S	Gate 8 (Bldg. 1100)	18.79	87.24	6.13	6.13	6.13	5.74	7.12
G187-S	Next to Bldg. 311	0	0	0	0	0	0	0
G188-S	Behind Bldg. 9719	0	0	0	0	0	0	0
G189-S	HQ Bldg. (HQ001)	0	0	0	0	0	0	0
G190-S	1727	0	0	0	0	0	0	0
Temporary	TFSS2	0	0	0	0	0	0	0
Total (lb/yr)	955.15	4,370.93	294.15	293.10	292.96	273.93	341.67
Total (t	on/yr)	0.48	2.19	0.15	0.15	0.15	0.14	0.17

TABLE 3.4 Actual HAP Emissions from Stationary IC Engines

IC Engi	ne Details				1	Emissions (lb/yr	·)			
Unit ID	Bldg. No.	Acetaldehyde	Acrolein	Benzene	1,3- Butadiene	Formaldehyde	Naphthalene	РОМ	Toluene	Xylene
G102-S	3	0.038	0.005	0.046	0.002	0.058	0.004	0.004	0.020	0.014
G103-S	7	0.019	0.002	0.023	0.001	0.029	0.002	0.002	0.010	0.007
G104-S	9	0.144	0.017	0.175	0.007	0.221	0.016	0.016	0.077	0.053
G108-S	350	0.001	3.3E-04	0.033	-	0.003	0.005	0.003	0.012	0.008
G109-S	350	0.001	3.3E-04	0.033	-	0.003	0.005	0.003	0.012	0.008
G110-S	421	0.005	0.001	0.007	2.7E-04	0.008	0.001	0.001	0.003	0.002
G112-S	456	0.034	0.004	0.042	0.002	0.053	0.004	0.004	0.018	0.013
G113-S	457	0.002	2.8E-04	0.003	1.2E-04	0.004	2.6E-04	2.6E-04	0.001	0.001
G115-S	933	0.007	0.001	0.008	3.5E-04	0.011	0.001	0.001	0.004	0.003
G116-S	899	0.007	0.001	0.009	3.8E-04	0.011	0.001	0.001	0.004	0.003
G117-S	1345	0.020	0.002	0.024	0.001	0.030	0.002	0.002	0.010	0.007
G119-S	1591	0.009	0.001	0.010	4.3E-04	0.013	0.001	0.001	0.005	0.003
G121-S	4420 A	0.010	0.001	0.012	0.001	0.015	0.001	0.001	0.005	0.004
G122-S	4524	0.017	0.002	0.021	0.001	0.027	0.002	0.002	0.009	0.006
G123-S	5018	0.002	0.000	0.003	1.1E-04	0.003	0.000	0.000	0.001	0.001
G127-S	7000	0.013	0.002	0.016	0.001	0.020	0.001	0.001	0.007	0.005
G129-S	7705	0.005	0.001	0.007	2.8E-04	0.008	0.001	0.001	0.003	0.002
G130-S	7731	0.001	7.4E-05	0.001	3.1E-05	0.001	6.8E-05	6.6E-05	3.3E-04	0.000
G131-S	7754	0.021	0.003	0.025	0.001	0.032	0.002	0.002	0.011	0.008
G132-S	7761	0.007	0.001	0.008	3.4E-04	0.010	0.001	0.001	0.004	0.003
G133-S	7851	0.007	0.001	0.009	3.7E-04	0.011	0.001	0.001	0.004	0.003
G134-S	9961	0.001	1.5E-04	0.002	6.4E-05	0.002	1.4E-04	1.4E-04	0.001	0.000
G135-S	10504	0.003	3.2E-04	0.003	1.3E-04	0.004	2.9E-04	2.9E-04	0.001	0.001
G136-S	15003	0.004	5.0E-04	0.005	2.1E-04	0.006	4.5E-04	4.5E-04	0.002	0.002
G139-S	19107	0.005	0.001	0.006	2.4E-04	0.007	0.001	0.001	0.003	0.002
G140-S	19222	0.007	0.001	0.008	3.5E-04	0.010	0.001	0.001	0.004	0.003
G141-S	19298	0.001	1.2E-04	0.001	5.1E-05	0.002	1.1E-04	1.1E-04	0.001	3.7E-04
G142-S	19501	0.001	1.5E-04	0.002	6.3E-05	0.002	1.4E-04	1.3E-04	0.001	4.6E-04
G144-S	15505	0.001	1.4E-04	0.001	6.1E-05	0.002	1.3E-04	1.3E-04	0.001	4.4E-04
G145-S	16010	0.012	0.001	0.015	0.001	0.019	0.001	0.001	0.007	0.005
G146-S	2916	0.023	0.003	0.028	0.001	0.035	0.003	0.002	0.012	0.008
G147-S	2916	0.011	0.001	0.014	0.001	0.017	0.001	0.001	0.006	0.004
G148-S	4420 B	0.006	0.001	0.007	2.8E-04	0.008	0.001	0.001	0.003	0.002
G149-S	4588	0.013	0.002	0.016	0.001	0.020	0.001	0.001	0.007	0.005
G150-S	6599	0.002	2.7E-04	0.003	1.2E-04	0.003	2.5E-04	2.5E-04	0.001	0.001
G151-S	19108	0.004	4.7E-04	0.005	2.0E-04	0.006	4.3E-04	4.3E-04	0.002	0.001
G151-S	280	0.004	4.4E-04	0.004	1.9E-04	0.006	4.1E-04	4.0E-04	0.002	0.001
G153-S	939	0.031	0.004	0.038	0.002	0.048	0.003	0.003	0.016	0.011
G154-S	5653	0.002	2.1E-04	0.002	8.7E-05	0.003	1.9E-04	1.9E-04	0.001	0.001
G154-S	6875	0.002	0.001	0.002	2.9E-04	0.003	0.001	0.001	0.001	0.001
0122-2	00/3	0.000	0.001	0.007	4.7D-U4	0.009	0.001	0.001	0.003	0.002

IC Eng	ine Details]	Emissions (lb/yr	·)			
Unit ID	Bldg. No.	Acetaldehyde	Acrolein	Benzene	1,3- Butadiene	Formaldehyde	Naphthalene	POM	Toluene	Xylene
G156-S	7199	0.006	0.001	0.007	2.9E-04	0.009	0.001	0.001	0.003	0.002
G157-S	6800	0.002	2.6E-04	0.003	1.1E-04	0.003	2.4E-04	2.3E-04	0.001	0.001
G158-S	9599	0.003	3.8E-04	0.004	1.6E-04	0.005	3.5E-04	3.4E-04	0.002	0.001
G159-S	19221	0.006	0.001	0.007	3.0E-04	0.009	0.001	0.001	0.003	0.002
G160-S	1071	0.006	0.001	0.007	3.0E-04	0.009	0.001	0.001	0.003	0.002
G161-S	203	0.006	0.001	0.007	2.8E-04	0.008	0.001	0.001	0.003	0.002
G163-S	1860	0.019	0.002	0.023	0.001	0.029	0.002	0.002	0.010	0.007
G164-S	3000	0.017	0.002	0.021	0.001	0.027	0.002	0.002	0.009	0.006
G165-S	7710	0.008	0.001	0.009	3.9E-04	0.012	0.001	0.001	0.004	0.003
G166-S	15017	0.012	0.001	0.014	0.001	0.018	0.001	0.001	0.006	0.004
G167-S	19231	0.011	0.001	0.013	0.001	0.016	0.001	0.001	0.006	0.004
G168-S	LWSS1	0.011	0.001	0.014	0.001	0.017	0.001	0.001	0.006	0.004
G169-S	LWSS2	0.004	0.001	0.005	2.2E-04	0.007	4.8E-04	4.7E-04	0.002	0.002
G170-S	LWSS3	0.003	3.6E-04	0.004	1.5E-04	0.005	3.3E-04	3.3E-04	0.002	0.001
G171-S	SOSS1	0.003	3.0E-04	0.003	1.3E-04	0.004	2.8E-04	2.7E-04	0.001	0.001
G172-S	CRSS1	0.003	3.3E-04	0.003	1.4E-04	0.004	3.0E-04	2.9E-04	0.001	0.001
G174-S	7723	0	0	0	0	0	0	0	00	0
G176-S	305 (DOIM Next to 306)	0.011	0.001	0.013	0.001	0.016	0.001	0.001	0.006	0.004
G177-S	625	0.009	0.001	0.010	4.4E-04	0.013	0.001	0.001	0.005	0.003
G178-S	8080 (Rte. 144 DOIM)	0.009	0.001	0.010	4.4E-04	0.013	0.001	0.001	0.005	0.003
G179-S	19100	0.008	0.001	0.010	4.3E-04	0.013	0.001	0.001	0.004	0.003
G180-S	Gate 3 (next to 7808)	0.006	0.001	0.007	2.9E-04	0.009	0.001	0.001	0.003	0.002
G181-S	1412	0	0	0	-	0	0	0	0	0
G182-S	10499	0.005	0.001	0.006	2.4E-04	0.007	0.001	0.001	0.002	0.002
G183-S	Gate 1	0.012	0.001	0.015	0.001	0.019	0.001	0.001	0.006	0.004
G184-S	Gate 5 (Bldg. 821)	0.007	0.001	0.009	0.000	0.011	0.001	0.001	0.004	0.003
G185-S	Gate 7 (Bldg,4501)	0.010	0.001	0.012	5.0E-04	0.015	0.001	0.001	0.005	0.004
G186-S	Gate 8 (Bldg. 1100)	0.015	0.002	0.018	0.001	0.023	0.002	0.002	0.008	0.006
G187-S	Next to Bldg. 311	0	0	0	0	0	0	0	0	0
G188-S	Behind Bldg. 9719	0	0	0	0	0	0	0	0	0
G189-S	HQ Bldg. (HQ001)	0	0	0	-	0	0	0	0	0
G190-S	1727	0	0	0	0	0	0	0	0	0
Temporary	TFSS2	0	0	0	0	0	0	0	0	0
Tota	l (lb/yr)	0.72	0.09	0.93	0.04	1.10	0.09	0.08	0.40	0.28
Total	(ton/yr)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE 3.5
Potential Emissions of Criteria Pollutants from Stationary IC Engines

IC Engi	ne Details			Emi	ssions (lb/yr))		
Unit ID	Building No.	СО	NO_X	SO ₂	PM	PM-10	PM-2.5	VOC
G102-S	3	1,225.26	5,687.80	399.82	399.82	399.82	374.03	464.31
G103-S	7	668.33	3,102.44	218.09	218.09	218.09	204.02	253.26
G104-S	9	1,336.65	6,204.87	436.17	436.17	436.17	408.03	506.52
G108-S	350	1,993.25	7,504.00	163.45	134.37	130.38	118.42	192.06
G109-S	350	1,993.25	7,504.00	163.45	134.37	130.38	118.42	192.06
G110-S	421	133.67	620.49	43.62	43.62	43.62	40.80	50.65
G112-S	456	1,024.77	4,757.07	334.40	334.40	334.40	312.82	388.33
G113-S	457	100.25	465.37	32.71	32.71	32.71	30.60	37.99
G115-S	933	1,559.43	7,239.02	508.87	508.87	508.87	476.04	590.94
G116-S	899	334.16	1,551.22	109.04	109.04	109.04	102.01	126.63
G117-S	1345	1,024.77	4,757.07	334.40	334.40	334.40	312.82	388.33
G119-S	1591	222.78	1,034.15	72.70	72.70	72.70	68.01	84.42
G121-S	4420 A	445.55	2,068.29	145.39	145.39	145.39	136.01	168.84
G122-S	4524	556.94	2,585.36	181.74	181.74	181.74	170.01	211.05
G123-S	5018	89.11	413.66	29.08	29.08	29.08	27.20	33.77
G127-S	7000	668.33	3,102.44	218.09	218.09	218.09	204.02	253.26
G129-S	7705	846.55	3,929.75	276.24	276.24	276.24	258.42	320.80
G130-S	7731	1,113.88	5,170.73	363.48	363.48	363.48	340.03	422.10
G131-S	7754	556.94	2,585.36	181.74	181.74	181.74	170.01	211.05
G132-S	7761	222.78	1,034.15	72.70	72.70	72.70	68.01	84.42
G133-S	7851	267.33	1,240.97	87.23	87.23	87.23	81.61	101.30
G134-S	9961	1,336.65	6,204.87	436.17	436.17	436.17	408.03	506.52
G135-S	10504	267.33	1,240.97	87.23	87.23	87.23	81.61	101.30
G136-S	15003	200.50	930.73	65.43	65.43	65.43	61.20	75.98
G139-S	19107	133.67	620.49	43.62	43.62	43.62	40.80	50.65
G140-S	19222	133.67	620.49	43.62	43.62	43.62	40.80	50.65
G141-S	19298	49.01	227.51	15.99	15.99	15.99	14.96	18.57
G142-S	19501	49.01	227.51	15.99	15.99	15.99	14.96	18.57
G144-S	15505	49.01	227.51	15.99	15.99	15.99	14.96	18.57
G145-S	16010	111.39	517.07	36.35	36.35	36.35	34.00	42.21
G146-S	2916	1,069.32	4,963.90	348.94	348.94	348.94	326.42	405.22
G147-S	2916	1,211.90	5,625.75	395.46	395.46	395.46	369.95	459.24
G148-S	4420 B	267.33	1,240.97	87.23	87.23	87.23	81.61	101.30
G149-S	4588	779.71	3,619.51	254.43	254.43	254.43	238.02	295.47

IC Engi	ine Details			Emi	ssions (lb/yr))		
Unit ID	Building No.	СО	NO_X	SO ₂	PM	PM-10	PM-2.5	VOC
G150-S	6599	111.39	517.07	36.35	36.35	36.35	34.00	42.21
G151-S	19108	178.22	827.32	58.16	58.16	58.16	54.40	67.54
G152-S	280	111.39	517.07	36.35	36.35	36.35	34.00	42.21
G153-S	939	891.10	4,136.58	290.78	290.78	290.78	272.02	337.68
G154-S	5653	57.92	268.88	18.90	18.90	18.90	17.68	21.95
G155-S	6875	178.22	827.32	58.16	58.16	58.16	54.40	67.54
G156-S	7199	111.39	517.07	36.35	36.35	36.35	34.00	42.21
G157-S	6800	111.39	517.07	36.35	36.35	36.35	34.00	42.21
G158-S	9599	89.11	413.66	29.08	29.08	29.08	27.20	33.77
G159-S	19221	222.78	1,034.15	72.70	72.70	72.70	68.01	84.42
G160-S	1071	66.83	310.24	21.81	21.81	21.81	20.40	25.33
G161-S	203	98.02	455.02	31.99	31.99	31.99	29.92	37.14
G163-S	1860	445.55	2,068.29	145.39	145.39	145.39	136.01	168.84
G164-S	3000	445.55	2,068.29	145.39	145.39	145.39	136.01	168.84
G165-S	7710	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07
G166-S	15017	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07
G167-S	19231	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07
G168-S	LWSS1	222.78	1,034.15	72.70	72.70	72.70	68.01	84.42
G169-S	LWSS2	222.78	1,034.15	72.70	72.70	72.70	68.01	84.42
G170-S	LWSS3	155.94	723.90	50.89	50.89	50.89	47.60	59.09
G171-S	SOSS1	155.94	723.90	50.89	50.89	50.89	47.60	59.09
G172-S	CRSS1	155.94	723.90	50.89	50.89	50.89	47.60	59.09
G174-S	7723	124.75	579.12	40.71	40.71	40.71	38.08	47.28
G176-S	305 (DOIM Next to 306)	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07
G177-S	625	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07
G178-S	8080 (Rte. 144 DOIM)	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07
G179-S	19100	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07
G180-S	Gate 3 (next to 7808)	329.71	1,530.53	107.59	107.59	107.59	100.65	124.94
G181-S	1412	0	0	0	0	0	0	0
G182-S	10499	267.33	1,240.97	87.23	87.23	87.23	81.61	101.30
G183-S	Gate 1	267.33	1,240.97	87.23	87.23	87.23	81.61	101.30
G184-S	Gate 5 (Bldg. 821)	267.33	1,240.97	87.23	87.23	87.23	81.61	101.30
G185-S	Gate 7 (Bldg,4501)	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07
G186-S	Gate 8 (Bldg.	356.44	1,654.63	116.31	116.31	116.31	108.81	135.07

IC Engi	ne Details	Emissions (lb/yr)									
Unit ID	Jnit ID Building No.		NO _X	SO ₂	PM	PM-10	PM-2.5	VOC			
	1100)										
G187-S	Next to Bldg. 311	0	0	0	0	0	0	0			
G188-S	Behind Bldg. 9719	0	0	0	0	0	0	0			
G189-S	HQ Bldg. (HQ001)	0	0	0	0	0	0	0			
G190-S	1727	0	0	0	0	0	0	0			
Temporary TFSS2		0	0	0	0	0	0	0			
Total (lb/yr)		30,539.05	138,267.74	8,991.41	8,933.25	8,925.28	8,342.36	10,446.13			
Total (ton/yr)		15.27	69.13	4.50	4.47	4.46	4.17	5.22			

TABLE 3.6
Potential HAP Emissions from Stationary IC Engines

IC Engine Details		Emissions (lb/yr)										
Unit ID	Bldg. No.	Acetaldehyde	Acrolein	Benzene	1,3- Butadiene	Formaldehyde	Naphthalene	POM	Toluene	Xylene		
G102-S	3	0.989	0.119	1.20	0.050	1.52	0.109	0.107	0.528	0.368		
G103-S	7	0.540	0.065	0.656	0.028	0.830	0.060	0.059	0.288	0.200		
G104-S	9	1.08	0.130	1.31	0.055	1.66	0.119	0.117	0.575	0.401		
G108-S	350	0.059	0.018	1.82	-	0.185	0.305	0.192	0.659	0.453		
G109-S	350	0.059	0.018	1.82	-	0.185	0.305	0.192	0.659	0.453		
G110-S	421	0.108	0.013	0.13	0.006	0.166	0.012	0.012	0.058	0.040		
G112-S	456	0.827	0.100	1.01	0.042	1.27	0.091	0.090	0.441	0.307		
G113-S	457	0.081	0.010	0.098	0.004	0.125	0.009	0.009	0.043	0.030		
G115-S	933	1.26	0.152	1.53	0.064	1.94	0.139	0.137	0.671	0.468		
G116-S	899	0.270	0.033	0.328	0.014	0.415	0.030	0.029	0.144	0.100		
G117-S	1345	0.827	0.100	1.01	0.042	1.27	0.091	0.090	0.441	0.307		
G119-S	1591	0.180	0.022	0.219	0.009	0.277	0.020	0.020	0.096	0.067		
G121-S	4420 A	0.360	0.043	0.438	0.018	0.553	0.040	0.039	0.192	0.134		
G122-S	4524	0.450	0.054	0.547	0.023	0.692	0.050	0.049	0.240	0.167		
G123-S	5018	0.072	0.009	0.088	0.004	0.111	0.008	0.008	0.038	0.027		
G127-S	7000	0.540	0.065	0.656	0.028	0.830	0.060	0.059	0.288	0.200		
G129-S	7705	0.683	0.082	0.831	0.035	1.05	0.076	0.074	0.364	0.254		
G130-S	7731	0.899	0.108	1.09	0.046	1.38	0.099	0.098	0.480	0.334		
G131-S	7754	0.450	0.054	0.547	0.023	0.692	0.050	0.049	0.240	0.167		
G132-S	7761	0.180	0.022	0.219	0.009	0.277	0.020	0.020	0.096	0.067		
G133-S	7851	0.216	0.026	0.263	0.011	0.332	0.024	0.023	0.115	0.080		
G134-S	9961	1.08	0.130	1.31	0.055	1.66	0.119	0.117	0.575	0.401		

IC Engine Details		Emissions (lb/yr)									
Unit ID	Bldg. No.	Acetaldehyde	Acrolein	Benzene	1,3- Butadiene	Formaldehyde	Naphthalene	POM	Toluene	Xylene	
G135-S	10504	0.216	0.026	0.263	0.011	0.332	0.024	0.023	0.115	0.080	
G136-S	15003	0.162	0.020	0.197	0.008	0.249	0.018	0.018	0.086	0.060	
G139-S	19107	0.108	0.013	0.131	0.006	0.166	0.012	0.012	0.058	0.040	
G140-S	19222	0.108	0.013	0.131	0.006	0.166	0.012	0.012	0.058	0.040	
G141-S	19298	0.040	0.005	0.048	0.002	0.061	0.004	0.004	0.021	0.015	
G142-S	19501	0.040	0.005	0.048	0.002	0.061	0.004	0.004	0.021	0.015	
G144-S	15505	0.040	0.005	0.048	0.002	0.061	0.004	0.004	0.021	0.015	
G145-S	16010	0.090	0.011	0.109	0.005	0.138	0.010	0.010	0.048	0.033	
G146-S	2916	0.863	0.104	1.05	0.044	1.33	0.095	0.094	0.460	0.321	
G147-S	2916	0.978	0.118	1.19	0.050	1.51	0.108	0.106	0.522	0.364	
G148-S	4420 B	0.216	0.026	0.263	0.011	0.332	0.024	0.023	0.115	0.080	
G149-S	4588	0.630	0.076	0.766	0.032	0.968	0.070	0.068	0.336	0.234	
G150-S	6599	0.090	0.011	0.109	0.005	0.138	0.010	0.010	0.048	0.033	
G151-S	19108	0.144	0.017	0.175	0.007	0.221	0.016	0.016	0.077	0.053	
G152-S	280	0.090	0.011	0.109	0.005	0.138	0.010	0.010	0.048	0.033	
G153-S	939	0.719	0.087	0.875	0.037	1.107	0.080	0.078	0.384	0.267	
G154-S	5653	0.047	0.006	0.057	0.002	0.072	0.005	0.005	0.025	0.017	
G155-S	6875	0.144	0.017	0.175	0.007	0.221	0.016	0.016	0.077	0.053	
G156-S	7199	0.090	0.011	0.109	0.005	0.138	0.010	0.010	0.048	0.033	
G157-S	6800	0.090	0.011	0.109	0.005	0.138	0.010	0.010	0.048	0.033	
G158-S	9599	0.072	0.009	0.088	0.004	0.111	0.008	0.008	0.038	0.027	
G159-S	19221	0.180	0.022	0.219	0.009	0.277	0.020	0.020	0.096	0.067	
G160-S	1071	0.054	0.007	0.066	0.003	0.083	0.006	0.006	0.029	0.020	
G161-S	203	0.079	0.010	0.096	0.004	0.122	0.009	0.009	0.042	0.029	
G163-S	1860	0.360	0.043	0.438	0.018	0.553	0.040	0.039	0.192	0.134	
G164-S	3000	0.360	0.043	0.438	0.018	0.553	0.040	0.039	0.192	0.134	
G165-S	7710	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107	
G166-S	15017	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107	
G167-S	19231	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107	
G168-S	LWSS1	0.180	0.022	0.219	0.009	0.277	0.020	0.020	0.096	0.067	
G169-S	LWSS2	0.180	0.022	0.219	0.009	0.277	0.020	0.020	0.096	0.067	
G170-S	LWSS3	0.126	0.015	0.153	0.006	0.194	0.014	0.014	0.067	0.047	
G171-S	SOSS1	0.126	0.015	0.153	0.006	0.194	0.014	0.014	0.067	0.047	
G172-S	CRSS1	0.126	0.015	0.153	0.006	0.194	0.014	0.014	0.067	0.047	
G174-S	7723	0.101	0.012	0.123	0.005	0.155	0.011	0.011	0.054	0.037	
G176-S	305 (DOIM Next to 306)	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107	
G177-S	625	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107	
G178-S	8080 (Rte. 144 DOIM)	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107	
G179-S	19100	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107	
G180-S	Gate 3 (next to 7808)	0.266	0.032	0.324	0.014	0.410	0.029	0.029	0.142	0.099	

IC Engine Details		Emissions (lb/yr)										
Unit ID	Bldg. No.	Acetaldehyde	Acrolein	Benzene	1,3- Butadiene	Formaldehyde	Naphthalene	POM	Toluene	Xylene		
G181-S	1412	0	0	0	N/A	0	0	0	0	0		
G182-S	10499	0.216	0.026	0.263	0.011	0.332	0.024	0.023	0.115	0.080		
G183-S	Gate 1	0.216	0.026	0.263	0.011	0.332	0.024	0.023	0.115	0.080		
G184-S	Gate 5 (Bldg. 821)	0.216	0.026	0.263	0.011	0.332	0.024	0.023	0.115	0.080		
G185-S	Gate 7 (Bldg,4501)	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107		
G186-S	Gate 8 (Bldg. 1100)	0.288	0.035	0.350	0.015	0.443	0.032	0.031	0.153	0.107		
G187-S	Next to Bldg. 311	0	0	0	0	0	0	0	0	0		
G188-S	Behind Bldg. 9719	0	0	0	0	0	0	0	0	0		
G189-S	HQ Bldg. (HQ001)	0	0	0	-	0	0	0	0	0		
G190-S	1727	0	0	0	0	0	0	0	0	0		
Temporary	TFSS2	0	0	0	0	0	0	0	0	0		
Tota	Total (lb/yr)		2.62	29.72	1.09	33.35	2.98	2.71	12.75	8.87		
Total (ton/yr)		0.01	<0.01	0.01	<0.01	0.02	<0.01	<0.01	0.01	<0.01		

4.0 Engine Testing

Title V Source Designation(s)

X Significant Testing of IC engines burning natural gas, LPG, and/or diesel fuel

with power outputs >400 hp or test durations >2,000 hr/yr

Testing of IC engines burning gasoline with power outputs >100 hp or

test durations >500 hr/yr

_Insignificant Testing of IC engines burning natural gas, LPG, and/or diesel fuel

with power outputs \leq 400 hp <u>and</u> test durations \leq 2,000 hr/yr

Testing of IC engines burning gasoline with power outputs

≤100 hp <u>and</u> test durations ≤500 hr/yr

_Trivial Not applicable

4.1 BACKGROUND

Fort Stewart operated five engine test cells (E001-S through E005-S) that were used to perform maintenance-related tests on reciprocating internal combustion engines and transmissions used in military vehicles. There is also an additional cell with an electric motor (Cell 6) that is used for testing transmissions (E006-S) but is not considered in the emission calculations because it does not generate air emissions.

Overall the engine testing load has gone down when compared to previous years. Cell 1 was not used in 2007. Test Cells 2 and 3 test a variety of engine types. In 2007 these cells were used to test two different Detroit engines, two different Cummins engines, a 6.2L HUMMV engine and several 30 and 60 kW generators. With the exception of the 30 and 60 kW generators (40 and 80 hp), the engines tested in Cells 2 and 3 ranged between 130 and 500 hp. Cells 4 & 5 were used to test transmissions for the M113A3 Armored Personnel Carriers, M1A1 Abrams Tanks, and M88 Recovery Vehicles using a 210 hp 6V53 Detroit engine, 295 hp Cummings engine and a 550 hp AVDS 1790 engine respectively. In addition, construction of a seventh test cell at the GANG/National Guard Training Center (NGTC) facility was never completed. There are no plans to complete this cell in the foreseeable future and thus it has not been included in this inventory.

The test cells are equipped with dynamometers to accurately measure engine characteristics such as power output and engine speed. A log of engines tested and engine run times was provided for CY 2007. In 2007 the total combined engine run times in Cells 2 and 3 was 3.62 hours and for the transmission cells (Cells 4 & 5) 8.75 hours. Information regarding engine test time by engine type and test cell is summarized in Table 4.1.

The Georgia EPD has designated the operation of diesel-fired internal combustion engines with power ratings greater than 400 horsepower as "significant" sources of air pollution. Because each of the engine test cells may be used to test IC engines with power ratings greater than 400 horsepower, they are all designated as significant sources for Title V permitting purposes.

4.2 EMISSION ESTIMATES

Actual Emissions

Engine tests are conducted using jet propellant No. 8 (JP-8) fuel. Emission factors for the combustion of JP-8 fuel in internal combustion (IC) engines are not available; therefore, emission factors for the combustion of diesel fuel in IC engines were used to estimate emissions. Reciprocating engine emission factors were obtained from Sections 3.3 and 3.4 of AP-42 (Ref. 1) and are presented in Section 4.3, Table 4.2. These emission factors are dependent upon the power output (i.e., horsepower) of the engine tested, with a change in emission factors occurring at a power rating of 600 horsepower (447 kW).

Estimates of actual emissions from engine testing were done using 100 percent of the rated horsepower of each engine for the duration of the test. Actual emissions from engine testing were estimated by multiplying the engine power rating by the test duration, and the appropriate emission factor. For example, the calculation used to estimate actual CO emissions from the testing of transmissions using the 295 hp Cummings engine is given below.

Unit ID: E004-S (Test Cell 4, Building 1064)

Type of engine: Cummings 295 hp

Engine power rating: 295 hp, assumed to run at 100% capacity

Test duration: 1.25 hr/yr

CO emission factor: 6.68 x 10⁻³ lb/hp-hr

CO emissions =
$$(295 \text{ hp}) * (1.25 \text{ hr/yr}) * (6.68 \times 10^{-3} \text{ lb/hp-hr}) * (1.0)$$

= 2.46 lb/yr

As shown in the example above, the emission factors for CO and many of the criteria pollutants are given in terms of lb/hp-hr (power output). The emission factors for particulates from engines > 600 hp and for HAPs were expressed in terms of lb/MMBtu (fuel input). Using an average brake-specific fuel consumption value of 7,000 Btu/hp-hr (Ref. 1, AP-42 Section 3.3), the HAP emission and particulate emissions for engines > 600 hp were calculated from the emission factors based on fuel input. For example, the following calculation illustrates how benzene emissions were determined for the emission unit (E004-S) shown above.

Benzene emissions =
$$(295 \text{ hp}) * (1.25 \text{ hr/yr}) * (1.0) * (9.33 \text{ x}10^{-4} \text{ lb/MMBtu/hr}) * (7,000 \text{ Btu/hp-hr})$$

= 0.002 lb/yr

The detailed emission estimates for engine testing are presented in Section 4.3, Tables 4.3 and 4.4.

Potential Emissions

Potential emissions were based on the maximum number of hours that could potentially be spent conducting engine tests in each cell. It was assumed that engine testing could occur 24 hours per day, 365 days per year. Historically the maximum length of each engine test conducted at E002-

S and E004-S has been 2.75 hours (engine run time) + 15 minutes for set-up and take-down (total time 3 hours per test). Therefore eight tests (24 hr/3 hr) could be conducted in one day and the potential testing hours per year would be 8,030 (2.75 hr/test * 8 tests/day * 365 days/yr). The same operating schedule was assumed for the other cells.

For the potential emissions it is assumed based on historical data, that Cell 1 only tests a 750 hp AVDS 1790 2DR engine. For Cells 2 and 3, the largest engine tested in 2007 was the 430 hp 8V92 Detroit Engine. However, the 2005 AEI shows a 600 hp 903T-600 Cummins engine was tested. Site personnel indicated that this engine could be tested in future years in Cells 2 and 3, and thus the 600 hp engine was assumed for the potential emission calculations. Also, in 2007 the largest engine used in the transmissions test cells (Cells 4 and 5) was 550 hp. In 2005 the 750 hp AVDS 1790 2DR engine was used. Site personnel also indicated that this engine could also be used in the future. Thus this engine was also used for the potential emission calculations associated with Cells 4 and 5.

Potential emissions were estimated in the same manner as actual emissions, but based on the potential number of test hours; these estimates are presented in Section 4.3, Tables 4.5 and 4.6.

Emissions Summary

Table 4.0 below provides the total emissions of criteria pollutants and combined HAP from engine testing at Fort Stewart. The actual emissions for the test cells are quite low. In 2007 all of the test cells were run less than 12 hours in total. Thus, in terms of actual emissions engine testing was a comparatively minor source of air emissions when compared to the other fuel combustion sources on Fort Stewart.

TABLE 4.0 Emissions Summary – Engine Testing

Emission Type	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC	НАР
Actual (lb/yr)	23.84	107.57	8.81	5.18	5.01	4.88	6.09	0.074
Actual (ton/yr)	0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Potential (lb/yr)	153,429.21	669,509.28	67,704.13	13,610.57	11,189.17	9,353.60	17,896.82	307.36
Potential (ton/yr)	76.71	334.75	33.85	6.81	5.59	4.68	8.95	0.15

Emission Source Updates

No significant changes from the 2006 inventory.

4.3 DETAILED SOURCE AND EMISSION TABLES

Tables 4.1 through 4.6 below provide a breakdown of the engines tested (including fuel used), emission factors used, and emission estimates for each engine.

TABLE 4.1 Engine Testing Information for CY2007

		Actual E	Ingine Operati	ng Hours ^a	
Description of Engine Tested	CELL 1 (E001-S)	CELL 2 (E002-S)	CELL 3 (E003-S)	CELL 4 (E004-S)	CELL 5 (E005-S)
JP-8, AVDS 1790 - 550 HP					3.67
JP-8, 6V53T DETROIT - 210 HP		0.65			3.83
JP-8, 8V92 DETROIT - 430 HP		0.13	0.22		
JP-8, 6.2L HUMMV – 160 HP		0.07	0.20		
JP-8, NTC 400 CUMMINS – 400 HP		0.36	0.23		
JP-8, NTC 250 CUMMINS - 250 HP		0.30	0.05		
ALLIS-CHALMERS 60KW GEN. – 80 HP		0.27			
6.5L N.A. (HUMMWV) – 160 HP		0.12			
30 kW ENGINE – 40 HP		0.11	0.92		
JP-8, CUMMINS – 295 HP				1.25	
Total		2.00	1.62	1.25	7.50

^a Potential emissions were based on 8,031 testing hours. For Cells 1, 4, and 5 the engine type assumed was AVDS 1790-DR (750 hp). For Cells 2 and 3 the engine type assumed was 903T-600 (612 hp Cummings engine used in 2005). These were the largest engines tested over the past five years.

TABLE 4.2
Emission Factors for Engine Testing Using Diesel^a or JP-8

D. H. A A	Engine Ou	tput Rating
Pollutant	0 to 600 hp	>600 hp
Em	ission Factor - Criteria Polluta	nts (lb/hp-hr)
СО	6.68E-03	5.50E-03
NO_X	0.031	0.024
PM	2.20E-03 ^b	0.0697 (lb/MMBtu)
PM-10	2.20E-03	0.0573 (lb/MMBtu)
PM-2.5	2.20E-03 ^b	0.0479 (lb/MMBtu)
SO ₂ °	2.05E-03	8.09E-03(S) ^d
VOC ^e	2.51E-03	6.416E-04 ^f
Emission	n Factor - Hazardous Air Pollu	tants (lb/MMBtu ^a)
Acetaldehyde	7.67x10 ⁻⁴	2.52x10 ⁻⁵
Acrolein	9.25x10 ⁻⁵	7.88x10 ⁻⁶
Benzene	9.33x10 ⁻⁴	7.76x10 ⁻⁴
1,3-Butadiene	3.91x10 ⁻⁵	
Formaldehyde	1.18x10 ⁻³	7.89x10 ⁻⁵
Naphthalene	8.48x10 ⁻⁵	1.30x10 ⁻⁴

Pollutant	Engine Output Rating					
Ponutant	0 to 600 hp	>600 hp				
POM	8.32x10 ⁻⁵	8.20x10 ⁻⁵				
Toluene	$4.09x10^{-4}$	2.81x10 ⁻⁴				
Xylenes	2.85x10 ⁻⁴	1.93x10 ⁻⁴				

^a Emission factors for JP-8 were assumed to equal the diesel fuel emission factors, emission factors are from EPA document AP-42, Section 3.3, Tables 3.3-1 and 3.3-2 and Section 3.4, Tables 3.4-1 through 3.4-4 (Ref. 1). A brake specific fuel consumption (BSFC) value of 7,000 Btu/hp-hr was used to convert between power output and fuel input (AP-42, Section 3.3, Ref. 1).

^b PM and PM-2.5 factors are equal to the PM-10 factor because all emitted PM are typically < 1 μm in diameter.

^c SO_x factor provided; assumed SO₂ equaled SO_x.

^d The variable S in the emission factor equals the sulfur content of the fuel expressed as percent weight. The sulfur content of JP-8 fuel is limited to 0.3%w [Military Specification MIL-T-83133] Therefore, 0.3 was the value assumed for the fuel sulfur content.

^e TOC factor provided; assumed VOC equaled TOC.

f TOC factor provided and additional data indicated that NMTOC equaled 91% of TOC; therefore, assumed VOC equaled 91% of TOC.

TABLE 4.3
Actual Criteria Pollutant Emissions From Engine Testing

							-	
Unit ID	Cell No.	СО	NO_X	SO ₂	PM	PM-10	PM-2.5	VOC
E001-S	Cell 1	0	0	0	0	0	0	0
E002-S	Cell 2	3.12	14.48	0.96	1.03	1.03	1.03	1.17
E003-S	Cell 3	1.79	8.30	0.549	0.589	0.589	0.589	0.673
E004-S	Cell 4	2.46	11.43	0.756	0.811	0.811	0.811	0.927
E005-S	Cell 5	16.47	73.36	6.54	2.75	2.58	2.45	3.32
Total (lb/yr)		23.84	107.57	8.81	5.18	5.01	4.88	6.09
Total (ton/yr)		0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE 4.4
Actual HAP Emissions from Engine Testing

Unit ID	Emissions (lb/yr)										
Unit 1D	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Naphthalene	POM	Toluene	Xylenes		
E001-S	0	0	0	0	0	0	0	0	0		
E002-S	0.003	3.0E-04	0.003	1.3E-04	0.004	2.8E-04	2.7E-04	0.001	0.001		
E003-S	0.001	1.7E-04	0.002	7.3E-05	0.002	1.6E-04	1.6E-04	0.001	0.001		
E004-S	0.002	2.4E-04	0.002	1.0E-04	0.003	2.2E-04	2.1E-04	0.001	0.001		
E005-S	0.005	0.001	0.016	2.2E-04	0.008	0.002	0.002	0.006	0.004		
Total (lb/yr)	0.011	0.001	0.023	0.001	0.017	0.003	0.002	0.009	0.007		
Total (ton/yr)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		

TABLE 4.5
Potential Criteria Pollutant Emissions From Engine Testing

Unit ID	Cell No.	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
E001-S	Cell 1	33,123.75	144,540.00	14,616.61	2,938.38	2,415.62	2,019.34	3,863.73
E002-S	Cell 2	27,028.98	117,944.64	11,927.15	2,397.72	1,971.15	1,647.78	3,152.81
E003-S	Cell 3	27,028.98	117,944.64	11,927.15	2,397.72	1,971.15	1,647.78	3,152.81
E004-S	Cell 4	33,123.75	144,540.00	14,616.61	2,938.38	2,415.62	2,019.34	3,863.73
E005-S	Cell 5	33,123.75	144,540.00	14,616.61	2,938.38	2,415.62	2,019.34	3,863.73
Total (lb/yr)	153,429.21	669,509.28	67,704.13	13,610.57	11,189.17	9,353.60	17,896.82
Total (t	ton/yr)	76.71	334.75	33.85	6.81	5.59	4.68	8.95

TABLE 4.6
Potential HAP Emissions from Engine Testing

Unit ID	Emissions (lb/yr)											
Omt ID	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde	Naphthalene	POM	Toluene	Xylenes			
E001-S	1.06	0.332	32.71	-	3.33	5.48	3.46	11.85	8.14			
E002-S	0.867	0.271	26.69	-	2.71	4.47	2.82	9.67	6.64			
E003-S	0.867	0.271	26.69	-	2.71	4.47	2.82	9.67	6.64			
E004-S	1.06	0.332	32.71	-	3.33	5.48	3.46	11.85	8.14			
E005-S	1.06	0.332	32.71	-	3.33	5.48	3.46	11.85	8.14			
Total (lb/yr)	4.92	1.54	151.53	-	15.41	25.39	16.01	54.87	37.69			
Total (ton/yr)	<0.01	<0.01	0.08	-	0.01	0.01	0.01	0.03	0.02			

5.0 ABRASIVE BLASTING

Title V Source Designation(s)

___ Significant Any abrasive blasting operation that is not considered "insignificant"

or "trivial" as described below

X Insignificant Abrasive blasting operations that are stationary provided that the

activity is performed indoors, no significant fugitive particulate emissions enter the environment, and no visible emissions enter the

outdoor atmosphere.

Portable blast-cleaning equipment

Blast-cleaning equipment using a suspension of abrasive in water and

any exhaust system or collector serving them exclusively

___ Trivial Repair or maintenance activities that are not related to the source's

primary business activity <u>and</u> do not otherwise trigger a permit

modification or do not utilize control devices (i.e., required to be listed

in Title V permit application).

5.1 BACKGROUND

Fort Stewart conducts abrasive blasting operations (i.e., rust, corrosion, or paint removal operations conducted using sand and glass beads) at many locations on post. Nine stationary, indoor abrasive blasting operations were identified. The drive-in blasting booth (Unit ID A105-S, Bldg. 1074) is used to conduct all of the blasting that was previously performed outside. Data regarding the location, type of operation conducted, air pollution control equipment used, type and quantity of blasting media used, and quantity of dust collected was obtained during a site visit (see Table 1.0 for data POCs) and is summarized in Table 5.0. With the exception of the drive in booth, all the units identified were self-contained glove box blast cabinets.

The inventoried operations are stationary, all activities are performed indoors, allow no significant fugitive particulate emissions to enter the environment, and allow no visible emissions to enter the outdoor environment. Therefore, they are categorized as "insignificant" sources of air pollution.

5.2 EMISSION ESTIMATES

Actual Emissions

Abrasive blasting operations are sources of particulate emissions. The quantity of particulate emissions is dependent upon the quantity of abrasive blasting waste produced and the efficiency of the control device. Fabric filters and/or cyclones control the particulate emissions from each of these operations; however, no specific data were available regarding the particulate control efficiency of the control devices.

Fabric filters are capable of capturing and controlling most particulate emissions that are 5 microns or greater in diameter. The particulate matter control efficiency for fabric filter-controlled abrasive blasting operations is 98 percent or greater. For the seven-glove box cabinets the quantity of abrasive used is small and all exhaust is vented to a cyclone followed by a fabric filter.

Emissions from each of the abrasive blasting operations were estimated using mass balance procedures described in Section 2 of the U.S. Air Force Document *Air Emission Inventory Guidance Document for Stationary Source at Air Force Installation* (Ref. 2). The emissions were estimated using the amount of blasting media used in the unit during the year and by assuming a fabric/cyclone collection efficiency of 98 percent. The amount of media was estimated by shop personnel are shown in Table 5.0. The following example illustrates how emissions were calculated.

Unit ID: A105-S

Total amount of dust collected*: 27,000 lb/year *: Weight of dust collected that was

assumed to represent weight of blast media used.

Particulate matter captured by control: 98%

Particulate matter emissions = (27,000 lb/yr) * (1-0.98%) = 540.00 lb/yr

All of the particulate emissions from the abrasive blasting operations were assumed to be classified as PM-10 and PM-2.5.

Potential Emissions

Emissions from abrasive blasting operations are proportional to the number of hours the operations are conducted per year. The number of hours per year for abrasive blasting operations was assumed proportional to the number of hours the installation operates per year. Actual installation operations were estimated to occur 2,080 hours per year. Potentially, the installation could operate at 8,760 hours per year. The actual emissions were multiplied by a factor of 4.21 (8,760/2,080).

The use of air pollution control equipment should not be included in potential emission estimates unless the use of the control equipment is included as a federally enforceable condition in a permit. The use of particulate control equipment on Fort Stewart's abrasive blasting operations is not federally enforceable. However, the control devices installed on the inventoried units are integral components of the operational equipment. As such, abrasive blasting operations are not conducted without the operation of the control device and thus the control efficiencies were accounted for when determining potential emissions.

Emissions Summary

Table 5.0 below provides the total emissions of criteria pollutants from abrasive blasting operations at Fort Stewart.

TABLE 5.0
Abrasive Blasting Details and Emissions Summary

	Building	Media	Capture	Blast Medi	a Used (lb/yr)	PM Emis	sions (lb/yr)	
Unit ID	Number	Type	Efficiency (%)	Actual	Potential	Actual	Potential	
A101-S	SS1052	Glass Beads	98	106	446	2.12	8.93	
A105-S	1074	Sand	98	27,000*	113,712	540.00	2,274.23	
A106-S	1170	Glass Beads	98	106	446	2.12	8.93	
A107-S	1503	Sand	99.99	0	446	0.00	0.04	
A108-S	10531	Glass Beads	98	477	2,009	9.54	40.18	
A109-S	1170	Glass Beads	98	106	446	2.12	8.93	
A110-S	1170	Glass Beads	98	106	446	2.12	8.93	
A111-S	1065	Glass Beads	98	106	446	2.12	8.93	
A112-S	1065	Glass Beads	98	106	446	2.12	8.93	
A113-S	10501	Glass Beads	98	0	446	0	8.93	
		Total (lb/yr)	562.26	2,376.95				
	Total (ton/yr) 0.28 1.19							

^{*:} Amount of dust collected, assumed equal to the amount of blast media used.

Emission Source Updates

The following updates were made from the 2006 inventory.

• Added A113-S (Bldg. 10501), unit located outside and not used in 2007 (calculated potential emissions only).

6.0 STORAGE TANKS

Title V Source Designation(s)

 \underline{X} Significant Petroleum storage tanks with a capacity \geq 40,000 gallons storing a

liquid with a true vapor pressure >0.50 psia

Petroleum storage tanks with a capacity $\geq 10,000$ gallons storing a

liquid with a true vapor pressure of >2.0 psia

Petroleum storage tanks that are subject to any standard, limitation,

or other requirement under Sections 111 or 112 (excluding

Section 112(r)) of the CAAA of 1990

Chemical storage tanks storing a liquid with a true vapor pressure

>0.19 psia

 \underline{X} Insignificant Petroleum storage tanks storing a liquid with a true vapor pressure

≤0.50 psia

Petroleum storage tanks with a capacity <40,000 gallons storing a liquid with a true vapor pressure of ≤ 2.0 psia that are not subject to any standard, limitation, or other requirement under Sections 111 or

112 (excluding Section 112(r)) of the CAAA of 1990

Petroleum storage tanks with a capacity <10,000 gallons

Chemical storage tanks storing a liquid with a true vapor pressure

≤0.19 psia

X Trivial Storage tanks storing substances that will not emit any VOC or HAPs

6.1 BACKGROUND

Fort Stewart operates and maintains numerous fuel storage tanks throughout the installation. The tanks contain jet fuel (JP-8), motor gasoline (MOGAS), diesel fuel, fuel oil, used/waste oil, off-specification JP-8, and LPG. Data regarding storage tanks and fuel throughput was obtained during the site visits, through email, and over the telephone. No data were obtained for storage tanks containing used/waste oil or LPG because air pollution emissions from these tanks are negligible.

One hundred thirty-four (134) storage tanks were identified for this inventory. See Section 6.3, Table 6.1 for a list of the tanks identified. A small number of larger tanks handle a majority of the fuel stored on Fort Stewart. The fuel stored in the greatest quantity is JP-8. Six (6) aboveground storage tanks (ASTs) located at the Contractor Owned Contractor Operated (COCO) bulk storage facility handle a majority of the JP-8 used on Fort Stewart. The JP-8 tank capacities range between 20,000 and 40,000 gallons. In addition, the COCO facility also has two (2) storage tanks for diesel and one (1) for MOGAS. The vast majority of the fuel stored at the COCO facility is loaded into tank trucks (See Section 7.0 Fuel Loading) and distributed across Fort Stewart. A relatively small potion of the fuel is dispensed from retail pumps. The single MOGAS tank utilizes Stage I vapor recovery.

A majority of the MOGAS stored at Fort Stewart is associated with retail service stations for privately owned vehicle (POV) fueling. Three (3) 12,000 gallon underground storage tanks (USTs) store MOGAS at the AAFES service station located at Building 7336 (Bryan Village Shoppette), and one (1) 10,000 gallon and three (3) 12,000 gallon USTs store MOGAS at the AAFES service station located at Building 939 (Victory Shoppette). All of these tanks utilize Stage I vapor recovery when they are loaded.

Twenty-two of the tanks identified (T301-S through T354-S) store fuel oil used by boilers or other heating equipment. Fuel oil for the CEP (Bldg. 1412) is stored in two 165,000-gallon ASTs (T333-S and T334-S). Sixty-five of the tanks identified (T602-S through T678-S) store diesel fuel that is used by stationary internal combustion engines (pumps and emergency generators). A majority of the remaining tanks identified support fueling operations for government owned vehicles (GOV).

Tanks storing MOGAS with a capacity greater than 10,000 gallons were classified as significant sources. All remaining tanks qualified as ether trivial or insignificant sources.

Fuel throughputs for the storage tank that support stationary engine testing operations and the tanks that support emergency generators and pumps were calculated based on the engines' power ratings and hours of operation as discussed in the Sections 3.0 and 4.0. Fuel throughput for tanks associated with heating units was obtained from DPW records. See Table 1.0 for the primary POCs that provided tank and fuel throughput data.

6.2 EMISSION ESTIMATES

The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for all storage tanks.

Actual Emissions

Storage tank emissions are the result of tank breathing and working losses. Breathing losses may be responsible for a significant fraction of the overall emissions from aboveground storage tanks, but these losses are typically negligible from underground storage tanks. However, breathing losses from underground storage tanks that are used to store gasoline can be responsible for a significant fraction of their overall emissions.

Uncontrolled working (filling) and breathing (standing) losses from above-ground storage tanks and working losses from underground storage tanks were determined using the AP-42 equations in Section 7.1.3.1 (Ref. 1) and through the use of EPA's TANKS program (Ref. 3). The fuel throughputs used in estimating the emissions are given in Table 6.1. The emissions form USTs associated with the AAFES service stations (Buildings 7736 and 939) were determined using the methodology and emission factors given in AP-42, Section 5.2, Table 5.2-7 (Ref. 1). JP-8 properties were taken from the *Air Emission Inventory Guidance Document for Stationary Sources at Air Force Installations* (Ref. 2) and from *Useful Properties/Characteristics of JP-8 Fuel for Performing Air Emissions Inventories* (Ref. 4). Due to the complexity of the equations

used to calculate VOC emissions from ASTs a sample calculation is not shown. A sample calculation is presented for VOC emissions from USTs associated with POV service stations, and for the fuel oil/diesel USTs. The example calculations are shown below.

Gasoline Service Station UST

Unit ID: T002-S (Tank has Balanced Submerged Filling (Stage I)

Capacity: 12,000 gal
Gasoline Throughput: 1,494,275 gal/yr

VOC Emission Factor: 0.3 lb/1000 gal (Displacement Loss with Stage I)^a

VOC Emission Factor: 1.0 lb/1000 gal (Breathing Loss)^a

^a Emission factors from AP-42, Section 5.2, Table 5.2-7 (Ref. 1)

VOC losses/emissions = (1,494,275 gal/yr) * (0.3lb/1,000 gal + 1.0 lb/1,000 gal) * (1/1,000 gal) = 1,942.56 lb/yr

Fuel Oil UST Emission Calculation

Working loss = $(0.0010) * (M_v) * (P_{VA}) * (Q) * (K_N) * (K_p) (AP-42 Section 7.1.3.1)$

 M_v = molecular weight of vapor (lb/lb mole)

 P_{VA} = true vapor pressure of vapor (psia)

 K_N = turnover factor (= 1.0 for N < 36)

 K_p = product factor (1.0 for all organic liquids except crude oil)

Q = annual throughput bbl/yr

Unit ID: T301-S (Fuel Oil No.2)

Capacity: 4,000 gal Fuel Throughput, (Q): 1,827.4 gal/yr Vapor pressure, P_{VA} 0.0074 psi Molecular Wt, M_v 130 lb/lb mole

```
VOC working loss = (0.0010) * (130 lb/lb mole) * (0.0074 psi) * (1,827.4 gal) * (1.0) * (1.0) * [1 barrel/42 gallons] = 0.042 lb/yr
```

Note: Breathing losses associated with USTs storing fuel oil No. 2/diesel and JP-8 were considered negligible and thus were not calculated.

In addition to VOCs, several HAPs are emitted from fuel storage tanks. HAPs present in JP-8, diesel fuel, and MOGAS were identified based on the speciated profiles presented in Section 6.3, Tables 6.2, 6.3 and 6.4, respectively. Because of the similarity between No.2 fuel oil and diesel fuel, the HAP present in No.2 fuel oil were assumed to be the same as those present in diesel fuel.

The quantity of HAP emitted from each fuel storage tank was estimated by multiplying the quantity of fuel vapor emitted from each tank (VOC) by each HAP <u>vapor</u> phase weight percent from the applicable speciated profile. For example, the calculation used to estimate the quantity of benzene emitted from the storage of MOGAS in tank T002-S is shown below.

Unit ID: T002-S (UST storing MOGAS)

VOC losses: 1,942.56 lb/yr

Benzene content VOC vapor: 0.6 %_w (MOGAS fuel profile)

Benzene Emissions = (1,942.56 lb/yr) * (0.6)* (1/100)= 11.66 lb/yr

Actual VOC and HAP emissions from fuel storage tanks are found in Section 6.3, Table 6.5.

Potential Emissions

Storage tank emissions are proportional to fuel throughput. Potential emissions were estimated by increasing the fuel throughput for each tank to the maximum physical or operational limit. Throughputs for tanks supporting the COCO facility were based upon maximum tank loading and unloading rates and the time (overhead time) needed to prepare a fuel delivery prior to unloading. The maximum amount of fuel that could be processed through the COCO facility tanks was determined in Section 7.0, Fueling Operations. One limiting factor for the COCO facility is that pumps can be used for fuel receiving and issues but cannot perform both operations simultaneously. For a complete description on how the potential throughput was determined see Section 7.0.

Potential throughputs for the MOGAS USTs at the Victory and Bryan Village Shoppettes (Service Stations) were based on potential gallons dispensed as determined in Section 7.0. The methodology used was based on EPAs' *Technical Support Document for Potential to Emit Guidance Memo* (Ref. 5). The methodology assumed a per vehicle fuel dispensing rate of 10 gallons per minute and that each vehicle being refueled is replaced by another vehicle every 10 minutes (6 vehicles per hour). Also considered in the methodology is the number of refueling positions.

Potential throughputs for storage tanks that support GOV fueling operations were assumed to be proportional to the number of hours the installation operates per year. Actual installation operations were estimated to occur 2,080 hours per year. Potentially, the installation could operate 8,760 hours per year. Thus the potential throughputs were estimated by multiplying the actual throughputs for each tank by the ratio of 8,760/2,080.

Potential throughputs for storage tanks supporting heating units/boilers, IC engine units, and engine testing operations are limited by the maximum consumption rates of the units they supply. Potential throughput estimates for heating units, IC engines, and engine testing operations are discussed in detail in Sections 2.0, 3.0, and 4.0 respectively.

Potential VOC and HAP emissions from fuel storage tanks are found in Section 6.3, Table 6.6.

Emissions Summary

Table 6.0 provides the total emissions of VOCs and combines HAPs from fuel storage tanks at Fort Stewart.

TABLE 6.0 Emissions Summary – Fuel Storage Tanks

Emission Type	VOC	НАР		
Actual (lb/yr)	13,004.26	947.52		
Actual (ton/yr)	6.50	0.47		
Potential (lb/yr)	28,044.74	1,994.77		
Potential (ton/yr)	14.02	1.00		

Emission Source Updates

The following updates were made from the 2006 inventory:

- T104-S: Updated building number from 2905 to 2902.
- T305-S (Bldg. 9), T316-S (Bldg. 450): Updated tank type from AST to UST.
- Deleted T310-S (Bldg. 402 Demolished) and T315-S (Bldg. 419).
- T663-S, T669-S, and T670-S: Updated building numbers.
- Added the following ASTs associated with new generators: T673-S (Bldg. 10499), T674-S (Bldg. 7808), T675-S (Gate 1), T676-S (Gate 5), T677-S (Gate 7), and T678-S (Gate 8).
- Added T672-S (Bldg. 203).

6.3 DETAILED SOURCE AND EMISSIONS TABLES

Tables 6.1 through 6.6 below provide a breakdown of the fuel storage tanks, fuel speciation profiles, and emission estimates for each tank.

TABLE 6.1 Storage Tanks

	Building No.	Capacity	Tank		Through	out (gal/yr)
Unit ID	/ Location	(gal)	Туре	Fuel Stored	Actual	Potential
T001-S	350	20,000	AST	Diesel	0	750,857
T002-S ^a	939	12,000	UST	MOGAS	1,494,275	2,687,480
T003-S ^a	939	10,000	UST	MOGAS	1,245,229	2,239,567
T004-S ^a	939	10,000	UST	MOGAS	403,734	726,123
T005-S ^a	939	10,000	UST	MOGAS	363,650	654,031
T022-S ^a	COCO	20,000	AST	MOGAS	245,480	22,365,957
T023-S ^a	7336	12,000	UST	MOGAS	1,075,112	4,428,219
T024-S ^a	7336	12,000	UST	MOGAS	126,236	519,946
T025-S ^a	7336	12,000	UST	MOGAS	74,738	307,834
T101-S	1175	1,000	AST	MOGAS	8,400	35,377
T102-S	2151	550	AST	Diesel	2,200	9,265
T103-S	2151	550	AST	MOGAS	3,600	15,162
T104-S	2905	5,000	AST	Diesel	14,362	60,486
T108-S	GANG 10511	6,000	AST	Diesel	3,752	15,802
T109-S	GANG 10511	1,500	AST	MOGAS	1,653	6,962
T114-S	GANG Alpha Range	500	AST	Diesel	653	2,751
T116-S	GANG Fox Trot Range	500	AST	Diesel	653	2,751
T118-S	GANG Golf Range	500	AST	Diesel	0	0
T121-S	GANG MPRC Range	500	AST	Diesel	653	2,751
T122-S	COCO	20,000	AST	Diesel	91,999	10,690,169
T123-S	COCO	20,000	AST	JP-8	130,830	7,423,729
T124-S	COCO	30,000	AST	JP-8	196,244	11,135,593
T125-S	COCO	30,000	AST	JP-8	196,244	11,135,593
T126-S	8064 - Forestry	5,000	AST	MOGAS	18,437	77,648
T127-S	8064 - Forestry	5,000	AST	Diesel	38,348	161,504
T128-S	8073 - Range Supply	500	AST	MOGAS	957	4,031
T129-S	8081-Range Control	500	AST	Diesel	653	2,751
T130-S	1157	12,000	AST	JP-8	30,399	128,027
T131-S	1171	250	AST	JP-8	1,800	7,581
T132-S	1171	250	AST	JP-8	1,800	7,581
T133-S	1175	1,000	AST	JP-8	9,600	40,431
T134-S	1175	500	AST	Kerosene	0	0

11.24 ID	Building No.	Capacity	Tank	E1 (41	Through	out (gal/yr)
Unit ID	/ Location	(gal)	Type	Fuel Stored	Actual	Potential
T135-S	COCO	40,000	AST	JP-8	261,659	14,847,458
T136-S	COCO	40,000	AST	JP-8	261,659	14,847,458
T137-S	COCO	40,000	AST	JP-8	261,659	14,847,458
T138-S	COCO	40,000	AST	Diesel	183,997	21,380,339
T139-S	GANG Hotel Range	500	AST	JP-8	653	2,751
T140-S	17003 - Ammo. Supply Pt.	500	AST	Diesel	454	1,912
T141-S	1412	500	AST	Diesel	4,000	16,846
T142-S	DMMC Hotel Range	500	AST	MOGAS	957	4,031
T143-S	DMMC Alpha Range	500	AST	MOGAS	957	4,031
T144-S	DMMC Fox Trot Range	500	AST	MOGAS	957	4,031
T145-S	DMMC Golf Range	500	AST	MOGAS	0	0
T146-S	DMMC MPRC Range	500	AST	MOGAS	957	4,031
T206-S	10522	10,000	AST	JP-8	11,181	47,089
T207-S	1064 - DOL Test Cells	1,500	AST	JP-8	354	1,597,812
T301-S	1	4,000	UST	No. 2	1,827	140,786
T302-S	4	1,000	UST	No. 2	286	29,409
T305-S	9	550	UST	No. 2	421	11,826
T311-S	410	1,000	UST	No. 2	2,140	43,112
T313-S	418	1,000	UST	No. 2	250	30,410
T314-S	419	4,000	UST	No. 2	12,316	86,349
T316-S	450	550	UST	No. 2	777	12,389
T330-S	1245	5,000	UST	No. 2	4,836	94,483
T331-S	1310	1,000	UST	No. 2	558	25,029
T333-S	1412	165,000	AST	No. 2	1,670	361,283
T334-S	1412	165,000	AST	No. 2	1,670	361,283
T335-S	1630	6,000	UST	No. 2	2,916	125,143
T336-S	1820	1,500	UST	No. 2	2,205	40,546
T337-S	2150	1,000	UST	No. 2	189	21,837
T339-S	7704	1,000	AST	No. 2	3,741	63,072
T342-S	8084	500	AST	No. 2	1,494	36,604
T345-S	17003	500	AST	No. 2	250	6,507
T346-S	17005	500	AST	No. 2	738	19,898
T347-S	19102	1,500	UST	No. 2	2,968	25,467

Unit ID	Building No.	Capacity	Tank	Fuel Stored	Through	put (gal/yr)
Unit ID	/ Location	(gal)	Type	ruei Storea	Actual	Potential
T348-S	19103	3,000	UST	No. 2	2,311	40,546
T349-S	19104	3,000	UST	No. 2	4,481	135,154
T353-S	19225	3,000	UST	No. 2	4,266	75,086
T354-S	1186	500	UST	No. 2	250	11,826
T602-S	3	1,000	AST	Diesel	353	9,213
T603-S	7	1,000	AST	Diesel	177	5,025
T604-S	9	1,000	AST	Diesel	1,337	10,050
T608-S	421	500	AST	Diesel	50	1,005
T610-S	456	250	AST	Diesel	321	7,705
T611-S	457	250	AST	Diesel	22	754
T613-S	899	1,000	AST	Diesel	69	2,513
T614-S	933	1,000	AST	Diesel	64	11,725
T615-S	1345	250	AST	Diesel	182	7,705
T617-S	1591	500	AST	Diesel	79	1,675
T619-S	4420A	2,000	AST	Diesel	92	3,350
T620-S	4524	1,000	AST	Diesel	163	4,188
T621-S	5018	500	AST	Diesel	20	670
T623-S	5653	250	AST	Diesel	16	436
T625-S	7000	250	AST	Diesel	124	5,025
T626-S	7199	250	AST	Diesel	53	838
T627-S	7705	500	AST	Diesel	51	6,365
T628-S	7731	250	AST	Diesel	6	8,375
T629-S	7754	1,000	AST	Diesel	193	4,188
T630-S	7761	500	AST	Diesel	63	1,675
T631-S	7851	1,000	AST	Diesel	67	2,010
T632-S	9961	2,000	AST	Diesel	12	10,050
T633-S	10504	500	AST	Diesel	25	2,010
T634-S	15003	500	AST	Diesel	38	1,508
T636-S	16010	250	AST	Diesel	114	838
T637-S	19107	500	AST	Diesel	44	1,005
T638-S	19222	500	AST	Diesel	63	1,005
T639-S	19298	250	AST	Diesel	9	369
T640-S	19501	250	AST	Diesel	12	369
T641-S	15505	250	AST	Diesel	11	369
T642-S	2916	250	AST	Diesel	211	8,040
T643-S	2916	300	AST	Diesel	104	9,112
T644-S	4420B	500	AST	Diesel	51	2,010
T645-S			AST	Diesel	121	5,863

W * ID	Building No.	Capacity	Tank	F 164	Through	out (gal/yr)
Unit ID	/ Location	(gal)	Type	Fuel Stored	Actual	Potential
T646-S	6599	500	AST	Diesel	21	838
T647-S	19108	1,000	AST	Diesel	37	1,340
T648-S	280	500	AST	Diesel	34	838
T649-S	939	500	AST	Diesel	288	6,700
T650-S	6875	125	AST	Diesel	54	1,340
T651-S	7199	250	AST	Diesel	53	838
T652-S	6800	85	AST	Diesel	20	838
T653-S	9599	260	AST	Diesel	29	670
T654-S	19221	600	AST	Diesel	55	1,675
T655-S	1071	500	AST	Diesel	55	503
T658-S	1860	194	AST	Diesel	174	3,350
T659-S	3000 - DOIM	500	AST	Diesel	161	3,350
T660-S	LWSS1	145	AST	Diesel	101	1,675
T661-S	LWSS2	145	AST	Diesel	41	1,675
T662-S	LWSS3	145	AST	Diesel	28	1,173
T663-S	SOSS1	145	AST	Diesel	23	1,173
T664-S	625-DOIM	303	AST	Diesel	80	2,680
T665-S	19100 - DOIM Evans Field	303	AST	Diesel	78	2,680
T666-S	7710 - DOIM	305	AST	Diesel	71	2,680
T667-S	15017 -DOIM	305	AST	Diesel	109	2,680
T668-S	19231 -DOIM	305	AST	Diesel	98	2,680
T669-S	305 - DOIM	303	AST	Diesel	99	2,680
T670-S	8080 - DOIM	303	AST	Diesel	80	2,680
T671-S	7723	250	AST	Diesel	0	0
T672-S	203	500	AST	Diesel	51	737
T673-S	10499	305*	AST	Diesel	43	2,010
T674-S	7808	305*	AST	Diesel	53	2,479
T675-S	Gate1	305*	AST	Diesel	113	2,010
T676-S	Gate 5	305*	AST	Diesel	70	2,010
T677-S	Gate 7	305*	AST	Diesel	91	2,680
T678-S	Gate 8	305*	AST	Diesel	141	2,680

^a Significant Title V Source Unit IDs in italics are new.

TABLE 6.2 Speciated Profiles for JP-8 Fuel

Hannadana Ain Dalladana	Content	(% _w)
Hazardous Air Pollutant	Liquid Phase	Vapor Phase
Benzene	0.033	0.613
Cumene	0.179	0.330
Ethylbenzene	0.157	0.271
Naphthalene	0.264	0.003
Toluene	0.216	1.143
2,2,4-Trimethylpentane	0.001	0.010
Xylenes	1.173	1.877

Source: Air Emissions Inventory Guidance Document for Stationary Sources at Air Force Installations, Chapter 13 (Ref. 2).

TABLE 6.3 Speciated Profiles for Diesel Fuel

Hazardous Air	Conten	at (% _w) ^a
Pollutant	Liquid Phase	Vapor Phase
Benzene	0.2	7.2
Cumene	0.1	0.4
Ethylbenzene	0.2	0.7
Hexane	0.04	2.3
Naphthalene	0.2	Negligible
Toluene	0.4	4.1
Xylenes	0.8	2.5

Source: Air Emissions Inventory Guidance Document for Stationary Sources at Air Force Installations, Chapter 13 (Ref. 2).

TABLE 6.4
Speciated Profiles for MOGAS

Hanandana Ain Ballintant	Conter	nt (% _w)
Hazardous Air Pollutant	Liquid Phase	Vapor Phase
Benzene	1.8	0.6
Cumene	0.5	0.02
Ethylbenzene	1.4	0.04
Hexane	1.0	0.5
Methyl tert-Butyl Ether	4.5	4.6
Naphthalene	0.3	Negligible
Toluene	7.0	0.7
2,2,4-Trimethylpentane	4.0	0.7
Xylenes	7.0	0.2

Source: Air Emissions Inventory Guidance Document for Stationary Sources at Air Force Installations, Chapter 15 (Ref. 2).

TABLE 6.5
Actual Emissions from Storage Tanks

	T 10: 1					Emissic	ons (lb/yr)				
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T001-S	Diesel	0	0	0	0	0	-	0	0	-	0
T002-S	MOGAS	1,942.56	11.66	0.389	0.78	9.71	89.36	0	13.60	13.60	3.89
T003-S	MOGAS	1,618.80	9.71	0.324	0.648	8.09	74.46	0	11.33	11.33	3.24
T004-S	MOGAS	524.85	3.15	0.105	0.210	2.62	24.14	0	3.67	3.67	1.05
T005-S	MOGAS	472.75	2.84	0.095	0.189	2.36	21.75	0	3.31	3.31	0.95
T022-S	MOGAS	3,640.28	21.84	0.728	1.46	18.20	167.45	0	25.48	25.48	7.28
T023-S	MOGAS	1,397.65	8.39	0.280	0.559	6.99	64.29	0	9.78	9.78	2.80
T024-S	MOGAS	164.11	0.985	0.033	0.066	0.82	7.55	0	1.15	1.15	0.328
T025-S	MOGAS	97.16	0.583	0.019	0.039	0.486	4.47	0	0.680	0.680	0.194
T101-S	MOGAS	288.99	1.73	0.058	0.116	1.44	13.29	0	2.02	2.02	0.578
T102-S	Diesel	0.19	0.014	0.001	0.001	0.004	-	0	0.008	-	0.005
T103-S	MOGAS	158.43	0.95	0.032	0.063	0.792	7.29	0	1.11	1.11	0.317
T104-S	Diesel	1.74	0.125	0.007	0.012	0.040	-	0	0.071	-	0.044
T108-S	Diesel	1.51	0.109	0.006	0.011	0.035	I	0	0.062	-	0.038
T109-S	MOGAS	310.38	1.86	0.062	0.124	1.55	14.28	0	2.17	2.17	0.62
T114-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T116-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T118-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T121-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T122-S	Diesel	7.17	0.516	0.029	0.050	0.165	-	0	0.294	-	0.179
T123-S	JP-8	48.23	0.296	0.159	0.131	-	-	1.4E-03	0.551	4.8E-03	0.905
T124-S	JP-8	72.11	0.442	0.238	0.195	-	-	2.2E-03	0.824	7.2E-03	1.35
T125-S	JP-8	72.11	0.442	0.238	0.195	-	-	2.2E-03	0.824	7.2E-03	1.35
T126-S	MOGAS	1,021.03	6.13	0.204	0.408	5.11	46.97	0	7.15	7.15	2.04

Y ID	T. I.C.					Emissio	ons (lb/yr)				
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T127-S	Diesel	2.21	0.159	0.009	0.015	0.051	-	0	0.091	-	0.055
T128-S	MOGAS	124.55	0.747	0.025	0.050	0.623	5.73	0	0.87	0.872	0.249
T129-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T130-S	JP-8	21.33	0.131	0.070	0.058	-	-	6.4E-04	0.244	2.1E-03	0.400
T131-S	JP-8	0.65	0.004	0.002	0.002	-	ı	2.0E-05	0.007	6.5E-05	0.012
T132-S	JP-8	0.65	0.004	0.002	0.002	-	I	2.0E-05	0.007	6.5E-05	0.012
T133-S	JP-8	2.80	0.017	0.009	0.008	-	-	8.4E-05	0.032	2.8E-04	0.053
T134-S	Kerosene	0	ı	-	-	-	ı	-	-	-	-
T135-S	JP-8	95.94	0.588	0.317	0.260	-	-	2.9E-03	1.1E+00	9.6E-03	1.80
T136-S	JP-8	95.94	0.588	0.317	0.260	-	I	2.9E-03	1.1E+00	9.6E-03	1.80
T137-S	JP-8	95.94	0.588	0.317	0.260	-	I	2.9E-03	1.1E+00	9.6E-03	1.80
T138-S	Diesel	14.27	1.027	0.057	0.100	0.328	I	0	0.585	-	0.357
T139-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T140-S	Diesel	0.13	0.009	0.001	0.001	0.003	-	0	0.005	-	0.003
T141-S	Diesel	0.23	0.017	0.001	0.002	0.005	-	0	0.009	-	0.006
T142-S	MOGAS	143.28	0.860	0.029	0.057	0.716	6.59	0	1.00	1.00	0.287
T143-S	MOGAS	149.85	0.899	0.030	0.060	0.749	6.89	0	1.05	1.05	0.300
T144-S	MOGAS	122.45	0.735	0.024	0.049	0.612	5.63	0	0.857	0.857	0.245
T145-S	MOGAS	113.47	0.681	0.023	0.045	0.567	5.22	0	0.794	0.794	0.227
T146-S	MOGAS	122.45	0.735	0.024	0.049	0.612	5.63	0	0.857	0.857	0.245
T206-S	JP-8	15.61	0.096	0.052	0.042	-	-	4.7E-04	0.178	1.6E-03	0.293
T207-S	JP-8	1.88	0.012	0.006	0.005	-	=	5.6E-05	0.021	1.9E-04	0.035
T301-S	No. 2	0.04	0.003	1.7E-04	2.9E-04	0.001	-	0	0.002	-	0.001
T302-S	No. 2	0.01	4.7E-04	2.6E-05	4.6E-05	1.5E-04	-	0	2.7E-04	-	1.6E-04
T305-S	No. 2	0.01	0.001	3.9E-05	6.7E-05	2.2E-04	-	0	4.0E-04	-	2.4E-04

TI LI ID	E IG		Emissions (lb/yr)											
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes			
T311-S	No. 2	0.05	0.004	2.0E-04	3.4E-04	0.001	-	0	0.002	_	0.001			
T313-S	No. 2	0.01	4.1E-04	2.3E-05	4.0E-05	1.3E-04	-	0	2.3E-04	-	0.000			
T314-S	No. 2	0.28	0.020	1.1E-03	0.002	0.006	-	0	0.012	-	0.007			
T316-S	No. 2	0.02	0.001	7.1E-05	1.2E-04	4.1E-04	-	0	0.001	-	4.4E-04			
T330-S	No. 2	0.11	0.008	4.4E-04	7.8E-04	0.003	-	0	0.005	-	0.003			
T331-S	No. 2	0.01	0.001	5.1E-05	8.9E-05	2.9E-04	-	0	0.001	-	0.000			
T333-S	No. 2	15.36	1.106	0.061	0.108	0.353	-	0	0.630	-	0.384			
T334-S	No. 2	15.36	1.106	0.061	0.108	0.353	-	0	0.630	-	0.384			
T335-S	No. 2	0.07	0.005	2.7E-04	4.7E-04	0.002	-	0	0.003	-	0.002			
T336-S	No. 2	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001			
T337-S	No. 2	0.00	3.1E-04	1.7E-05	3.0E-05	1.0E-04	-	0	1.8E-04	-	1.1E-04			
T339-S	No. 2	0.33	0.024	0.001	0.002	0.008	-	0	0.014	-	0.008			
T342-S	No. 2	0.16	0.012	0.001	0.001	0.004	-	0	0.007	-	0.004			
T345-S	No. 2	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003			
T346-S	No. 2	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004			
T347-S	No. 2	0.07	0.005	2.7E-04	4.8E-04	0.002	ı	0	0.003	-	0.002			
T348-S	No. 2	0.05	0.004	2.1E-04	3.7E-04	0.001	-	0	0.002	-	0.001			
T349-S	No. 2	0.10	0.007	4.1E-04	0.001	0.002	-	0	0.004	-	0.003			
T353-S	No. 2	0.10	0.007	3.9E-04	0.001	0.002	-	0	0.004	-	0.002			
T354-S	No. 2	0.01	0.000	2.3E-05	4.0E-05	1.3E-04	-	0	2.3E-04	-	1.4E-04			
T602-S	Diesel	0.24	0.017	0.001	0.002	0.006	-	0	0.010	-	0.006			
T603-S	Diesel	0.24	0.017	0.001	0.002	0.006	-	0	0.010	-	0.006			
T604-S	Diesel	0.27	0.019	0.001	0.002	0.006	-	0	0.011	-	0.007			
T608-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003			
T610-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002			

II II II	T. I.C.	Emissions (lb/yr)											
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes		
T611-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001		
T613-S	Diesel	0.23	0.017	0.001	0.002	0.005	-	0	0.009	-	0.006		
T614-S	Diesel	0.23	0.017	0.001	0.002	0.005	-	0	0.009	-	0.006		
T615-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002		
T617-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003		
T619-S	Diesel	0.46	0.033	0.002	0.003	0.011	-	0	0.019	-	0.012		
T620-S	Diesel	0.24	0.017	0.001	0.002	0.006	-	0	0.010	-	0.006		
T621-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003		
T623-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001		
T625-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001		
T626-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001		
T627-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003		
T628-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001		
T629-S	Diesel	0.24	0.017	0.001	0.002	0.006	-	0	0.010	-	0.006		
T630-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003		
T631-S	Diesel	0.23	0.017	0.001	0.002	0.005	-	0	0.009	-	0.006		
T632-S	Diesel	0.46	0.033	0.002	0.003	0.011	-	0	0.019	-	0.012		
T633-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003		
T634-S	Diesel	0.13	0.009	5.2E-04	0.001	0.003	-	0	0.005	-	0.003		
T636-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001		
T637-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003		
T638-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003		
T639-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001		
T640-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001		0	0.002	-	0.001		
T641-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001		

W 1/ ID	T. I.C.					Emissi	ons (lb/yr)				
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T642-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	_	0.002
T643-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002
T644-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T645-S	Diesel	0.22	0.016	0.001	0.002	0.005	-	0	0.009	-	0.006
T646-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T647-S	Diesel	0.22	0.016	0.001	0.002	0.005	-	0	0.009	-	0.006
T648-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T649-S	Diesel	0.13	0.009	0.001	0.001	0.003	-	0	0.005	-	0.003
T650-S	Diesel	0.03	0.002	1.2E-04	2.1E-04	0.001	-	0	0.001	-	0.001
T651-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002
T652-S	Diesel	0.03	0.002	1.2E-04	2.1E-04	0.001	-	0	0.001	-	0.001
T653-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001
T654-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T655-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T658-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002
T659-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T660-S	Diesel	0.03	0.002	1.2E-04	2.1E-04	0.001	-	0	0.001	-	0.001
T661-S	Diesel	0.03	0.002	1.2E-04	2.1E-04	0.001	I	0	0.001	-	0.001
T662-S	Diesel	0.03	0.002	1.2E-04	2.1E-04	0.001	-	0	0.001	-	0.001
T663-S	Diesel	0.03	0.002	1.2E-04	2.1E-04	0.001	-	0	0.001	-	0.001
T664-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T665-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	=	0	0.003	-	0.002
T666-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T667-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T668-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002

	- I.O.					Emissi	ons (lb/yr)				
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T669-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T670-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T671-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001
T672-S	Diesel	0.12	0.009	4.8E-04	8.4E-04	0.003	-	0	0.005	-	0.003
T673-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T674-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T675-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001
T676-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T677-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T678-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
Tota	ıl (lb/yr)	13,004.26	82.58	4.48	6.86	63.63	571.00	0.02	95.66	86.94	36.35
Tota	Total (ton/yr)		0.04	<0.01	<0.01	0.03	0.29	<0.01	0.05	0.04	0.02

TABLE 6.6
Potential Emissions from Storage Tanks

W. W. ID	P. IG.					Emissio	ns (lb/yr)				
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T001-S	Diesel	22.31	1.61	0.089	0.156	0.513	-	0	0.915	-	0.558
T002-S	MOGAS	3,493.72	20.96	0.699	1.40	17.47	160.71	0	24.46	24.46	6.99
T003-S	MOGAS	2,911.44	17.47	0.582	1.16	14.56	133.93	0	20.38	20.38	5.82
T004-S	MOGAS	943.96	5.66	0.189	0.378	4.72	43.42	0	6.61	6.61	1.89
T005-S	MOGAS	850.24	5.10	0.170	0.340	4.25	39.11	0	5.95	5.95	1.70
T022-S	MOGAS	5,612.08	33.67	1.12	2.24	28.06	258.16	0	39.28	39.28	11.22
T023-S	MOGAS	5,756.69	34.54	1.15	2.30	28.78	264.81	0	40.30	40.30	11.51
T024-S	MOGAS	675.93	4.06	0.135	0.270	3.38	31.09	0	4.73	4.73	1.35
T025-S	MOGAS	400.18	2.40	0.080	0.160	2.00	18.41	0	2.80	2.80	0.800
T101-S	MOGAS	530.27	3.18	0.106	0.212	2.65	24.39	0	3.71	3.71	1.06
T102-S	Diesel	0.38	0.027	0.002	0.003	0.009	-	0	0.016	-	0.010
T103-S	MOGAS	266.97	1.60	0.053	0.107	1.33	12.28	0	1.87	1.87	0.534
T104-S	Diesel	3.53	0.254	0.014	0.025	0.081	-	0	0.145	-	0.088
T108-S	Diesel	1.83	0.132	0.007	0.013	0.042	-	0	0.075	-	0.046
T109-S	MOGAS	360.22	2.16	0.072	0.144	1.80	16.57	0	2.52	2.52	0.720
T114-S	Diesel	0.19	0.014	0.001	0.001	0.004	1	0	0.008	-	0.005
T116-S	Diesel	0.19	0.014	0.001	0.001	0.004	1	0	0.008	-	0.005
T118-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T121-S	Diesel	0.19	0.014	0.001	0.001	0.004	-	0	0.008	-	0.005
T122-S	Diesel	68.61	4.94	0.274	0.480	1.578	-	0	2.81	-	1.72
T123-S	JP-8	315.44	1.93	1.04	0.855	-	-	0.009	3.61	0.032	5.92
T124-S	JP-8	472.08	2.89	1.56	1.28	-	-	0.014	5.40	0.047	8.86
T125-S	JP-8	472.08	2.89	1.56	1.28	-		0.014	5.40	0.047	8.86
T126-S	MOGAS	1,576.92	9.46	0.315	0.631	7.88	72.54	0	11.04	11.04	3.15

11.4 ID	E IG	Emissions (lb/yr)									
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T127-S	Diesel	5.50	0.396	0.022	0.039	0.127	-	0	0.226	-	0.138
T128-S	MOGAS	153.41	0.920	0.031	0.061	0.767	7.06	0	1.07	1.07	0.307
T129-S	Diesel	0.19	0.014	0.001	0.001	0.004	-	0	0.008	-	0.005
T130-S	JP-8	36.55	0.224	0.121	0.099	-	-	0.001	0.418	0.004	0.686
T131-S	JP-8	1.55	0.010	0.005	0.004	-	-	4.7E-05	0.018	1.6E-04	0.029
T132-S	JP-8	1.55	0.010	0.005	0.004	-	-	4.7E-05	0.018	1.6E-04	0.029
T133-S	JP-8	6.75	0.041	0.022	0.018	-	-	2.0E-04	0.077	0.001	0.127
T134-S	Kerosene	0.00	-	-	-	-	-	-	-	-	-
T135-S	JP-8	628.79	3.85	2.08	1.70	-	-	0.019	7.19	0.063	11.80
T136-S	JP-8	628.79	3.85	2.08	1.70	-	-	0.019	7.19	0.063	11.80
T137-S	JP-8	628.79	3.85	2.08	1.70	-	-	0.019	7.19	0.063	11.80
T138-S	Diesel	136.87	9.85	0.547	0.958	3.15	-	0	5.61	-	3.42
T139-S	Diesel	0.19	0.014	0.001	0.001	0.004	-	0	0.008	-	0.005
T140-S	Diesel	0.17	0.012	0.001	0.001	0.004	-	0	0.007	-	0.004
T141-S	Diesel	0.57	0.041	0.002	0.004	0.013	-	0	0.023	-	0.014
T142-S	MOGAS	239.01	1.43	0.048	0.096	1.20	10.99	0	1.67	1.67	0.478
T143-S	MOGAS	266.69	1.60	0.053	0.107	1.33	12.27	0	1.87	1.87	0.533
T144-S	MOGAS	151.31	0.908	0.030	0.061	0.757	6.96	0	1.06	1.06	0.303
T145-S	MOGAS	113.47	0.681	0.023	0.045	0.57	5.22	0	0.794	0.794	0.227
T146-S	MOGAS	151.31	0.908	0.030	0.061	0.757	6.96	0	1.06	1.06	0.303
T206-S	JP-8	21.21	0.130	0.070	0.057	-	-	0.001	0.242	0.002	0.398
T207-S	JP-8	49.52	0.304	0.163	0.134	-	-	0.001	0.566	0.005	0.929
T301-S	No. 2	3.22	0.232	0.013	0.023	0.074	-	0	0.132	-	0.081
T302-S	No. 2	0.67	0.048	0.003	0.005	0.015	-	0	0.028	-	0.017
T305-S	No. 2	0.27	0.020	0.001	0.002	0.006	-	0	0.011	-	0.007

11 '/ ID	- I.G.	Emissions (lb/yr)									
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T311-S	No. 2	0.99	0.071	0.004	0.007	0.023	-	0	0.040	-	0.025
T313-S	No. 2	0.70	0.050	0.003	0.005	0.016	-	0	0.029	-	0.017
T314-S	No. 2	1.98	0.142	0.008	0.014	0.045	-	0	0.081	-	0.049
T316-S	No. 2	0.28	0.020	0.001	0.002	0.007	-	0	0.012	-	0.007
T330-S	No. 2	2.16	0.156	0.009	0.015	0.050	-	0	0.089	-	0.054
T331-S	No. 2	0.57	0.041	0.002	0.004	0.013	-	0	0.024	-	0.014
T333-S	No. 2	24.97	1.798	0.100	0.175	0.574	-	0	1.024	-	0.624
T334-S	No. 2	24.97	1.798	0.100	0.175	0.574	-	0	1.024	-	0.624
T335-S	No. 2	2.87	0.206	0.011	0.020	0.066	-	0	0.118	-	0.072
T336-S	No. 2	0.93	0.067	0.004	0.007	0.021	-	0	0.038	-	0.023
T337-S	No. 2	0.50	0.036	0.002	0.004	0.012	-	0	0.021	-	0.013
T339-S	No. 2	1.31	0.094	0.005	0.009	0.030	-	0	0.054	-	0.033
T342-S	No. 2	0.68	0.049	0.003	0.005	0.016	-	0	0.028	-	0.017
T345-S	No. 2	0.29	0.021	0.001	0.002	0.007	-	0	0.012	-	0.007
T346-S	No. 2	0.60	0.043	0.002	0.004	0.014	-	0	0.025	-	0.015
T347-S	No. 2	0.58	0.042	0.002	0.004	0.013	-	0	0.024	-	0.015
T348-S	No. 2	0.93	0.067	0.004	0.007	0.021	-	0	0.038	-	0.023
T349-S	No. 2	3.10	0.223	0.012	0.022	0.071	-	0	0.127	-	0.077
T353-S	No. 2	1.72	0.124	0.007	0.012	0.040	-	0	0.071	-	0.043
T354-S	No. 2	0.27	0.020	0.001	0.002	0.006	-	0	0.011	-	0.007
T602-S	Diesel	0.48	0.035	0.002	0.003	0.011	-	0	0.020	-	0.012
T603-S	Diesel	0.37	0.027	0.001	0.003	0.009	-	0	0.015	-	0.009
T604-S	Diesel	0.50	0.036	0.002	0.004	0.012	-	0	0.021	-	0.013
T608-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T610-S	Diesel	0.26	0.019	0.001	0.002	0.006	-	0	0.011	-	0.007

11.24 ID	T. I.C.	Emissions (lb/yr)									
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T611-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T613-S	Diesel	0.30	0.022	0.001	0.002	0.007	-	0	0.012	-	0.008
T614-S	Diesel	0.55	0.040	0.002	0.004	0.013	-	0	0.023	-	0.014
T615-S	Diesel	0.26	0.019	0.001	0.002	0.006	-	0	0.011	-	0.007
T617-S	Diesel	0.16	0.012	0.001	0.001	0.004	-	0	0.007	-	0.004
T619-S	Diesel	0.55	0.040	0.002	0.004	0.013	-	0	0.023	-	0.014
T620-S	Diesel	0.34	0.024	0.001	0.002	0.008	-	0	0.014	-	0.009
T621-S	Diesel	0.13	0.009	0.001	0.001	0.003	-	0	0.005	-	0.003
T623-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002
T625-S	Diesel	0.19	0.014	0.001	0.001	0.004	-	0	0.008	-	0.005
T626-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T627-S	Diesel	0.29	0.021	0.001	0.002	0.007	-	0	0.012	-	0.007
T628-S	Diesel	0.26	0.019	0.001	0.002	0.006	-	0	0.011	-	0.007
T629-S	Diesel	0.34	0.024	0.001	0.002	0.008	-	0	0.014	-	0.009
T630-S	Diesel	0.16	0.012	0.001	0.001	0.004	-	0	0.007	-	0.004
T631-S	Diesel	0.29	0.021	0.001	0.002	0.007	-	0	0.012	-	0.007
T632-S	Diesel	0.73	0.053	0.003	0.005	0.017	-	0	0.030	-	0.018
T633-S	Diesel	0.17	0.012	0.001	0.001	0.004	ı	0	0.007	-	0.004
T634-S	Diesel	0.16	0.012	0.001	0.001	0.004	-	0	0.007	-	0.004
T636-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T637-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T638-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T639-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002
T640-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002
T641-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002

II.4 ID	E IG	Emissions (lb/yr)									
Unit ID	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T642-S	Diesel	0.26	0.019	0.001	0.002	0.006	-	0	0.011	-	0.007
T643-S	Diesel	0.31	0.022	0.001	0.002	0.007	-	0	0.013	-	0.008
T644-S	Diesel	0.17	0.012	0.001	0.001	0.004	-	0	0.007	-	0.004
T645-S	Diesel	0.38	0.027	0.002	0.003	0.009	-	0	0.016	-	0.010
T646-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T647-S	Diesel	0.25	0.018	0.001	0.002	0.006	-	0	0.010	-	0.006
T648-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T649-S	Diesel	0.30	0.022	0.001	0.002	0.007	-	0	0.012	-	0.008
T650-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T651-S	Diesel	0.08	0.006	3.2E-04	0.001	0.002	-	0	0.003	-	0.002
T652-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001
T653-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T654-S	Diesel	0.17	0.012	0.001	0.001	0.004	-	0	0.007	-	0.004
T655-S	Diesel	0.13	0.009	0.001	0.001	0.003	-	0	0.005	-	0.003
T658-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T659-S	Diesel	0.21	0.015	0.001	0.001	0.005	-	0	0.009	-	0.005
T660-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T661-S	Diesel	0.07	0.005	2.8E-04	4.9E-04	0.002	-	0	0.003	-	0.002
T662-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002
T663-S	Diesel	0.06	0.004	2.4E-04	4.2E-04	0.001	-	0	0.002	-	0.002
T664-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T665-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T666-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T667-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T668-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004

Unit ID	F 10:		Emissions (lb/yr)								
	Fuel Stored	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
T669-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T670-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T671-S	Diesel	0.05	0.004	2.0E-04	3.5E-04	0.001	-	0	0.002	-	0.001
T672-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T673-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T674-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T675-S	Diesel	0.10	0.007	4.0E-04	0.001	0.002	-	0	0.004	-	0.003
T676-S	Diesel	0.12	0.009	4.8E-04	0.001	0.003	-	0	0.005	-	0.003
T677-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
T678-S	Diesel	0.14	0.010	0.001	0.001	0.003	-	0	0.006	-	0.004
Total (lb/yr)		28,044.74	190.33	16.97	20.92	129.81	1,124.88	0.10	221.91	171.50	118.35
Total	(ton/yr)	14.02	0.10	0.01	0.01	0.06	0.56	<0.01	0.11	0.09	0.06

7.0 FUELING OPERATIONS

Title V Source Designation(s)

 \underline{X} Significant Fueling operations that are not considered insignificant as listed

below

<u>X</u> Insignificant Gasoline storage and handling equipment at loading facilities

handling < 20,000 gallons per day or at vehicle dispensing facilities that are not subject to any standard, limitation, or other requirement under Section 111 or 112 (excluding 112(r)) if the Federal Clean Air

Act

Other fueling operations that are <u>not</u> subject to any specific state or federal standard or permit condition that have potential emissions <10,000 lb/yr of any regulated air pollutant, <1,000 lb/yr of any regulated HAP, and <2,500 lb/yr of a combination of regulated HAPs

Trivial Not applicable

7.1 BACKGROUND

To serve the operational needs of GOV, POV, and other fuel burning equipment, Fort Stewart has a number of fueling operations. A fueling operation is defined as the transfer of fuel from 1) a storage tank into to a tank truck or vehicle, or 2) a tank truck into a vehicle (including aircraft). These types of operations result in VOC and HAP emissions. Fuel transfers from tank trucks into storage tanks also generate VOC and HAP emissions; however, emissions from those transfers were previously addressed as emissions from storage tanks (see Section 6.0).

All liquid fuels that support Fort Stewart fueling operations are supplied to Fort Stewart by commercial tank trucks. Contractors deliver JP-8, diesel, and MOGAS to the storage tanks located at the COCO fueling facility. Contractors also deliver MOGAS directly to the storage tanks located at the Bryan Village Shoppette, the Victory Shoppette, and other fuel dispensing points on Fort Stewart. In a similar manner contractors deliver diesel fuel to various fuel dispensing points. Table 7.1 given in Section 7.3 shows the various locations on Fort Stewart that are engaged in fueling operations and provides data on the amount of fuel dispensed and/or transferred in 2007. The primary fuel loading activity (transfer of fuel from storage tanks to tank trucks) occurs at the COCO plant. The vast majority of the remaining fueling operations are fuel dispensing into vehicles (POV, GOV) and equipment. Most significant are the operations that involve the transfer and dispensing of MOGAS as these operations emit VOCs at rates that are between 37 and 350 times greater than VOC emission rates associated with JP-8 and diesel transfer/fueling operations.

Information on the quantities of fuel transferred/dispensed was obtained from multiple sources. The primary points of contacts for this information are given in Section 1.0, Table 1.0.

Except for gasoline handling systems at vehicle fuel dispensing facilities the Georgia EPD has not provided specific guidance regarding the designation of fueling operations as "significant," "insignificant," or "trivial" sources of air pollution. However, as per Georgia EPD *Major Source Operating Permit Application Introduction and Instructions*, an activity is designated as an insignificant source if it is: (1) not subject to any specific state or federal standard or permit condition and (2) generates potential emissions that are less than 10,000 lb/yr of any regulated air pollutant, less than 1,000 lb/yr of any regulated HAP, and less than 2,500 lb/yr of a combination of regulated HAPs. Based on these specifications, the gasoline dispensing activities located at Buildings 939 (F001-S) and 7336 (F002-S) are designated as significant sources.

7.2 EMISSION ESTIMATES

The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for all fueling operations, and a discussion of changes since the 2006 inventory.

Actual Emissions

Fueling operations result in the displacement of vapor from tank trucks and from aircraft/vehicle fuel tanks. The discussion of how emissions are estimated is segregated based on the type of fueling operation.

Tank Truck Fuel Loading Operations

Vapor displacement emissions from tank truck fuel loading were estimated using the "loading loss" equation for loading petroleum liquids from AP-42, Section 5.2, Equation 1 (Ref. 1). The emission factor is dependent upon the fuel temperature, vapor pressure, molecular weight, and a saturation factor, as follows:

 $E_R = 12.46 * [(M) * (P) * (S) / (T)]$ Equation (Eq.) 7.1

where: E_R = Emissions due to vapor displacement (lb/1,000 gal fuel transferred)

M = Fuel vapor molecular weight (lb/pound moles [lb-mol])

P = True fuel vapor pressure (psia)

S = Saturation factor for fuel loading method

T = Temperature of fuel loaded, °R (degrees Fahrenheit [°F] + 460)

All of the tank trucks and aircraft use a submerged loading method without vapor recovery. Values for the variables in Equation 7.1 along with the calculated emission factors (E_R) are presented in Section 7.3, Table 7.2.

Actual VOC emissions due to vapor displacement from tank truck fuel loading were calculated by multiplying the quantities of fuel transferred by the appropriate emission factor (E_R) . For example, the calculation used to estimate the quantity of VOC emitted from the transfer/loading of JP-8 to tank trucks is presented below.

Unit ID/Activity.: F139-S (JP-8 Loading to Tank Truck at COCO

Bulk Storage Facility)

Quantity of JP-8 loaded: 1,176,887 gal/yr Vapor displacement emission factor: 0.07129 lb/1,000 gal

VOC content of vapor: 100%_w

```
VOC emissions = (1,176,887 gal/yr) * (0.07129 lb/1,000 gal) * (1.0)
= 83.90 lb/yr
```

In addition to VOC, several HAPs are emitted during fuel loading. HAPs present in JP-8, MOGAS and diesel fuel were already presented in Section 6.0, Tables 6.2 through 6.4. Because of the similarity between No. 2 fuel oil and diesel fuel, the HAP present in No. 2 fuel oil were assumed to be the same as those present in diesel fuel. The quantity of each HAP emitted due to vapor displacement was estimated by multiplying the quantity of vapor/VOC emitted by the HAP vapor phase weight percent. For example, the calculation used to estimate the quantity of benzene emitted from the transfer of JP-8 to tank trucks is presented below.

Unit ID: F139-S
Diesel vapor displacement emissions: 83.90 lb/yr
Benzene content of JP-8 vapor: 0.613 %_w

Benzene emissions =
$$(83.90 \text{ lb/yr}) * (0.613\%)$$

= 0.514 lb/yr

In addition to filling losses, organic fuel vapors are emitted from tank trucks due to standing/breathing losses; these emissions are called transit losses. Currently, the only documented emission factor for tank truck transit losses is 0.01 lb of organic vapor per 1,000 gallons of MOGAS transported [EPA document AP-42, Section 5.2 (Ref. 1)]. No factors have been developed for the transport of other fuels. Transit losses were included in the estimation of emissions from the MOGAS tank truck filling operation at the COCO fuel storage facility.

Vehicle Fuel Dispensing Operations

Vapor displacement emissions from GOV and POV vehicle fuel dispensing operations were estimated using emission factors from EPA document AP-42, Section 5.2 (Ref. 1). The emission factor for fueling MOGAS-powered vehicles (AP-42, Section 5.2, Equation 6) is dependent upon the temperature of the fuel in the vehicle fuel tank, the temperature of the dispensed fuel, and the Reid vapor pressure of the fuel. The MOGAS emission factor is calculated as follows:

$$E_R = 2.2046 * [(0.0884) * (T_D) + (0.485) * (RVP) - (0.0949) * (\Delta T) - 5.909]$$
 Eq. 7.2

where: E_R = Emissions due to vapor displacement (lb/1,000 gal fuel transferred)

 T_D = Temperature of dispensed fuel (°F)

RVP = Reid vapor pressure (psia)

 ΔT = Temperature difference (°F) between fuel in vehicle tank and dispensed fuel

There is no similar equation for fueling of non-MOGAS-powered vehicles. Therefore, the "loading loss" equation for petroleum liquids (Eq. 7.1 shown previously) was used with the splash loading value entered for the saturation factor (S). The resulting emission factors for splash loading of diesel and JP-8 were used to estimate the VOC emissions associated with fuel dispensing for diesel and JP-8.

Representative values for the variables in Equations 7.1 and 7.2, along with the calculated emission factors (E_R) are presented in Section 7.3, Table 7.3*.

*Note: The vapor displacement factor determined for MOGAS fuel dispensing was calculated using area specific values for the variables (RVP, T_D, ΔT) in equation 7.2 and does not account for Stage II controls for vapor recovery. Inspection of the MOGAS dispensing facilities verified that none of the fuel dispensing activities on Fort Stewart has a vapor recovery system.

Actual VOC emissions due to vapor displacement from GOV and POV fuel dispensing operations were calculated by multiplying the quantities of fuel transferred by the appropriate emission factor as demonstrated previously under the tank truck fuel-loading example. In the case of MOGAS dispensing the vapor displacement factor was added to an emission factor that accounted for vapor losses that result from fuel spillage. The spillage factor (0.7 lb per 1,000 gallons of fuel dispensed) was obtained from AP-42, Section 5.2, Table 5.2-7 (Ref. 1). The example below shows the calculation for VOC emissions due to MOGAS dispensing at the Bryan Village Shoppette (Unit ID F002-S).

Unit ID: F002-S

MOGAS throughput: 1,299,877 gal/yr

Uncontrolled refueling losses: 13.3627 lb/10³ gal [AP-42, Section 5.2, Eq. 6 (Ref. 1) &

EPA Guidance Document: 50/3-91-022a (Ref. 6)]

Spillage losses: 0.7 lb/1,000 gal [AP-42 Section 5.2, Table 5.2-7 (Ref. 1)]

VOC emissions = (1,299,877 gal/yr * 0.7 lb/1,000 gal * 1/1,000 gal) + (1,299,877 gal/yr)

* 13.3627 lb/1,000 gal * 1/1,000 gal) = 909.91 + 17,369.87 = 18,279.78 lb/yr

The quantity of each HAP emitted due to fuel dispensing was estimated by multiplying the VOC fueling losses by the HAP <u>liquid</u> phase weight percent. For example, the calculation used to estimate the quantity of benzene emitted due to MOGAS fuel dispensing at the Bryan Shoppette is presented below.

Unit ID: F002-S

VOC emissions: 18,279.78 lb/yr

Benzene content of vapor gasoline: 0.6%_w

Benzene Emissions = (18,279.78 lb/yr) * (0.006) = 109.68 lb/yr

Actual VOC and HAP emissions from fueling operations (i.e., cumulative emissions from each source due to vapor displacement, transit losses, and/or fuel spillage) are presented in Section 7.3, Table 7.4.

Potential Emissions

Emissions from fueling operations are proportional to the quantity of fuel transferred. Potential gasoline dispensed at the Victory and Bryan Village Shopettes were based on EPAs *Technical Support Document for Potential to Emit Guidance Memo, Documentation of Emission Calculations* (Ref. 5). The methodology presented assumed a per vehicle fuel dispensing rate of 10 gallons per minute and that each vehicle being refueled is replaced by another vehicle every 10 minutes (6 vehicles per hour). This is equivalent to one gallon per minute [10 gallons/minute * 6 * 1/60) minutes) for each refueling position. The number of refueling positions is the number of vehicles that could be pumping fuel simultaneously. For the Bryan Village Shoppette it was determined that there are 10 refueling positions. For the Victory Shoppette 12 refueling positions were identified. Thus for example, the potential gasoline dispensed for the Bryan Village Shoppette (F002-S) would be calculated as follows:

The amount of potential fuel transferred into tank trucks at the COCO facility is limited by the rate at which the facility can receive fuel. The following was used to determine the rate at which fuel can be received into the facility. The result will then be used as the potential fuel transfer/issues to tank trucks.

The potential amount of fuel (JP-8, MOGAS & Diesel) transferred to tank trucks at the COCO facility was calculated based on the following:

- 1. Four bulk fueling stations [two (2) 300 gal/min pumps for the transfer of JP-8, one (1) 125 gal/min pump for the transfer of MOGAS, and one (1) 220 gal/min pump for the transfer of diesel].
- 2. Each pump can be used for fuel receiving and issues **but cannot perform both operations simultaneously**. Thus, the maximum amount of fuel received over 6 months would represent the maximum amount of fuel that could be issued in the following 6-month period. These issues would represent the potential fuel transfer for a year. However, as described in number 3 below the amount of fuel that can be received at the COCO facility cannot be a continuous process.
- 3. Thirty (30) minutes of overhead time is required for each fuel delivery (no tank loading occurs during this period this time is spent preparing each delivery for the loading operation).
- 4. The typical size of tank trucks delivering fuel to the facility is 8,000 gallons.

The following example illustrates how the potential fuel receipts were calculated:

Unload/pump time per delivery = (8,000 gal / 300 gal/min) = 26.66 min

Total time per delivery = (26.66 min + 30 min) = 56.6 min = 0.944 hour

Max receiving rate = 8,000 gal/0.944 hour

Max receipts (6 mo) = 8,000 gal/0.944 hr * 4,380 hr/6 mo = 37,188,644 gal/ 6 mo

Total potential JP-8 receipts = (2 receiving points) * 37,118,644 gal

Total potential JP-8 receipts = 74,237,288 gal/yr

For the remaining fueling operations, including the retail fuel dispensing at the COCO, it was assumed the amount of fuel transferred and/or dispensed is proportional to the number of hours the installation operates per year. Actual installation operations were estimated to occur 2,080 hours per year (40 hours per week * 52 week per year). The installation could potentially operate 8,760 hours per year. Therefore, the potential quantities of fuel were estimated by multiplying actual fuel transfers by the ratio of 8,760/2,080.

Using the potential fuel data determined from the methods above, the calculations to estimate potential VOC and HAP emissions were done using the same methodology used for the actual VOC and HAP emissions. Potential VOC and HAP from fueling operations are presented in Section 7.3, Table 7.5.

Emissions Summary

Table 7.0 below provides the total emissions of VOC and combined HAP from fueling operations at Fort Stewart.

TABLE 7.0 Emissions Summary - Fueling Operations

Emission Type	VOC	НАР		
Actual (lb/yr)	71,911.07	5,290.41		
Actual (ton/yr)	35.96	2.65		
Potential (lb/yr)	306,726.04	22,460.93		
Potential (ton/yr)	153.36	11.23		

Emission Source Updates

No updates were made from the 2006 inventory. However, range fuel use was down because of closures to construct a digital multi purpose range complex (MPRC) and changes in support contracts.

^a Represents the maximum amount of fuel that can be transferred to tank trucks in one year

7.3 DETAILED SOURCE AND EMISSIONS TABLES

Tables 7.1 through 7.5 below provide a breakdown of the fueling operations, fuel characteristics, and emission estimates for each fueling activity.

TABLE 7.1 Fueling Operations

Unit	Building	Description of Activity	Type of Fuel		unt Handled al/yr)
ID	No.	Description of Activity	Handled	Actual	Potential
F001-S ^a	939	POV Fuel Dispensing - Victory Shoppette	MOGAS	3,519,493	6,307,200
F002-S ^a	7336	POV Fuel Dispensing - Bryan Village	MOGAS	1,299,877	5,256,000
F101-S	1157	Tank Truck Loading - HazWaste Turn-In Center	Used JP-8	30,399	128,027
F104-S	1175	GOV Fuel Dispensing - DOL Yard Equipment	MOGAS	8,400	35,377
F105-S	2151	Fuel Dispensing - Golf Course	Diesel	2,200	9,265
F106-S	2151	Fuel Dispensing - Golf Course	MOGAS	3,600	15,162
F107-S	2902	GOV Fuel Dispensing - Central Handling Facility	Diesel	16,152	68,025
F113-S	10511	GOV Fuel Dispensing - GANG Bldg. & Grounds	Diesel	3,752	15,802
F114-S	10511	GOV Fuel Dispensing - GANG Bldg. & Grounds	MOGAS	1,653	6,962
F115-S	10522	GOV Fuel Dispensing - GANG RTI	JP-8	8,542	35,975
F124-S	Alpha Range	GOV Fuel Dispensing	Diesel	653	2,751
F126-S	Fox Trot Range	GOV Fuel Dispensing	Diesel	653	2,751
F128-S	Golf Range	GOV Fuel Dispensing	Diesel	0	0
F131-S	MPRC Range	GOV Fuel Dispensing	Diesel	653	2,751
F136-S	8064	GOV Fuel Dispensing - Forestry	MOGAS	18,437	77,648
F137-S	COCO	GOV Fuel Dispensing – Bulk Storage Facility	JP-8	112,304	472,973
F138-S	8064	GOV Fuel Dispensing - Forestry	Diesel	38,348	161,504
F139-S	COCO	Tank Truck Loading - Bulk Storage Facility	JP-8	1,176,887	74,237,288

Unit	Building	Description of Activity	Type of Fuel		unt Handled al/yr)
ID	No.	Description of Activity	Handled	Actual	Potential
F140-S	COCO	Tank Truck Loading - Bulk Storage Facility	Diesel	68,546	32,070,508
F141-S	COCO	GOV Retail Fuel Dispense- Bulk Storage Facility	Diesel	206,697	870,512
F142-S	COCO	GOV Fuel Dispense - Bulk Storage Facility	MOGAS	246,299	1,037,298
F143-S	8073	GOV Fuel Dispensing DMMC - Range Control	MOGAS	957	4,031
F144-S	8081	GOV Fuel Dispensing - Range Control	Diesel	653	2,751
F146-S	COCO	Tank Truck Fuel Loading - Bulk Storage Facility	MOGAS	6,376	22,365,957
F148-S	1412	GOV Fuel Dispensing – Central Energy Plant	Diesel	4,000	16,846
F149-S	17003	GOV Fuel Dispensing – Ammo Supply Point	Diesel	454	1,912
F150-S	Hotel Range	GOV Fuel Dispensing	Diesel	653	2,751
F153-S	1175	GOV Fuel Dispensing - DOL	JP-8	9,600	40,431
F154-S	Alpha Range	GOV Fuel Dispensing	MOGAS	957	4,031
F-155S	Fox Trot Range	GOV Fuel Dispensing	MOGAS	957	4,031
F-156S	Golf Range	GOV Fuel Dispensing	MOGAS	0	0
F-157S	Hotel Range	GOV Fuel Dispensing	MOGAS	957	4,031
F-158-S	MPRC Range	GOV Fuel Dispensing	MOGAS	957	4,031

^a Significant Source

TABLE 7.2

Data for Estimating Vapor Displacement Emissions for Aircraft and Tank Truck Fueling Operations

Variable ^a	Fuel Transferred						
v ar lable	MOGAS	Diesel	JP-8				
M (lb/lb-mol)	67 ^b	130°	152 ^d				
P (psia)	5.7 ^{,e}	8.5x10 ^{-3,c}	0.033 ^{,d}				
\mathbf{S}^{f}	6.0x10 ⁻¹	6.0x10 ⁻¹	6.0x10 ⁻¹				
T (°R) ^g	526	526	526				
E _R (lb/1,000 gal) ^h	5.43 ^h	0.0157	0.0713				

^a Variables from Equation 7.1. M=Molecular weight of vapors, P=true fuel vapor pressure, S-see footnote f, T-see footnote g, E_R = Emissions due to vapor displacement

b Based on data contained in AP-42 (Ref. 1)Table 7.1-2 and EPA-50/3-91-022a (Ref. 6). A yearly average Reid Vapor pressure of 10.7 psia was estimated for MOGAS used at the installation.

^c EPA document, AP-42, Section 7, Table 7.1-2 (Ref. 1).

^d Based on data summarized in *Useful Properties/Characteristics of JP-8 Fuel for Performing Air Emissions Inventories* (Ref. 4).

^e Based on data contained in AP-42, Section 7.0, Table 7.1-2 and Figure 7.1-14a (Ref. 1).

Saturation factor = 0.6 for submerged loading, dedicated normal service; EPA document AP-42, Section 5, Table 5.2-1(Ref. 1).

^g Average yearly temperature for Savannah, Georgia = 66.3 °F.

h Emission factor includes transit losses of 0.01 lb/1,000 gallons fuel transferred.

TABLE 7.3

Data for Estimating Vapor Displacement Emissions for GOV and POV Fueling Operations

Variable ^a	Fuel Transferred						
v ar iable	MOGAS (Eq. 7.2)	Diesel (Eq. 7.1)	JP-8 (Eq. 7.1)				
RVP (psia) ^b	10.7						
T _D (°F) ^c	81						
ΔT (°F) ^d	4.0						
M (lb/lb-mol)		130 ^e	152 ^f				
P (psia)		8.5x10 ^{-3,e}	0.033 ^{,f}				
T (°R)°		526	526				
S ^g	1.45	1.45	1.45				
E _R (lb/1,000 gal) ^h	14.06 ^h	0.038	0.172				

^a Variables from Equations 7.1 and 7.2.

^b EPA-50/3-91-022a, Table 3-3 (Ref. 6).

^c EPA-50/3-91-022a, Table 3-4 (Ref. 6).

^d EPA-50/3-91-022a, Table 3-5 (Ref. 6).

^e EPA document, AP-42, Section 7, Table 7.1-2.

^f Based on data summarized in *Useful Properties/Characteristics of JP-8 Fuel for Performing Air Emissions Inventories* (Ref. 4).

^g Saturation Factor for Splash Landing Dedicated Normal Service, taken from AP-42, Section 5, Table 5.2-1 (Ref. 1).

h 13.36 lb/1,000 gal (determined from Eq. 7.2) + 0.7 lb/1,000 gal spillage loss [AP-42, Section 5, Table 5.2-7 (Ref. 1)].

TABLE 7.4
Actual Emissions from Fueling Operations

						Emission	ns (lb/yr)				
Unit ID	Fuel Type	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
F001-S ^a	MOGAS	49,493.72	296.96	9.90	19.80	247.47	2,276.71	-	346.46	346.46	98.99
F002-S ^a	MOGAS	18,279.83	109.68	3.66	7.31	91.40	840.87	-	127.96	127.96	36.56
F101-S	Used JP-8	2.17	0.013	0.007	0.006	-	-	6.5E-05	0.025	2.2E-04	0.041
F104-S	MOGAS	118.13	0.71	0.024	0.047	0.591	5.43	-	0.827	0.827	0.236
F105-S	Diesel	0.083	0.006	3.3E-04	5.8E-04	0.002	-	-	0.003	-	0.002
F106-S	MOGAS	50.63	0.304	0.010	0.020	0.253	2.33	-	0.354	0.354	0.101
F107-S	Diesel	0.613	0.044	0.002	0.004	0.014	-	-	0.025	-	0.015
F113-S	Diesel	0.142	0.010	0.001	0.001	0.003	-	-	0.006	-	0.004
F114-S	MOGAS	23.25	0.139	0.005	0.009	0.116	1.069	-	0.163	0.163	0.046
F115-S	JP-8	1.47	0.009	0.005	0.004	-	-	4.E-05	0.017	1.E-04	0.028
F124-S	Diesel	0.025	0.002	9.9E-05	1.7E-04	0.001	-	-	0.001	-	0.001
F126-S	Diesel	0.025	0.002	9.9E-05	1.7E-04	0.001	-	-	0.001	-	0.001
F128-S	Diesel	0	0	0	0	0	-	-	0	-	0
F131-S	Diesel	0.025	0.002	9.9E-05	1.7E-04	0.001	-	-	0.001	-	0.001
F136-S	MOGAS	259.27	1.56	0.052	0.104	1.30	11.93	-	1.81	1.81	0.519
F137-S	JP-8	19.35	0.119	0.064	0.052	-	-	0.001	0.221	0.002	0.363
F138-S	Diesel	1.46	0.105	0.006	0.010	0.033	-	-	0.060	-	0.036
F139-S	JP-8	83.90	0.514	0.277	0.227	-	-	0.003	0.96	0.008	1.57
F140-S	Diesel	1.08	0.078	0.004	0.008	0.025	-	-	0.044	-	0.027
F141-S	Diesel	7.85	0.565	0.031	0.055	0.180	-	-	0.322	-	0.196
F142-S	MOGAS	3,463.64	20.78	0.693	1.385	17.32	159.33	-	24.25	24.25	6.93
F143-S	MOGAS	13.46	0.081	0.003	0.005	0.067	0.619	-	0.094	0.094	0.027
F144-S	Diesel	0.025	0.002	9.9E-05	1.7E-04	0.001	-	-	0.001	-	0.001
F146-S	MOGAS	35.25	0.211	0.007	0.014	0.176	1.621	-	0.247	0.247	0.070
F148-S	Diesel	0.152	0.011	0.001	0.001	0.003	-	-	0.006	-	0.004
F149-S	Diesel	0.017	0.001	6.9E-05	1.2E-04	4.0E-04	-	-	0.001	-	4.3E-04

Unit ID	E. al Taur		Emissions (lb/yr)								
Unit ID	Fuel Type	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
F150-S	Diesel	0.025	0.002	9.9E-05	1.7E-04	0.001	-	-	0.001	-	0.001
F153-S	JP-8	1.65	0.010	0.005	0.004	-	-	5.0E-05	0.019	0.000	0.031
F154-S	MOGAS	13.46	0.081	0.003	0.005	0.067	0.619	-	0.094	0.094	0.027
F-155S	MOGAS	13.46	0.081	0.003	0.005	0.067	0.619	-	0.094	0.094	0.027
F-156S	MOGAS	0	0	0	0	0	0	-	0	0	0
F-157S	MOGAS	13.46	0.081	0.003	0.005	0.067	0.619	-	0.094	0.094	0.027
F-158-S	MOGAS	13.46	0.081	0.003	0.005	0.067	0.619	-	0.094	0.094	0.027
Tot	Total (lb/yr) 71,911.07 432.24 14.76 29.09 359.22 3,302.39 3.3E-03 504.25					502.55	145.91				
Tota	al (ton/yr)	35.96	0.22	0.01	0.01	0.18	1.65	<0.01	0.25	0.25	0.07

^a Significant Source

TABLE 7.5
Potential Emissions from Fueling Operations

						Emission	s (lb/yr)				
Unit ID	Fuel Type	VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
F001-S	MOGAS	88,696.53	532.18	17.74	35.48	443.48	4,080.04	-	620.88	620.88	177.39
F002-S	MOGAS	73,913.77	443.48	14.78	29.57	369.57	3,400.03	-	517.40	517.40	147.83
F101-S	Used JP-8	9.13	0.056	0.030	0.025	-	-	2.7E-04	0.104	0.001	0.171
F104-S	MOGAS	497.50	2.98	0.099	0.199	2.49	22.88	-	3.48	3.48	0.995
F105-S	Diesel	0.352	0.025	1.4E-03	0.002	0.008	-	-	0.014	-	0.009
F106-S	MOGAS	213.21	1.279	0.043	0.085	1.066	9.81	-	1.492	1.492	0.426
F107-S	Diesel	3	0.186	0.010	0.018	0.059	-	-	0.106	-	0.065
F113-S	Diesel	0.600	0.043	0.002	0.004	0.014	-	-	0.025	-	0.015
F114-S	MOGAS	97.90	0.587	0.020	0.039	0.490	4.50	-	0.685	0.685	0.196
F115-S	JP-8	6.198	0.038	0.020	0.017	-	-	1.9E-04	0.071	0.001	0.116
F124-S	Diesel	0.104	0.008	4.2E-04	0.001	0.002	-	-	0.004	-	0.003
F126-S	Diesel	0.104	0.008	4.2E-04	7.3E-04	0.002	-	-	0.004	-	0.003
F128-S	Diesel	0	0	0	0	0	-	-	0	-	0
F131-S	Diesel	0.104	0.008	4.2E-04	0.001	0.002	-	-	0.004	-	0.003
F136-S	MOGAS	1,091.95	6.55	0.218	0.437	5.46	50.23	-	7.644	7.644	2.184
F137-S	JP-8	81.49	0.500	0.269	0.221	-	-	0.002	0.931	0.008	1.53
F138-S	Diesel	6.13	0.441	0.025	0.043	0.141	-	-	0.251	-	0.153
F139-S	JP-8	5,292.53	32.44	17.47	14.34	-	-	0.159	60.49	0.529	99.34
F140-S	Diesel	503.68	36.265	2.015	3.526	11.585	-	-	20.651	-	12.592
F141-S	Diesel	33.04	2.38	0.132	0.231	0.760	-	-	1.355	-	0.826
F142-S	MOGAS	14,587.25	87.52	2.917	5.835	72.94	671.01	-	102.11	102.11	29.17
F143-S	MOGAS	56.69	0.340	0.011	0.023	0.283	2.61	-	0.397	0.397	0.113
F144-S	Diesel	0.104	0.008	0.000	0.001	0.002	-	-	0.004	-	0.003
F146-S	MOGAS	121,400.56	728.40	24.280	48.560	607.003	5,584.43	-	849.804	849.804	242.801
F148-S	Diesel	0.639	0.046	0.003	0.004	0.015	-	-	0.026	-	0.016
F149-S	Diesel	0.073	0.005	2.9E-04	0.001	0.002	-	-	0.003	-	0.002

Unit ID	Fuel Type		Emissions (lb/yr)								
Unit 1D		VOC	Benzene	Cumene	Ethylbenzene	Hexane	MTBE	Naphthalene	Toluene	2,2,4-TMP	Xylenes
F150-S	Diesel	0.104	0.008	4.2E-04	0.001	0.002	-	-	0.004	-	0.003
F153-S	JP-8	6.97	0.043	0.023	0.019	-	-	2.1E-04	0.080	0.001	0.131
F154-S	MOGAS	56.69	0.340	0.011	0.023	0.283	2.61	-	0.397	0.397	0.113
F-155S	MOGAS	56.69	0.340	0.011	0.023	0.283	2.61	-	0.397	0.397	0.113
F-156S	MOGAS	0	0	0	0	0	0	-	0	0	0
F-157S	MOGAS	56.69	0.340	0.011	0.023	0.283	2.61	-	0.397	0.397	0.113
F-158-S	MOGAS	56.69	0.340	0.011	0.023	0.283	2.61	-	0.397	0.397	0.113
Total (lb/yr) 306,726.04 1,877.20 80.15 138.77 1,516.51 13.				13,835.98	0.162	2,189.61	2,106.01	716.54			
Tota	al (ton/yr)	153.36	0.94	0.04	0.07	0.76	6.92	<0.01	1.09	1.05	0.36

^a Significant Source

8.0 SPRAY PAINT BOOTHS

Title V Source Designation(s)

<u>X</u> Significant Spray paint booths that have potential emissions $\geq 10,000 \text{ lb/yr}$ of any

regulated air pollutant, ≥1,000 lb/yr of any regulated HAP, or

≥2,500 lb/yr of a combination of regulated HAPs

Spray paint booths that are subject to any specific state or federal

standard or permit condition

X Insignificant Spray paint booths that are <u>not</u> subject to any specific state or federal

standard or permit condition that have potential emissions

<10,000 lb/yr of any regulated air pollutant, <1,000 lb/yr of any regulated HAP, and <2,500 lb/yr of a combination of regulated HAPs

Trivial Not applicable

8.1 BACKGROUND

Five spray paint booths were identified on Fort Stewart. Two of the paint booths identified (P101-S and P102-S) were not used in 2007. One of the three active booths (P001-S, Bldg. 1073) is used by the DOR. The Directorate of Community Activities and Services (DCAS) and the GANG/MATES organization typically use the second active booth (P103-S). In the past this booth has been leased to DOR when their workload is high. However, in 2007 GANG/MATES were the primary users. Spray painting operations at P001-S and P103-S include painting GOV and miscellaneous components. The third active booth (P106-S) is operated by Eagle Services and replaces the outdoor painting activities for MILVAN containers (P104-S in the 2006 inventory) and for tracks used by tactical and combat vehicles (P105-S in the 2006 inventory).

The inactive booth (P101-S) belongs to the DPW carpentry shop and is currently being used as a storeroom. There are no plans to activate the DPW booth in the foreseeable future. The second inactive booth (P102-S) is located at the Libby Auto Craft Center. The manager of the Craft Center reported that the paint booth was closed due to fire hazard concerns, and thus there was no usage in CY2007.

Detailed product usage records were maintained for the active spray booths. General information regarding each of the spray painting operations and data on the quantity of paints used is presented in Section 8.3, Tables 8.1 and 8.2. See Section 1.0, Table 1.0 for a list of data sources.

The Georgia EPD has not provided specific guidance regarding the designation of spray paint booths as "significant," "insignificant," or "trivial" sources of air pollution. Based on Fort Stewart's Title V permit, P001-S (Building 1073) is designated as a significant source while the remaining spray painting operations are designated as insignificant sources.

8.2 EMISSION ESTIMATES

Spray painting is a source of PM, PM-10, PM-2.5, VOC, and HAP emissions. Material safety data sheets (MSDS) for each of the products (paints and thinners) used were obtained. The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for the identified spray paint activities.

Actual Emissions

Composition of each product is based on data contained in the MSDS. VOC and volatile HAP emissions were estimated assuming all VOC and volatile HAP were released to the atmosphere. As an example, the calculation used to estimate VOC emissions from the application of a tancolored polyurethane coating is presented below.

Unit ID: P001-S

Product applied: Polyurethane Coating, Tan, 33446

National stock number: 8010-01-276-3640

Quantity sprayed: 3,295 gal/yr

VOC content of paint: 3.471 lb/gal (from MSDS)

VOC emissions = (3,295 gal/yr) * (3.471 lb/gal) = 11,436.95 lb/yr

PM, PM-10, PM-2.5, and particulate HAP emissions were also calculated. Two factors, particulate controls and paint application/transfer method, will affect how much particulate matter is emitted to the atmosphere.

Painting operations, which are conducted within a paint spray booth with dry filter or waterfall controls, will have reduced PM emissions. The overall particulate emissions will be reduced by the particulate removal efficiency of the controls. A conservative value for fabric filter control system efficiency was estimated to be 60 percent using *Perry's Chemical Engineering Handbook* (Ref. 7). Some fabric control systems however, have efficiencies at or above 90 percent. Waterfall controls are estimated to reduce particulate emissions by 85 percent. The paint booth at GANG/MATES (P103-S) has a waterfall control while the DOL booth (P001-S) and the Eagle Services booth (P106-S) have fabric filters.

Typical transfer efficiencies were obtained from Section 30, Table 30-1 of the U.S. Air Force Document *Air Emission Inventory Guidance Document for Stationary Sources at Air Force Installations* (Ref. 2). The transfer efficiencies associated with the various paint application methods are presented in Section 8.3, Table 8.3.

Very little data was available concerning the breakdown of PM emissions from spray painting. As a default, 46.7% of PM emissions were assumed to be PM-10 and PM-2.5. In a paint booth appreciable amounts of the paint particles do not reach the control device due to deposition on the paint booth floor and walls. This fact was not taken into consideration because of the lack of information available to estimate overspray fall-out.

The following calculation provides an example of how particulate emissions were estimated.

Unit ID: P001-S

Product applied: Hentzen, 08609TUZ, Tan National stock number: 8010-01-276-3640

Quantity sprayed: 3,295 gal/yr
Density of paint: 10.2075 lb/gal

Pigment composition: 40.81%_w

Paint transfer efficiency: 40% (Airless Spray Gun)

Particulate control efficiency: 60% (Filters)

TSP/PM emissions =
$$(3,295 \text{ gal/yr}) * (10.2075 \text{ lb/gal}) * (0.4081) * (1-0.40) * (1-0.60)$$

= $3,294.30 \text{ lb/yr}$

Note: If reliable solids content data were not available from the MSDS, then the solid content in an applied coating was estimated to equal one hundred minus the weight percent of VOC, exempt solvents (i.e., solvents that are not classified as VOC), and water.

HAP emissions were estimated by multiplying the quantity of paint applied (lb) by the weight percent of the hazardous component. If the hazardous component was a particulate the control and transfer efficiencies were applied in the same manner as in the example above. Both HAP and criteria pollutant emissions by individual painting operation are shown in Section 8.3, Table 8.4.

Potential Emissions

Emissions from spray paint booths are proportional to the quantity of products applied. For P001-S the potential emissions for the paint use were based on data provided by the paint booth operators (See Section 1.0, Table 1.0 for POCs). The following information was provided as the scenario (See note) that could lead to the highest potential paint use.

- For every hour during which painting could be conducted, at least 30 minutes is spent on preparation.
- For four (4) hours in a day (24 hours) no painting can be conducted due to cleaning and shift changes.
- Painters use a maximum of 7 gallons to paint the largest vehicle in a one-hour block (30 minutes is the maximum painting time/hr see above).

Based on the above the potential paint use for P001-S was determined as follows:

```
Hours/shift spent without painting = (4 hr) / (3 shifts) = 1.33 hr/shift
Hours/shift spent painting = (8 hr/shift) – (1.33 hr/shift not painting) = 6.67 hr/shift
Gallons used/shift = (6.67 hr/shift) * (7 gal/hr) = 46.69 gal/shift
Potential gal/day = (46.69 gal/shift) * (3 shift/day) = 140 gal/day
Potential gal/yr = (140 gal/day) * (365 day/yr) = 51,100 gal/yr
```

Potential thinner use at P001-S was based on a use rate of use 5-10 gallons of thinner per shift. This equates to 15-20 gal of thinner per day, and 7,300 gallons per year.

Note: The above scenario to estimate potential paint and thinner use was based on discussions with paint shop personnel in 2007 for the 2006 inventory. In 2008 paint shop personnel indicated that the given scenario would still be applicable for the 2007 inventory

P103-S and P106-S operated over 12-months in 2007. The potential product/paint usage for these booths was assumed proportional to the number of hours the installation operates per year. Actual installation operations were estimated to occur 2,080 hours per year (40 hours per week * 52 week per year). The installation could potentially operate 8,760 hours per year. Therefore, the potential quantities of paint were estimated by multiplying actual fuel transfers by the ratio of 8,760/2,080.

Potential emissions calculations from the active spray paint booths were estimated using the same mass balance procedures that were used to estimate actual emissions. However, control equipment should not be included in potential emissions estimates unless the use of the control equipment is included as a federally enforceable condition in a permit. The use of particulate control on P001-S is required by the Title V permit for the installation. However, the control equipment is not required for the other spray paint booths. Therefore, potential PM emissions were estimated by assuming that the particulate control equipment was not present on units P103-S and P106-S. Potential emissions by individual painting operation are shown in Section 8.3, Table 8.5.

Because P101-S and P102-S will not be operated in the foreseeable future their potential emissions were not estimated.

Emissions Summary

Table 8.0 given below summarizes actual and potential HAP emissions from spray paint booths and outdoor spray painting at Fort Stewart.

TABLE 8.0 Emissions Summary - Spray Paint Booths

Emission Type	VOC	PM	PM-10	PM-2.5	HAP
Actual (lb/yr)	37,844.70	7,072.90	3,303.04	3,303.04	9,741.56
Actual (ton/yr)	18.92	3.54	1.65	1.65	4.87
Potential (lb/yr)	234,403.17	61,586.39	28,760.85	28,760.85	74,639.81
Potential (ton/yr)	117.20	30.79	14.38	14.38	37.32

Emission Source Updates

The Eagle Services outdoor MILVAN and track painting operations (Unit IDs P104-S and P105-S in the 2006 Inventory) are no longer conducted. All Eagle Services painting is now conducted in a new paint spray booth that has been assigned the Unit ID P106-S). The Unit IDs P104-S and P105-S have been deleted in the 2007 inventory.

In 2007 there was approximately a 63 percent reduction in the amount of paint used across Fort Stewart when compared to 2006.

8.3 DETAIL SOURCE AND EMISSION TABLES

Tables 8.1 through 8.5 below provide information on spray paints used and estimates of emissions for each painting activity.

TABLE 8.1 Summary of Paint Spray Booth Activities

Unit ID	Building No.	Organization / Shop	Items Painted	Spray Gun Type	Pollution Control Equipment	2007 Paint Sprayed (gal)
P001-S ^a	1073	DOR / Allied Trades	GOV, Equipment	Airless	Dry filters	5,200
P101-S	1105	DPW / Carpentry	1	1	1	Inactive
P102-S	1503	Libby Auto Craft Center	1	1	1	Inactive
P103-S	10531	GANG / MATES	GOV, Equipment	Airless	Waterfall	904
P106-S ^b	1210	Eagle Services	MILVAN Containers, Tracks, Small Parts	HVLP	Dry filters	42

^a Significant paint booth

HVLP = high volume-low pressure

^b Replaces P104-S and P105-S (outdoor painting that used tarps for overspray control)

TABLE 8.2 Spray Paint Information

NSN	Material Description	Color/Type	VOC Content (lb/gal)	Actual Use (gal)	Potential Use (gal)
	UNIT ID P001-S (Airless Spr	ay Guns, Fabr	ic Particulat	te Filters ^a)	
8010-01-229-7547	HENTZEN, 08605GUZ-GD	GREEN	3.49	30	148
8010-01-229-7544	HENTZEN, 08606TAU-GD	BROWN	3.496	1	5
8010-01229-7541	HENTZEN, 08610KUZ-GD	BLACK	3.495	1	5
8010-01-276-3640	HENTZEN, 08609TUZ-GD	TAN	3.471	3,295	16,235
8010-00-181-8079	CHEMICAL SPECIALIST, TYPE 1	THINNER	7.42	780	5,788
8010-01-187-9820	NILES CHEM., N-1088A	WHITE PRIMER	4.26	104	512
8010-01-187-9820	NILES CHEM., N-1088B, 4:1 BLEND	-	5.17	26	128
8010-01-229-7547	SHER. WILLAMS, F93G104	GREEN	327	47	488
-	SHER.WILLIAMS, B53W311	WATER BASED TAN	0.65	760	7,896
8010-01-276-3640	SHER. WILLIAMS, F93H107	TAN	3.36	2,373	24,654
8010-00-181-8079	NILES CHEM. PAINT, TYPE 1	THINNER	7.42	668	4,300
8010-01-212-1704	NILES CHEM. PAINT, TYPE 2	THINNER	7.00	88	566
8010-01-187-9820	SHER. WILLIAMS, E90W201	WHITE PRIMER	3.88	82	852
8010-01-187-9820	SHER. WILLIAMS, V93V202, 4:1 BLEND	-	5.89	17	177
U	NIT ID P103-S (Airless Spray	Guns, Waterf	fall Particulo	ate Control ^b)	
8010-01-276-3640	SHERWIN-WILLIAMS, F93H107	TAN	3.36	902	3799
8010-01-187-9820	SHERWIN WILLIAMS, E90W201	WHITE PRIMER	3.88	2	868
8010-01-212-1704	NILES CHEM. PAINT, TYPE 2	THINNER	7.00	206 ^c	8
	UNIT ID P106-S (HVLP Spra	ıy Guns, Fabri	c Particulate	e Control ^b)	
-	SHER. WILLIAMS, B53B300	BLACK	1.60	29	122
-	SHER. WILLIAMS, B53W311 (BASE)	TAN	1.59	7	29
-	SHER. WILLIAMS, B53W311 (BASE)	WHITE	1.59	1	4
-	SHER. WILLIAMS, B53W311 (BASE)	GREEN	1.59	5	21

^a Assumed 60 percent particulate control efficiency for fabric filters (filters efficiencies can be as high as 90 percent or greater).

b Assumed 85 percent particulate control efficiency for waterfall control.

^c Thinner use estimated based on the thinner to paint ratio determined at Bldg. 1073 (paint use for Bldg. 10531 paint booth multiplied by the ratio).

TABLE 8.3 Summary of Spray Application Methods

Application Method	Transfer Efficiency Range (% _w) ^a
Air Atomizing	30
Airless	40
Air-Assisted Airless	45
HVLP	65
Electrostatic	80

^a Minimum value of a range cited in a 1992 EPA paper titled *VOC Pollution Prevention Operations in the Surface Coating Industry*. HVLP – high volume-low pressure

TABLE 8.4
Actual Emissions from Spray Paint Activities

W. W. PD	C	riteria Polli	utants (lb/	yr)	Hazardous Air Pollutants (lb/yr)								
Unit ID	voc	PM	PM-10	PM-2.5	Total HAP	Ethyl Benzene	MIBK	Chromium Compounds	Xylene	Toluene	Naphthalene	Hexamethylene Diisocyanate	Cobalt Compounds
P001-S	33,239.92	6,667.15	3,113.56	3,113.56	7,643.92	259.30	3,149.02	207.00	2,112.54	1,618.84	125.23	15.93	156.06
P103-S	4,481.86	397.74	185.74	185.74	2,097.64	37.45	1,383.34	19.66	187.26	376.31	46.81	0	46.81
P106-S	122.93	8.01	3.74	3.74	0	0	0	0	0	0	0	0	0
Total (lb/yr)	37,844.70	7,072.90	3,303.04	3,303.04	9,741.56	296.76	4,532.36	226.66	2,299.79	1,995.15	172.04	15.93	202.87
Total (ton/yr)	18.92	3.54	1.65	1.65	4.87	0.15	2.27	0.11	1.15	1.00	0.09	0.01	0.10

TABLE 8.5
Potential Emissions from Spray Paint Activities

н ин	Criteria Pollutants (lb/yr)			Hazardous Air Pollutants (lb/yr)									
Unit ID	voc	PM	PM-10	PM-2.5	Total HAP	Ethyl Benzene	MIBK	Chromium Compounds	Xylene	Toluene	Naphthalene	Hexamethylene Diisocyanate	Cobalt Compounds
P001-S	215,009.94	50,385.47	23,530.02	23,530.02	65,805.52	1830.73	31,969.81	1,089.59	13,202.61	14,721.87	1,301.06	78.48	1,611.37
P103-S	18,875.51	11,167.19	5,215.08	5,215.08	8,834.29	157.73	5,825.99	82.81	788.63	1,584.83	197.16	0	197.16
P106-S	517.72	33.73	15.75	15.75	0	0	0	0	0	0	0.00	0	0
Total (lb/yr)	234,403.17	61,586.39	28,760.85	28,760.85	74,639.81	1,988.46	37,795.80	1,172.39	13,991.24	16,306.69	1,498.22	78.48	1,808.53
Total (ton/yr)	117.20	30.79	14.38	14.38	37.32	0.99	18.90	0.59	7.00	8.15	0.75	0.04	0.90

9.0 ORGANIC SOLVENT CLEANING UNITS

Title V Source Designation(s)

Significant Organic solvent cleaning units with surface areas $> 10 \text{ ft}^2$

Organic solvent cleaning units that use halogenated solvents

<u>X</u> Insignificant Organic solvent cleaning units with surface areas ≤ 10 ft² that do not

use halogenated solvents

9.1 BACKGROUND

It was estimated that there were approximately 78 parts cleaning units (tanks) that were operated for at least part of 2007. In addition, it was estimated that there were approximately 25 inactive units. These inactive units are operable but not in use (i.e. no solvent in the units or the unit remains off and closed). Because of troop deployments the exact number of parts cleaners in use during the course of the year can vary. In addition, Eagle Services sometimes uses motor pools and parts cleaning units that were used by troops that are now deployed. Furthermore, although the parts cleaners are not portable, they are small enough that they can occasionally be moved between motor pools or other maintenance areas based on workload and the type of maintenance activities that need to be conducted. Therefore the list of parts cleaners provided later in this section is a snapshot in time, as over the course of the year there can be variations.

These maintenance-type cold cleaners are used to remove grease, oils, and soil from various metal, glass, and plastic items. A majority of the units are located in motor pools or maintenance shops. Many of the cold cleaners use the solvent Safety-Kleen Premium 150, Safety-Kleen 700, or Safety-Kleen 850. Safety-Kleen Premium 150 has a low volatility and does not contain HAPs or ODCs, while Safety-Kleen 700 and 800 are aqueous-based cleaners that do not contain VOC, HAPs, or ODCs. The cold cleaners are drained and refilled as needed and waste solvent from the units is picked up by Safety-Kleen for off-site disposal. Additional cleaning units are from manufacturers such as Graymills, Zep Purewash, Better Engineering, R&D Industries, Herkules, Little Scrubber, Hill Manufacturing, System One, Clarus, and Mansur. Many of these units use PD 680 Type II solvent. Recently there has been a trend to switch out the older units including Safety Kleen parts washers with new Clarus units.

None of the cold cleaners at Fort Stewart use halogenated solvents. All units have solvent bath surface areas covering less than 10 square feet; consequently, these units are designated as "insignificant" sources of air pollution. Data regarding Fort Stewart's organic solvent cleaning units are presented in Table 9.1.

9.2 EMISSION ESTIMATES

The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for all parts cleaning units.

Actual Emissions

Typically emissions from organic solvent cleaning operations are estimated based on the consumption of solvent, less the solvent that is removed for disposal. This information was not available for Fort Stewart. In such a case emissions from organic solvent cleaners can be estimated using emission factors for organic solvent cleaners from Table 4.6-2 of AP-42 (Ref. 1). The emission factors are general in nature, as they were derived from the entire population of degreasers in the U.S.

Based on AP-42, there are three sources of emissions from cold cleaners: bath evaporation, solvent carryout, and waste solvent evaporation. Emissions from each of these sources are affected by the work practices employed by the personnel utilizing the degreasers. Covering the solvent bath when the degreaser is not in use and/or using a solvent cleaning unit that is equipped with a remote solvent reservoir may reduce emissions due to bath evaporation. Allowing solvent on cleaned parts to drain back into the solvent bath may reduce solvent carryout emissions; the recommended draining time is 15 seconds. Finally, waste solvent evaporation may be reduced in a number of ways, the most effective of which (for the solvent user) is to ship it off site for disposal. Shown below is a summary of the emission estimation information provided in AP-42 that was used to estimate VOC emissions from the cold cleaners.

Emission Estimation based on Tables 4.6-1 and 4.6-2 AP-42 (Ref. 1)

Uncontrolled VOC emissions: 0.08 lb/ft²/hr

Emission reduction:

15-second drain

Close cover when not inserting or removing parts

Waste solvent reclamation

Total emission reduction: 28% - 83%, mid point = 55%

In order to accurately estimate VOC losses using the above AP-42 method it is important to be able to monitor the parts cleaner for a reasonable amount of time to evaluate/determine work practices and usage time.

VOC emissions for the parts cleaners at Fort Stewart were estimated based on the surface area of each parts washer and on assumptions related to work practices and operating schedule. Typically parts washers are used for short periods during the day. It is difficult to accurately assess how long each degreaser is uncovered and actively cleaning parts unless it is observed over a period of time. Parts cleaning operations from Building 1065 were investigated in 2006 to estimate a typical usage for a part washer/cleaner in a vehicle maintenance facility. This shop has a significant annual maintenance load and multiple parts cleaning units. Shop personnel estimated that the total cumulative use of all parts cleaners (14) is approximately 6 hours per day. Thus it is clear that the part cleaner units operate well less 8 hr/day or 2,080 hr/yr (8 hours * 5 days/week * 52 weeks/yr). The parts cleaners are typically used for 15-minute intervals and do not all operate simultaneously.

The above scenario was used to estimate 2007 operating hours. Although the above methodology yields an average per unit use rate of less than 1 hour per day, to be conservative we assumed usage was 1 hour per day for each unit. Actual usage can vary greatly from shop to

shop depending on work load, the type of equipment being maintained, the number of cleaning units in the shop, the number of users/mechanics, troop deployment levels, etc.

There was some data available regarding 2007 troop deployments. If troops were deployed for a portion of a year and those troops had a parts cleaning unit that they used on Fort Stewart the cleaning unit use was scaled down proportionally based on the number of months of deployment. Prior to scaling down usage it was also confirmed that Eagle Services did not take over use of the cleaning unit. When a majority of deployed soldiers/equipment return average use of parts washers should increase.

It was also assumed that emissions were reduced by using recommended emission control practices (e.g. allowing parts to drain for at least 15 seconds after immersion or washing with solvent, closing the cover on the parts washer when parts were not being placed into or being removed from the washer and sending used solvent off post to be reclaimed). An example of the calculation used to estimate actual VOC emissions from Unit D243-S is presented below.

Unit ID: D243-S (Bldg. 1065)

Surface area of parts washer: 7.93 ft²

Type of solvent: Safety-Kleen Premium 150

Hours of Operation: 260 hr/yr (1 hr/day * 5 day/wk * 52 wk/yr)

Emission factor (Table 4.6-1, AP-42) 0.08 lb/hr/ft²

Reduction due to work practices: 55% (28 – 83%, average is 55%)

VOC content of solvent: 100%_w

VOC emissions =
$$(7.93 \text{ ft}^2) * (0.08 \text{ lb/hr/ ft}^2) * (260 \text{ hr/yr}) * (100\%-55\%)$$

= 74.22 lb/yr

Estimates of actual emissions from organic solvent cleaning activities at Fort Stewart are presented in Section 9.3, Table 9.1.

Potential Emissions

Normal installation operations were assumed to be 2,080 hours per year (40 hours/week * 52 weeks/yr). Potentially, the installation could operate 8,760 hours per year. Thus, potential hours from organic solvent cleaning units were estimated by multiplying actual hours by the ratio of 8,760/2,080. Using the potential hours emissions were calculated as shown in the equation above. Potential emissions for each individual unit are shown in Section 9.3, Table 9.1.

Emissions Summary

Table 9.0 below provides the total emissions of criteria pollutants from organic solvent cleaning units at Fort Stewart.

TABLE 9.0 Emissions Summary – Organic Solvent Cleaning Units

Emission Type	VOC
Actual (lb/yr)	4,527.23
Actual (ton/yr)	2.26
Potential (lb/yr)	23,276.24
Potential (ton/yr)	11.64

Emission Source Updates

The following updates were made since the 2006 inventory.

• Added D261-S (Bldg. 10531), D262-S (Bldg. 10506), D263-S (Bldg. S0921), D264-S (Bldg. S0920), D265-S and D266-S (Bldg.1160).

9.3 DETAILED SOURCE AND EMISSIONS TABLES

Table 9.1 below provides the actual and potential emissions for each parts cleaning unit at Fort Stewart.

TABLE 9.1
Organic Solvent Cleaning Unit Information and Emissions for CY2007

Organic Solvent Cleaning Circ Institution and Dississions for C12007							
Unit ID	Building	Surface Area	Estimated Operatin		VOC Emis	sions (lb/yr)	
	Number	(ft ²)	Actual ^a	Potential	Actual	Potential	
D102-S	230	5.2	108	1,095	20.40	206.17	
D132-S	1129	5.2	260	1,095	48.95	206.17	
D143-S	1503	4.5	0	1,095	0.00	177.39	
D145-S	4577	5.2	260	1,095	48.95	206.17	
D146-S	4577	5.2	260	1,095	48.95	206.17	
D147-S	4577	5.2	260	1,095	48.95	206.17	
D148-S	8031	5.2	0	1,095	0.00	206.17	
D153-S	9898	4.5	260	1,095	42.12	177.39	
D154-S	10501	6.0	260	1,095	56.16	236.52	
D155-S	10501	6.0	260	1,095	56.16	236.52	
D156-S	10501	6.0	260	1,095	56.16	236.52	
D157-S	10501	6.0	260	1,095	56.16	236.52	
D158-S	10501	6.0	260	1,095	56.16	236.52	
D159-S	10501	6.0	260	1,095	56.16	236.52	
D171-S	10531	6.0	260	1,095	56.16	236.52	

Unit ID	Building	Surface Area	Estimated Operatin		VOC Emis	ssions (lb/yr)
CIRC ID	Number	(ft ²)	Actual ^a	Potential	Actual	Potential
D172-S	10531	6.0	260	1,095	56.16	236.52
D173-S	10531	6.0	260	1,095	56.16	236.52
D175-S	9392	6.0	260	1,095	56.16	236.52
D176-S	1503	6.0	260	1,095	56.16	236.52
D177-S	4577	9.4	108	1,095	36.47	369.76
D186-S	1503	5.2	260	1,095	48.95	206.17
D187-S	2152	5.2	260	1,095	48.95	206.17
D188-S	9896	9.4	260	1,095	87.80	369.76
D189-S	9897	9.4	260	1,095	87.80	369.76
D190-S	9899	9.4	260	1,095	87.80	369.76
D195-S	1170	5.3	260	1,095	49.61	208.93
D196-S	1170	5.3	260	1,095	49.61	208.93
D197-S	1170	5.3	260	1,095	49.61	208.93
D198-S	1170	8.8	260	1,095	82.37	346.90
D199-S	1170	5.3	260	1,095	49.61	208.93
D200-S	1170	5.3	260	1,095	49.61	208.93
D201-S	1170	5.3	260	1,095	49.61	208.93
D202-S	1170	5.3	260	1,095	49.61	208.93
D203-S	1208	6.0	260	1,095	56.16	236.52
D204-S	1261	6.0	260	1,095	56.16	236.52
D205-S	2910	1.0	260	1,095	9.36	39.42
D206-S	4528	6.0	260	1,095	56.16	236.52
D207-S	4577	6.0	108	1,095	23.40	236.52
D208-S	4577	6.0	108	1,095	23.40	236.52
D209-S	4577	6.0	108	1,095	23.40	236.52
D210-S	4577	5.3	108	1,095	20.67	208.93
D211-S	4578	8.8	260	1,095	82.37	346.90
D212-S	9392	2.0	260	1,095	18.72	78.84
D213-S	9796	9.4	260	1,095	87.80	369.76
D214-S	9797	6.8	260	1,095	63.18	266.09
D215-S	10531	6.0	260	1,095	56.16	236.52
D216-S	10537	6.0	260	1,095	56.16	236.52
D218-S	S1538	6.0	260	1,095	56.16	236.52
D223-S	1160	6.0	260	1,095	56.16	236.52
D224-S	1160	6.0	260	1,095	56.16	236.52
D225-S	1170	5.3	0	1,095	0.00	208.93
D226-S	1201	4.9	0	1,095	0.00	192.37

Unit ID	Building	Surface Area	Estimate Operatin		VOC Emis	ssions (lb/yr)
CIRC ID	Number	(ft ²)	Actual ^a	Potential	Actual	Potential
D227-S	1205	6.0	0	1,095	0.00	236.52
D228-S	1208	6.0	0	1,095	0.00	236.52
D229-S	1208	6.0	0	1,095	0.00	236.52
D230-S	1209	6.0	0	1,095	0.00	236.52
D231-S	1210	6.0	0	1,095	0.00	236.52
D232-S	1211	6.0	0	1,095	0.00	236.52
D233-S	1259	6.0	0	1,095	0.00	236.52
D234-S	1259	6.0	0	1,095	0.00	236.52
D235-S	1620	6.0	260	1,095	56.16	236.52
D236-S	1620	6.0	260	1,095	56.16	236.52
D237-S	1620	6.0	260	1,095	56.16	236.52
D238-S	1620	6.0	260	1,095	56.16	236.52
D239-S	4577	6.0	108	1,095	23.40	236.52
D240-S	4578	5.2	108	1,095	20.28	204.98
D241-S	s1087	5.3	0	1,095	0.00	210.50
D242-S	s1087	4.9	0	1,095	0.00	192.37
D243-S	1065	7.9	260	1,095	74.27	312.78
D244-S	1065	7.9	260	1,095	74.27	312.78
D245-S	1065	7.9	260	1,095	74.27	312.78
D246-S	1065	7.9	260	1,095	74.27	312.78
D247-S	1065	7.9	260	1,095	74.27	312.78
D248-S	1065	7.9	260	1,095	74.27	312.78
D249-S	1065	7.9	260	1,095	74.27	312.78
D250-S	1065	7.9	260	1,095	74.27	312.78
D251-S	1065	7.9	260	1,095	74.27	312.78
D252-S	1065	7.9	260	1,095	74.27	312.78
D253-S	1065	7.9	260	1,095	74.27	312.78
D254-S	1065	7.9	260	1,095	74.27	312.78
D255-S	1065	7.9	260	1,095	74.27	312.78
D256-S	1065	7.9	260	1,095	74.27	312.78
D257-S	12700	9.4	260	1,095	87.80	369.76
D258-S	12900	9.4	260	1,095	87.80	369.76
D259-S	13100	9.4	260	1,095	87.80	369.76
D260-S	13300	9.4	260	1,095	87.80	369.76
D261-S	10531	5.3	260	1,095	50.05	210.79
D262-S	10506	1.8	260	1,095	17.11	72.06
D263-S	S0921	7.9	260	1,095	73.94	311.42

Unit ID	Building	Surface Area	Estimated Annual Operating Hours		VOC Emissions (lb/yr)	
Cilit 1D	Number	(ft ²)	Actual ^a	Potential	Actual	Potential
D264-S	S0920	7.9	260	1,095	73.94	311.42
D265-S	1160	7.9	260	1,095	73.94	311.42
D266-S	1160	7.9	260	1,095	73.94	311.42
	Total (lb/yr)					23,276.24
	Total (ton/yr)					11.64

^a Use estimated to be 1 hour or less per day based on use at Building 1065 (Operational data for each degreaser in other buildings was not obtained).

Unit IDs in italics are new for the 2007 inventory.

10.0 MISCELLANEOUS PRODUCT USAGE

Title V Source Designation(s)

X Significant Products used in the direct support of the installation's mission that

have potential emissions $\geq 10,000$ lb/yr of any regulated air pollutant, $\geq 1,000$ lb/yr of any regulated HAP, or $\geq 2,500$ lb/yr of a combination

of regulated HAPs

Products used in the direct support of the installation's mission that are subject to any specific state or federal standard or permit

condition

Insignificant Products used in the direct support of the installation's mission that

are not subject to any specific state or federal standard or permit condition that have potential emissions <10,000 lb/yr of any regulated air pollutant, <1,000 lb/yr of any regulated HAP, and <2,500 lb/yr of

a combination of regulated HAPs

X Trivial Products used during installation maintenance and upkeep activities

10.1 BACKGROUND

Many products (e.g., sealing compounds, cleaners, adhesives, aerosol paints, and solvents) that contain VOC, volatile HAP, and ODC are used in numerous maintenance and repair activities across Fort Stewart. This Section addresses emissions from the use of these "miscellaneous" products. Products used in spray painting booths and enclosures, and in organic solvent cleaning units have been addressed in other sections of this report. Products used during installation maintenance and upkeep operations were not inventoried because the Georgia EPD has designated these activities as "trivial" sources of air pollution. In addition, products that clearly contribute negligible or no air pollution, such as batteries, were not inventoried, even though they are used.

Data on the miscellaneous product usage for 2007 was obtained from a hazardous material database used to track chemicals used on both Fort Stewart and Hunter Army Airfield. Emphasis was placed on identifying products which have VOCs, evaporation rates that are not negligible, and have a reasonable opportunity to be exposed to the outside air (not used exclusively in a closed system). Cleaning/degreasing and lubricating/penetrating oil products accounted for the vast majority of the products for which emissions were estimated. These products along with their usage are shown in Table 10.1. Overall the products shown in the table account for only a small portion of the miscellaneous chemical products used on Fort Stewart. Products that were used in large quantities for which emissions were not estimated included engine lubricating oil, brake fluid, hydraulic/transmission fluid, and antifreeze/coolant. These types of products are used primarily in closed circuits/equipment (engines, radiators, transmissions, etc.) and thus have very little opportunity to be released to the outside environment.

The Georgia EPD has not provided any specific guidance regarding the designation of miscellaneous product usage in support of the installation's mission as a "significant," "insignificant," or "trivial" source of air pollution. Miscellaneous chemicals represent multiple fugitive sources that are located installation wide. These activities, are grouped together here as one source category. Miscellaneous product usage is listed in Title V permit as a significant source.

10.2 EMISSION ESTIMATES

The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for all miscellaneous product usage.

Actual Emissions

It was assumed all products listed in the hazardous materials database were used. This will likely overstate emissions, as some portion of these products is likely kept in inventory. Emissions were estimated assuming all VOC and volatile HAP in each product were released to the atmosphere. Composition (VOC content and HAP content) of each product is based on data contained in the product's MSDS. A particular product's MSDS was obtained based upon the national stock number and product description given in the hazardous materials database.

The calculation used to estimate VOC emissions from "WD-40" is presented below.

```
WD-40 Corrosion preventative: 1,781 (16 oz) cans/yr (NSN: 8030-01-439-0681)
```

Product specific gravity (SG):

O.8121 (from MSDS)

Product density:

O.8121 (from MSDS)

6.81 lb/gal (SG * 8.319)

3.4383 lb/gal (from MSDS)

```
VOC emissions = (1,781 can/yr) * (16 oz/can) * (1 lb/16 oz) * [(3.4383 lb/gal) / (6.81 lb/gal)]
= 899.20 lb/yr
```

Many of the products used (e.g., oils, greases, and antifreeze) contain constituents that are technically classified as VOC. However, the use of these products typically results in negligible air emissions because the product constituents have low volatilities and/or the products are used within closed systems. To avoid overestimating VOC emissions it was assumed that no VOC emissions resulted from the use of these products.

Potential Emissions

Actual emissions from the use of miscellaneous products are proportional to the number of units (quantity) of each product used per year. The number of units of each product used was assumed proportional to the number of hours the installation operates per year. Actual installation operations were estimated to occur 2,080 hours per year. Potentially the installation could operate at 8,760 hours per year. Potential emissions were thus estimated by multiplying the actual emissions by the ratio of 8,760/2,080.

Because emissions from miscellaneous product usage are classified as "fugitive" emissions, criteria pollutant and ODC emissions from this source category are not included in facility wide potential-to-emit determinations.

Emissions Summary

Table 10.0 below provides the total emissions of VOC and HAP from miscellaneous product usage at Fort Stewart.

TABLE 10.0 Emissions Summary - Miscellaneous Product Usage

Emission Type	VOC	HAP (Methanol)*
Actual (lb/yr)	20,029.52	2,549.24
Actual (ton/yr)	10.01	1.27
Potential (lb/yr)	83,707.84	10,736.22
Potential (ton/yr)	41.85	5.37

^{*:} Only one HAP identified

Emission Source Updates

No emissions calculated for antifreeze/coolants.

10.3 DETAILED SOURCE AND EMISSION TABLES

Table 10.1 shows the miscellaneous chemicals for which emission were estimated.

 $\begin{tabular}{ll} TABLE~10.1\\ Miscellaneous~Product~Usage~Information~for~CY2007^a \end{tabular}$

National Stock		Annu	al Use	Potent	ial Use
Number	Product Name	Gallons	Pounds	Gallons	Pounds
2910006469727	Engine Starter Cylinder	-	17	-	69
6810002010907	Denatured Alcohol	110	728	463	3,068
6810005437415	Denatured Ethyl Alcohol	67	455	282	1,916
6810002865435	Isopropyl Alcohol	70	458	295	1,928
6840005843129	Pine Oil Disinfectant Detergent (gal)	208	1,652	876	6,960
6840006877904	Pine Oil Disinfectant Detergent (qt)	109	864	458	3,639
6850001395297	Rain Repellent	5	31	19	130
6850002246663	Rifle Bore Cleaning Cmpd	24	180	101	759
6850009262275	Windshield Wash	384	3,062	1,617	12,894
7930013425316	Simple Green	1,225	10,413	5,159	43,853

National Stock		Annu	ıal Use	Potent	ial Use
Number	Product Name	Gallons	Pounds	Gallons	Pounds
8030014390681	WD-40 Corrosion Preventive	-	1,781	-	7,501
6850011670678	Brakleen Brake Parts Cleaner	-	6,510	-	27,417
9150010536688	Cleaner, Lubricant, & Preservative	275	1,972	1,158	8,307
9150010546453	Cleaner, Lubricant, & Preservative	91	684	384	2,882
9150010400947	Primer Adhesive	-	724	-	3,048
9150002617899	Penetrating Oil Type 1 - 1 Pint Can	1	6	4	25
9150005297518	Penetrating Oil - Aerosol Can	-	221	-	932
9150010796124	Cleaner, Lubricant, & Preservative	4	29	17	122
6850014742317	Cleaning Compound MIL PRF 680	1,200	7,676	5,054	32,328
6840012843982	Insect Repellant (2 oz tubes)	69	584	69	584
9150011021473	Cleaner, Lubricant, & Preservative	4	31	18	132
6850009652332	Carbon Removing Compound	55	472	232	1,990
6840012781336	Insect Repellant Clothing	-	540	-	2,274

^a Products that have VOCs, evaporation rates that are not negligible, and have a reasonable opportunity to be exposed to the outside air (not used exclusively in a closed system).

11.0 LANDFILLS

Title V Source Designation(s)

_Significant Landfills that are subject to any standard, limitation, or other

requirement under Sections 111 or 112 (excluding Section 112(r)) of

the CAAA.

X Insignificant Landfills that are <u>not</u> subject to any standard, limitation, or other

requirement under Sections 111 or 112 (excluding Section 112(r)) of

the CAAA.

__Trivial Not applicable

11.1 BACKGROUND

This section describes VOC, ODC, and HAP emissions from both active and inactive landfills. Five landfills are located at Fort Stewart. During 2007, one of the landfills, L101-S, was active while the remaining four sites were inactive. Either area or trench and fill methods have been used at each landfill. Although none of the landfills are equipped with emission control devices, 14 passive methane vent pipes were installed at the active landfill site during June 2000. This landfill is equipped with a gas collection device (i.e., vent pipes) and as per Georgia Environmental Protection Division Rules for Air Quality this landfill is classified as a point emission source, while the remaining landfills, which are not equipped with any type of gas collection device, are classified as fugitive emission sources.

The Georgia EPD has designated landfills that are not subject to any standard, limitation, or other requirement under Sections 111 or 112 (excluding Section 112(r)) of the CAAA as "insignificant" sources of air pollution. Because none of the landfills at Fort Stewart are subject to Sections 111 or 112, the landfills are designated as insignificant sources.

Data for all landfills was obtained from the 2005 and 2006 Fort Stewart Emission Inventory Reports, and from the contact(s) listed in Table 1. The South Central Landfill (L101-S) was opened during 1983. It is expected to remain open until 2020. Most of the waste discarded at L101-S consists of household trash, paper, plastics, and putresible garbage. This landfill is an area fill type with a surface area of 75 acres consisting of 15-foot deep-stacked cells giving a refuse depth of 30 feet. When filled, each cell contains 13 feet (depth) of refuse and is capped with 2 feet of soil. Each day, between 4 and 5 feet (depth) of refuse are added to a cell and all exposed refuse is covered with 6 inches of fill at the end of the day.

The inactive landfills were operated for varying time periods between 1970 and 1982. The trench and fill disposal method was used on these landfills.

Before emissions could be estimated, the maximum quantity of waste (capacity) that can be accumulated in each landfill had to be estimated. Trenches were estimated to account for 50 percent of the volume for a trench and fill landfill. Eighty percent of the volume of each trench in a trench and fill landfill was estimated to contain waste and the remaining 20 percent was

estimated to contain inorganic fill. Area fill landfills were also estimated to contain 75 percent waste and 25 percent inorganic fill by volume. Using a density of 54 pounds per cubic foot for landfill waste, the quantity of waste disposed in each landfill was calculated. For example, the calculation used to determine the quantity of refuse contained in an area fill landfill is presented below:

Unit ID: L101-S

Landfill: South Central Landfill

Fill method:

Surface area:

Waste depth:

Volume containing refuse:

Density of refuse:

Area

75 acres

30 feet (ft)

75%

54 lb/ft³

Maximum waste (tons) = $(75 \text{ acres}) * (43,560 \text{ ft}^2/\text{acre}) * (30 \text{ ft}) * (0.75) * (54 \text{ lb/ft}^3) * (1 \text{ ton/2,000 lb})$ = 1,984,703 tons

Maximum waste (megagrams [Mg]) = 1984703 * 0.9071847= 1,800,492 Mg

As an additional example, the calculation used to determine the quantity of refuse disposed in a trench and fill landfill is presented below:

Unit ID: L102-S

Landfill: South Central Landfill (SCL) - Closed 1

Fill method: Trench and fill

Surface area: 27 acres
Waste depth: 7 ft
Trench volume in landfill: 50%
Trench volume containing refuse: 80%
Density of refuse: 54 lb/ft³

Quantity of Waste = $(27 \text{ acres}) * (43,560 \text{ ft}^2/\text{acre}) * (7 \text{ ft}) * (0.50) * (0.80) * (54 \text{ lb/ft}^3)$ (1 ton/2,000 lb)= 88,900 tons

11.2 EMISSION ESTIMATES

The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for all landfills.

Actual Emissions

EPA's Landfill Air Emissions Estimation Model (Ref. 8) was used to estimate methane gas emissions from the inactive and active landfills. The following parameters were required in order to estimate emissions: the date the landfill opened, the date the landfill closed, current date,

the capacity (Mg), the average refuse acceptance rate (Mg), the methane generation rate (k), and the potential methane generation capacity (Lo).

The average refuse acceptance rate for the active landfill was estimated by dividing the total mass of refuse in the landfill by the number of years the landfill operated. The other landfills are already closed and thus assumed to have reached their capacity. Default values for k (0.04/yr) and Lo (3,530 ft³ methane/ton of refuse) that were used in the model were taken from AP-42, Section 2.4 (Ref. 1). [Note: The AP-42 default values for k and Lo are not as conservative as those required to be used in order to demonstrate compliance with the recent New Source Performance Standard (NSPS)/Emission Guideline (EG). However, the landfills at Fort Stewart are not subject to the NSPS/EG because they were each designed to hold less than 2.5 million megagrams (2.76 million tons) of waste. Therefore, the use of the AP-42 default values for k and Lo to estimate emissions from Fort Stewart's landfills is appropriate.]

VOC, HAP, and ODC emissions from each landfill were determined using an emission estimation methodology from AP-42, Section 2.4 (Ref. 1). Based on this methodology, emission factors for each pollutant are dependent upon the quantity of methane emitted, the median concentration of each compound in the total emissions, the molecular weight of each compound, and the temperature of the emissions. Methane gas is estimated to account for approximately 55 percent of the emissions from each landfill and an emission temperature of 77 °F (298 °K) was estimated. Emission factors for each pollutant were calculated using Equations 3 and 4 from AP-42. For example, the calculation used to determine an emission factor for toluene is presented below.

Ratio of total emissions to methane emissions: 1.82 (100 percent by volume $[\%_v]/55\%_v$)

Toluene median concentration: 165 parts per million by volume (ppmv)

Toluene molecular weight: 92.13 g/gram mole(s) (gmol)

Conversion constant: 8.205x10⁻⁵ cubic meters (m³)-atmosphere

(atm)/gmol- °K

Temperature of emissions: 298 °K Pressure of emissions: 1 atm

Toluene Emission Factor = $[(1.82) * (165/10^6) * (92.13 \text{ g/gmol}) * (1 \text{ atm})] / [(8.205 \times 10^{-5} \text{ m}^3 - \text{atm/gmol} - ^{\circ}K) * (1,000 \text{ g/kg}) * (298 ^{\circ}K)]$ = $1.13 \times 10^{-3} \text{ kg/m}^3 \text{ methane}$

Emissions from each landfill were estimated by multiplying the methane emission rate by the appropriate emission factor. For example, the calculation used to determine the quantity of toluene emitted from the South Central Landfill is presented below:

Unit ID: L101-S

Methane emission rate: $2,511,863 \text{ m}^3/\text{yr}$ Toluene emission factor: $1.13 \times 10^{-3} \text{ kg/m}^3$

Toluene emissions =
$$(2,511,863 \text{ m}^3/\text{yr}) * (1.13x10^{-3} \text{ kg/m}^3) * (2.2046 \text{ lb/kg})$$

= $6,257.55 \text{ lb/yr}$

Emission results are presented in Section 11.3, Tables 11.4 and 11.5.

Potential Emissions

Emissions from the active landfill (Unit ID L101-S) are expected to increase as the quantity of waste contained in the landfill increases. At the same time, emissions from each of the four inactive landfills are expected to decrease as the waste present in each of these landfills continues to decompose. It was estimated that the increase in emissions at the active landfill would be more than offset by the decrease in emissions at the inactive landfills. Therefore, potential emissions from the landfills were conservatively estimated to be the same as actual emissions from the landfills.

Criteria pollutant and ODC emissions from the inactive landfills that are classified as fugitive sources due to no gas-collection devices are not included in the installation-wide potential emission estimates. However, potential criteria pollutant and ODC emissions from the active landfill that is classified as a point source are included in the installation-wide potential emission estimates. Therefore, the "totaled" potential VOC and ODC emissions only include the emissions from the active landfill.

Emissions Summary

Table 11.0 below provides the total emissions of VOC and HAP from the landfill at Fort Stewart.

TABLE 11.0 Emissions Summary - Landfills

Emission Type	VOC	НАР	ODC
Actual (lb/yr)	96,214.43	10,341.42	1,130.09
Actual (ton/yr)	48.11	5.17	0.57
Potential (lb/yr)*	85,833.64	9,225.66	1,008.16
Potential (ton/yr)*	42.92	4.61	0.50

^{*} Potential emissions for L101-S only (landfill classified as a point source because passive methane vent pipes are installed & thus potentials were determined)

Emission Source Updates

There were no changes to landfill operations in 2007.

11.3 DETAILED SOURCE AND EMISSION TABLES

Tables 11.1 through 11.5 present the characteristics of the landfill, methane generation rate and HAP emission factors and a summary of emissions.

TABLE 11.1 Landfill Information for CY2007

Unit ID	Landfill Name	Year Opened	Year Closed	Surface Area (acre)	Refuse Depth (ft)	Fill Method	Maximum Refuse Mass	
							Tons	Mg
L101-S ^a	South Central Landfill	1983	Active	75	30	Area	1,984,703	1,800,492
L102-S	SCL- Closed 1	1970	1982	27	7	Trench	88,900	80,648.7
L103-S	SCL- Closed 2	1940	1970	30	7	Trench	98,800	89,629.85
L104-S	Camp Oliver	1970	1979	10	6	Trench	28,200	25,582.61
L105-S	TAC-X	1970	1979	5	5.5	Trench	12,900	11,702.68

^a Passive methane vent pipes are installed at this landfill; therefore, this landfill is classified as a point source.

TABLE 11.2
Methane Emission Rates for Landfills

Unit ID	Methane ^a Emission Rate (m ³ /yr)
L101-S	2,511,863.34
L102-S	165,236.02
L103-S	66,442.42
L104-S	49,509.39
L105-S	22,599.09

^a Methane emission rate calculated using the Landfill Air Emissions Estimation Model (Ref. 8).

TABLE 11.3
Emission Factors and Associated Data for Pollutants Emitted from Landfills

Pollutant	Molecular Weight (g/gmol) ^a	Median Concentration (ppmv) ^a	Emission Factor (kg/m³ methane)b	
	Criteria Poll	utants		
VOC	86.18	2,420°	1.55x10 ⁻²	
	Hazardous Air l	Pollutants	•	
Acrylonitrile	53.06	6.33	2.50x10 ⁻⁵	
Benzene	78.11	11.1°	6.45x10 ⁻⁵	
Carbon Disulfide	76.13	0.58	3.29x10 ⁻⁶	
Carbonyl Sulfide	60.07	0.49	2.19x10 ⁻⁶	
Carbon Tetrachloride	153.84	0.004	4.58x10 ⁻⁸	
Chlorobenzene	112.56	0.25	2.09x10 ⁻⁶	
Chloroform	119.39	0.03	2.67x10 ⁻⁷	
Ethylbenzene	106.16	4.61	3.64x10 ⁻⁵	
Ethyl Chloride	64.52	1.25	6.00x10 ⁻⁶	
Ethylene Dichloride	98.96	0.41	3.02x10 ⁻⁶	
Ethylidene Dichloride	98.95	2.35	1.73x10 ⁻⁵	
Hexane	86.18	6.57	4.21x10 ⁻⁵	
Mercury Compounds	200.61	2.92x10 ⁻⁴	4.36x10 ⁻⁹	
Chloromethane	50.49	1.21	4.55x10 ⁻⁶	
Methyl Chloroform	133.41	0.48	4.77x10 ⁻⁶	
Methylene Chloride	84.94	14.3	9.04x10 ⁻⁵	
MIBK	100.16	1.87	1.39x10 ⁻⁵	
Propylene Dichloride	112.99	0.18	1.51x10 ⁻⁶	
1,1,2,2-Tetrachloroethane	167.85	1.11	1.39x10 ⁻⁵	
Tetrachloroethylene	165.83	3.73	4.60x10 ⁻⁵	
Toluene	92.13	165°	1.13x10 ⁻³	
Trichloroethylene	131.40	2.82	2.76x10 ⁻⁵	
Vinyl Chloride	62.50	7.34	3.41x10 ⁻⁵	
Vinylidene Chloride	96.94	0.20	1.45x10 ⁻⁶	
Xylenes	106.16	12.1	9.56x10 ⁻⁵	
	Ozone Depleting	Substances	•	

Pollutant	Molecular Weight (g/gmol) ^a	Median Concentration (ppmv) ^a	Emission Factor (kg/m³ methane) ^b
Carbon Tetrachloride	153.84	0.004	4.58x10 ⁻⁸
Fluorotrichloromethane (R-11)	137.38	0.76	7.77x10 ⁻⁶
Dichlorodifluoromethane (R-12)	120.91	15.7	1.41x10 ⁻⁴
Dichlorofluoromethane (R-21)	102.92	2.62	2.01x10 ⁻⁵
Chlorodifluoromethane (HCFC-22)	86.47	1.30	8.37x10 ⁻⁶
Methyl Chloroform	133.41	0.48	4.77x10 ⁻⁶

Data from EPA document AP-42, Section 2.4, Tables 2.4-1 and 2.4-2 (Ref. 1).
 Emission factors calculated using EPA document AP-42, Section 2.4, Equations 3 and 4 (Ref. 1).
 Value for co-disposal of municipal solid waste and nonresidential waste.

TABLE 11.4 Actual and Potential^a VOC and HAP Emissions from Landfills

Unit ID	VOC	Acrylonitrile	Benzene	Carbon Disulfide	Carbonyl Sulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Ethylbenzene	Ethyl Chloride	Ethylene Dichloride	Ethylidene Dichloride	Hexane	Mercury Compounds	Chloromethane
L101-S ^a	85,833.64	138.44	357.18	18.22	12.13	0.254	11.57	1.479	201.57	33.23	16.72	95.80	233.14	0.024	25.20
L102-S	5,646.33	9.11	23.50	1.198	0.798	0.017	0.761	0.097	13.26	2.186	1.10	6.30	15.34	0.002	1.66
L103-S	2,270.42	3.66	9.45	0.482	0.321	0.007	0.306	0.039	5.332	0.879	0.442	2.53	6.17	0.001	0.666
L104-S	1,691.80	2.73	7.04	0.359	0.239	0.005	0.228	0.029	3.973	0.655	0.330	1.89	4.60	4.8E-04	0.497
L105-S	772.24	1.25	3.21	0.164	0.109	0.002	0.104	0.013	1.814	0.299	0.150	0.862	2.10	2.2E-04	0.227
Total (lb/yr) b	96,214.43	155.18	400.38	20.42	13.59	0.284	12.97	1.66	225.95	37.24	18.75	107.39	261.33	0.03	28.24
Total (ton/yr) b	48.11	0.08	0.20	0.01	0.01	<0.01	0.01	<0.01	0.11	0.02	0.01	0.05	0.13	<0.01	0.01

TABLE 11.4 (Continued)

Unit ID	Methyl Chloroform	Methylene Chloride	MIBK	Propylene Dichloride	1,1,2,2- Tetrachloroethane	Tetrachloroethylene	Toluene	Trichloroethylene	Vinyl Chloride	Vinylidene Chloride	Xylenes
L101-S ^a	26.41	500.60	76.97	8.36	76.97	254.73	6257.55	152.84	188.83	8.03	529.40
L102-S	1.74	32.93	5.06	0.550	5.06	16.76	411.64	10.05	12.42	0.528	34.83
L103-S	0.699	13.24	2.04	0.221	2.04	6.74	165.52	4.04	4.99	0.212	14.00
L104-S	0.521	9.867	1.52	0.165	1.52	5.02	123.34	3.01	3.72	0.158	10.43
L105-S	0.238	4.504	0.693	0.075	0.693	2.29	56.30	1.38	1.70	0.072	4.76
Total (lb/yr) b	29.61	561.15	86.28	9.37	86.28	285.54	7,014.34	171.32	211.67	9.00	593.43
Total (ton/yr) b	0.01	0.28	0.04	<0.01	0.04	0.14	3.51	0.09	0.11	<0.01	0.30

^a Except for L101-S (landfill with passive methane vent pipes), this fugitive criteria pollutant source category are not included in installation-wide Title V PTE.

^b Actual and potential totals

TABLE 11.5
Actual and Potential ODC Emissions from Landfills

Unit ID	Carbon Tetrachloride	R-11	R-12	R-21	HCFC-22	Methyl Chloroform
L101-S	0.254	43.03	780.81	111.31	46.35	26.41
L102-S	0.017	2.83	51.36	7.32	3.05	1.74
L103-S	0.007	1.14	20.65	2.94	1.23	0.699
L104-S	0.005	0.848	15.39	2.19	0.914	0.521
L105-S	0.002	0.387	7.02	1.00	0.417	0.238
Total (lb/yr) ^a	0.284	48.23	875.24	124.77	51.96	29.61
Total (ton/yr) a	<0.01	0.02	0.44	0.06	0.03	0.01

^a Actual and potential totals

R-11: Fluorotrichlormethane, R-12: Dichlorodifluoromethane, R-21: Dichlorofluoromethane, HCFC-22: Chlorodifluoromethane

12.0 WASTEWATER TREATMENT

Title V Source Designation(s)

X Significant Wastewater collection and treatment systems or equipment that are

subject to any standard, limitation, or other requirement under Sections 111 or 112 (excluding Section 112(r)) of the CAAA.

Industrial wastewater treatment systems

<u>X</u> Insignificant Sanitary wastewater collection and treatment systems or equipment

that are <u>not</u> subject to any standard, limitation, or other requirement under Sections 111 or 112 (excluding Section 112(r)) of the CAAA.

__ Trivial Not applicable

12.1 BACKGROUND

There are six wastewater treatment plants (WWTPs) located at Fort Stewart. The post operates and maintains five of the treatment plants, (one industrial and four sanitary WWTPs). The sixth treatment plant is owned and operated by the City of Hinesville and treats the majority of the sanitary wastewater generated at Fort Stewart. The Hinesville WWTP is not considered part of Fort Stewart's operations and should not be included in the post's Title V permit. Therefore, emissions from the Hinesville WWTP are not included in this emissions inventory. The remaining wastewater treatment operations have been included in the inventory because they are sources of fugitive air emissions.

Information regarding the treatment plant was obtained from the 2005 and 2006 Emission Inventories. Data on the quantities of wastewater treated were obtained from Directorate of Public Work contacts Mr. David Montano and Mr. Stanley Thomas (See Section 1.0, Table 1.0 for contact information). The industrial WWTP (IWWTP) is located in the main cantonment area of Fort Stewart (Building 4420) and treats a mixture of water, oils, and greases from motor pool sumps and wash racks located throughout the post. This treatment plant employs a series of passive treatments and is comprised of three grit chambers, a skimmer system, an equalization basin (approximately 6 acres), and four sand-filled filter beds. The grit chambers and skimmer system act as an oil/water separator, while the equalization basin holds the water for a sufficient length of time to allow for the settling of sedimentation. After the equalization basin, wastewater is passed through the filter beds and is subsequently discharged. Induced biodegradation, mechanical aeration, and chlorine are not used at the IWWTP.

Two of the sanitary WWTPs consist of aeration ponds and spray fields. These treatment plants are located at Camp Oliver and at Wright Army Airfield (WAAF). The WWTP at Camp Oliver is comprised of a mechanically aerated pond, an oxidation pond, and a spray field. Together, the two ponds have a surface area of approximately 2 acres and an average wastewater depth of approximately 2 feet. The WWTP at WAAF is comprised of one pond, partially separated in the middle with a dike, and a spray field. The pond has a surface area of approximately 1 acre and an average wastewater depth of approximately 4 feet. At both of these treatment plants, the wastewater is treated with chlorine prior to being discharged to the spray fields.

The remaining two sanitary WWTPs are packaged treatment plants and are located at Evans Field and at TAC-X. Both treatment plants consist of a single AST with a capacity of approximately 35,000 gallons. The tanks are subdivided into several compartments in which the wastewater is aerated and solids are allowed to settle out. At both WWTPs, the wastewater is treated with chlorine prior to being discharged. Recent upgrades to the TAC-X system include an aerated lagoon followed by a sedimentation basin and chlorine addition.

The Georgia EPD has designated sanitary wastewater collection and treatment systems or equipment that are not subject to any standard, limitation, or other requirement under Sections 111 or 112 (excluding Section 112(r)) of the CAAA as "insignificant" sources of air pollution. Because none of the sanitary WWTPs at Fort Stewart are subject to Sections 111 or 112, these WWTPs are designated as insignificant sources. The industrial WWTP is designated as a significant source of air pollution.

12.2 EMISSIONS ESTIMATES

The method used to calculate actual and potential emissions is described below. A summary of emissions from all wastewater treatment activities is presented in Table 12.0. Section 12.3, Table 12.1 provides the details and emissions for each wastewater treatment activity individually.

Actual Emissions

The EPA document, Procedures for the Preparation of Emissions Inventories for CO and Precursors of Ozone, Volume I: General Guidance for Stationary Source, Section 3.5-1, p. 3-14 (Ref. 9) identifies a VOC emission factor of 1.1x10⁻⁴ pounds per gallon of industrial wastewater treated. VOC emissions from sanitary wastewater were assumed to be insignificant. Data regarding the industrial wastewater component (i.e., percent by volume) of the influent treated at each treatment plant were provided by the Directorate of Public Works.

Actual VOC emissions were estimated by multiplying the average wastewater treatment rate by 1) the operating schedule, 2) the industrial component factor, and 3) the VOC emission factor. The calculation used to estimate actual VOC emissions from the IWWTP is presented below:

Unit ID: W001-S

204,153 gal/day Average treatment rate: Operating schedule: 365 day/yr

Industrial wastewater component: $99\%_{v}$

1.1x10⁻⁴ lb/gal industrial wastewater VOC emission factor:

VOC emissions = $(204,153 \text{ gal/day})*(365 \text{ day/yr})*(0.99)*(1.1x10^{-4} \text{ lb/gal})$ = 8.114.78 lb/yr

All of the treatment plants except for the Industrial WWTP treat chlorinated wastewater. The chloroform emission factor of 1.17x10⁻⁷ pounds per gallon of treated (chlorinated) wastewater was obtained from Fort Stewart's 1994 Emission Statement and was used as follows to estimate actual chloroform emissions. The calculation used to estimate actual chloroform emissions from the sanitary WWTP located at Camp Oliver is presented below:

Unit ID: W101-S

Average treatment rate: 2,664.49 gal/day Operating schedule: 365 days/yr

Chloroform emission factor: 1.17x10⁻⁷ lb/gal wastewater

Chloroform Emissions = $(2,664.49 \text{ gal/day}) * (365 \text{ days/yr}) * (1.17x10^{-7} \text{ lb/gal})$ = 0.113 lb/yr

Potential Emissions

Emissions from wastewater treatment operations are proportional to the quantity of wastewater treated. Potential emissions from each treatment plant were estimated assuming the plants could operate at their permitted capacities for an entire year. Total potential VOC emissions are not presented in the inventory/report summary tables because fugitive criteria pollutant emissions from this source category are not included in installation-wide potential-to-emit determinations. The calculation used to estimate potential VOC emissions from the IWWTP is presented below:

Unit ID: W001-S

Permitted treatment rate: 500,000 gal/day Operating schedule: 365 days/yr

Industrial wastewater component: 99%_v

VOC emission factor: 1.1x10⁻⁴ lb/gal industrial wastewater

VOC emissions = $(500,000 \text{ gal/day})*(365 \text{ day/yr})*(0.99)*(1.1x10^{-4} \text{ lb/gal})$ = 19,874.25 lb/yr

Emissions Summary

Table 12.0 below provides the total emissions of VOC for all wastewater treatment activities at Fort Stewart.

TABLE 12.0 Emissions Summary - Wastewater Treatment

Emission	Emissions (lb/yr)					
Type	VOC	HAP (Chloroform)				
Actual	8,121.6	0.718				
Potential	N/A	6.34				

Emission Source Updates

No significant changes were noted for wastewater treatment during the 2007 inventory data collection activity.

12.3 DETAILED SOURCE AND EMISSION TABLES

Table 12.1 presents the details for all the Fort Stewart wastewater treatment operations.

TABLE 12.1 Wastewater Treatment Details and Emissions

Unit ID	Treatment	Industrial Component (% _v)	Wastewater Treated (gal/day)			Emissions b/yr)	Potential Emissions (lb/yr)		
	Plant		Actual	Permitted	VOC	Chloroform	VOC a	Chloroform	
W001-S ^b	Industrial WWTP	99	204,153	500,000	8114.78	0	19,874.25	0	
W101-S	Camp Oliver	1	2,664	70,000	1.07	0.11	28.11	2.96	
W102-S	Evans Field	1	4,196	35,000	1.68	0.18	14.05	1.48	
W103-S	TAC-X	1	8,244	35,000	3.31	0.35	14.05	1.48	
W104-S	Wright AAF	1	1,884	10,000	0.76	0.08	4.02	0.42	
		Total (lb/yr)		8,121.60	0.72	19,934.48	6.34		
		Total (ton/yr)		4.06	<0.01	9.97	<0.01		

^a Fugitive criteria pollutant emissions from this source category are not included in installation-wide Title V potential-to-emit calculations.
^b Significant Title V Source

13.0 Prescribed Burning

Title V Source Designation(s)

__ Significant Prescribed burning not considered "insignificant" or "trivial" as

described below

<u>x</u> Insignificant Open burning in compliance with Georgia Rule 3910301.02(5) (which

includes prescribed burning of any forest land by the owner or

owner's designee)

<u>x</u> Trivial Wildfires and other accidental fires

13.1 BACKGROUND

Fort Stewart uses prescribed burning operations on approximately 279,000 acres of forested/grass land to control undergrowth, to reduce forest fire fuel, to increase training maneuverability, and to create a healthy forest environment. The installation is on a 3-year burn cycle, mandated by the U.S. Fish and Wildlife Service, and approximately one third of the total acreage is typically burned per year. Prescribed burning releases substantial quantities of fugitive emissions.

During 2007, the installation controlled litter accumulations using prescribed burning methods on 29,824 acres, including 8,947 acres of grassland, 5,965 acres of palmetto, and 14,912 acres of long needle pine. The prescribed burning operations were conducted using head, backing, flanking, and spot fires.

Due to differences between estimating emissions from the burning of grassland, palmetto, and long needle pine litter, these activities were separated into three distinct emission sources. The total acreage of each type of fuel burned was used to estimate emissions.

The Georgia EPD has designated certain open burning activities as "insignificant" (Georgia Rule 391-3-1-.03(10)(g)). Since all prescribed burning at Fort Stewart is fire set under controlled conditions to burn forest understory and used as a forest management practice by the owner or owner's designee, all three prescribed burning emission sources are designated "insignificant" (Georgia Rule 391-3-1-.02(5)).

Wildfires or other unplanned fires are considered one-time events that are not part of the installation's normal business operations. Therefore, these fires are designated as trivial sources of air pollution and have not been included in this inventory.

13.2 EMISSIONS ESTIMATES

The method used to calculate actual and potential emissions is described below. Also provided is a summary of total emissions for the prescribed burning activity.

Actual Emissions

Both criteria pollutants and HAP are emitted from prescribed burning operations. Criteria pollutant emissions were estimated using emission factors from AP-42, Section 13.1 (Ref.1). These emission factors, which are dependent upon the type of fuel consumed, are presented in Section 13.3, Table 13.1.

Emissions from prescribed burning operations are influenced by the quantity of fuel that is consumed during the operations. For grassland, the quantity of fuel present per acre is dependent upon the number of years between burns. Based on a 3-year accumulation period, 0.71 tons of fuel is present per acre of grassland. The quantity of fuel present in palmetto stands is dependent upon the number of years between burns and the height of the palmetto. Based on a 3-year accumulation period and an average vegetative height of 3 feet, 2.70 tons of fuel is present per acre of palmetto. The quantity of fuel present in long needle pine stands is dependent upon the number of years between burns and the stand basal area (tree cross-sectional area at chest height). Based on a 3-year accumulation period and an average stand basal area of 65 square feet per acre, 3.58 tons of fuel is present per acre of long needle pine forest. Data used to estimate emissions from prescribed burning is presented in Section 13.3, Table 13.2.

Actual criteria pollutant emissions from prescribed burns were estimated by multiplying the number of acres burned by the quantity of fuel consumed per acre and the appropriate emission factor. For example, the calculation used to estimate actual CO emissions from the prescribed burning of grassland is presented below:

Unit ID: B001-S
Type of litter: Grassland
Total acreage burned: 8,947 acres/yr
Litter consumed: 0.71 tons/acre
CO emission factor: 75 lb/1,000 lb litter

CO emissions = (8,947 acres/yr) * (0.71 ton/acre) * (2,000 lb/ton) * (75 lb/1,000 lb)= 952,856 lb/yr

The estimated VOC and HAP emissions from prescribed burning are found in Section 13.3, Tables 13.3 and 13.4.

Potential Emissions

Because emissions from prescribed burning operations are classified as "fugitive" emissions, criteria pollutant emissions from this source category are not included in facility-wide potential-to-emit determinations. No potential emissions were calculated for prescribed burning. Potential HAP emissions were assumed equal to actual HAP emissions.

Emissions Summary

Table 13.0 given below summarizes estimated actual criteria pollutant and HAP emissions from prescribed burning at Fort Stewart. Detailed criteria and HAP emission tables that present emissions for each unit are presented in Section 13.3.

TABLE 13.0 Emissions Summary* - Prescribed Burning

Emissions	CO	NOx	SO ₂	PM	PM-10	PM-2.5	VOC	HAP
lb/yr	18,432,240	303,371	0	2,777,822	1,998,221	1,998,221	448,434	4,967.28
ton/yr	9,216.12	151.69	0	1,388.91	999.11	999.11	224.22	2.48

^{*} Criteria pollutant lead is also a HAP and thus is included under the HAP category

Emission Source Updates

No significant changes were noted for prescribed burning during the 2007 inventory data collection activity.

13.3 DETAIL SOURCE AND EMISSION TABLES

Tables 13.1 through 13.6 below provide a summary of emission factors used, 2007 prescribed burning data, and a detailed breakdown of estimated emissions.

TABLE 13.1
Criteria Pollutant Emission Factors for Prescribed Burning Operations

Dallarda ad	Emission Factors (lb/1,000 lb litter burned) ^a							
Pollutant	Grassland	Palmetto	Long Needle Pine					
СО	75	125	126					
NO _x ^b	2.5	2.5	2.5					
PM	10	16	20					
PM-10	10	15	13					
PM-2.5	10°	15°	13					
VOC	0		4.2					

^a Emission factors from AP-42, Section 13.1, Tables 13.1-3 and 13.1-4 (Ref. 1).

^b A NO_x emission factor of 2 to 8 lb/ton litter burned is provided in AP-42 (Ref. 1). The midpoint of 5 lb/ton litter burned (2.5 lb/1,000 lb litter burned) was assumed for emission estimation purposes.

^c PM-10 factor provided; assumed PM-2.5 equals PM-10.

TABLE 13.2 Prescribed Burning Information for CY2007

Unit ID	Type of Vegetation	Fuel Loading (tons/acre)	Area Burned (acres/yr)
B001-S	Grassland	0.71	8,947
B002-S	Palmetto	2.7	5,965
B003-S	Long Needle Pine	3.58	14,912

Source: AP-42, Section 13.1 (Ref. 1)

TABLE 13.3
Actual Criteria Pollutant Emissions from Prescribed Burning Operations

Unit ID	Type of	Emissions (lb/yr)									
Unit ID	Vegetation	CO	NO _x	SO ₂	PM	PM-10	PM-2.5	VOC			
B001-S	Grassland	952,856	25,409	0	127,047	127,047	127,047	0			
B002-S	Palmetto	4,026,375	64,422	0	515,376	483,165	483,165	0			
B003-S	Long Needle Pine	13,453,010	213,540	0	2,135,398	1,388,009	1,388,009	448,434			
To	otal (lb/yr)	18,432,240	303,371	0	2,777,822	1,998,221	1,998,221	448,434			
Tot	tal (ton/yr)	9,216.12	151.69	0	1,388.91	999.11	999.11	224.22			

TABLE 13.4
Actual Hazardous Air Pollutant Emissions from Prescribed Burning Operations

Unit ID	Type of	Emissions (lb/yr)								
Unit 1D	Vegetation	Cadmium	Chromium	Lead	Manganese	Nickel	POM			
B001-S	Grassland	0	0	2.54	34.30	0	0			
B002-S	Palmetto	159.77	10.31	51.54	56.69	10.31	669.99			
B003-S	Long Needle Pine	661.97	42.71	213.54	234.89	42.71	2776.02			
Total (lb/yr)		821.74	53.02	267.62	325.89	53.02	3,446.01			
Total (ton/yr)		0.41	0.03	0.13	0.16	0.03	1.72			

14.0 ORDNANCE DETONATION

Title V Source Designation(s)

X Significant Ordnance detonation operations that have potential emissions

 \geq 10,000 lb/yr of any regulated air pollutant, \geq 1,000 lb/yr of any regulated HAP, or \geq 2,500 lb/yr of a combination of regulated

HAPs

Ordnance detonation operations that are subject to any specific

state or federal standard or permit condition

<u>X</u>Insignificant Ordnance detonation operations that are <u>not</u> subject to any

specific state or federal standard or permit condition that have potential emissions <10,000 lb/yr of any regulated air pollutant, <1,000 lb/yr of any regulated HAP, and <2,500 lb/yr of a

combination of regulated HAPs

_Trivial Not applicable

14.1 BACKGROUND

This Section discusses the fugitive emissions that are generated by the detonation of ordnance. As part of their training, Fort Stewart personnel use a variety of ordnance including small arms, large arms, and smoke devices. For the purposes of this inventory, small arms include ordnance ranging in size from 5.56 millimeters (mm) to 50 caliber (0.5 inch) and large arms include ammunition and weaponry greater than 50 caliber such as mortars, artillery shells, and grenades. Smoke devices include sources such as markers, grenades, and smoke pots. Explosive ordnance disposal (EOD) is also conducted at Fort Stewart and is accounted for in this Section. Information regarding the type and quantity of ordnance used during 2007 was made available from Fort Stewart's Range Facility Management Support System (RFMSS). See Section 1.0 for a list of data sources/point of contacts. The net explosive weight (NEW) and the type of explosive used in each type of ordnance were determined using 1) the U.S. Army Defense Ammunition Center, *Munitions Items Disposition Action System* (MIDAS) (Ref. 10), 2) the *Ammunition Book Complete* (Ref. 11), and 3) the *Hazard Classification of U.S. Military Explosives and Munitions* (Ref. 12).

Tables 14.1 through 14.3 in Section 14.3 present the ordnance data compiled for 2007.

The Georgia EPD has not provided specific guidance regarding the designation of ordnance detonation operations as "significant," "insignificant," or "trivial" sources of air pollution. However, as per the Georgia Environmental Protection Division, *Major Source Operating Permit Application Introduction and Instructions*, any activity that is not subject to any specific state or federal standard or permit condition that generates potential emissions that are less than 10,000 lb/yr of any regulated air pollutant, less than 1,000 lb/yr of any regulated HAP, and less than 2,500 lb/yr of a combination of regulated HAPs is designated as an insignificant source. Therefore, the significance of each ordnance detonation operation was determined after

estimating potential emissions (see Potential Emissions). Since small arms, large arms, and smoke devices are all used in the same locations, emissions from these three sources were combined prior to determining their significance. Explosive ordnance destruction (EOD) is conducted at a separate location and was considered separately from ordnance firing of small arms, large arms, and smoke devices. Based on these specifications, small arms detonation, large arms detonation, and smoke device detonation are designated as significant sources, while EOD operations are designated as an insignificant source.

14.2 EMISSION ESTIMATES

Actual Emissions

Emissions from the use of small arms ordnance (Unit ID O001-S) were estimated using emission factors from AP-42, Section 13.3 (Ref. 1)*. Actual CO, and PM/lead emissions were calculated by multiplying the amount of explosive in each round (i.e., NEW) by the number of rounds fired and by the appropriate emission factor.

Emissions from the use of large arms ordnance (Unit ID O002-S) and ordnance disposal (Unit ID No. O101-S), were estimated using the *Air Pathway Screening Assessments for Resource Conservation and Recovery Act Subpart X Permitting* document (Ref. 13)*. This document contains open burning (OB) and open detonation (OD) emission factors for munitions and ordnance (M&O), however, only OD emission factors were used to calculate emissions. OD emission factors for M&O were assumed representative of munitions firing. This document also states that the metallic HAP emission factors were derived by assuming that all of the metallic HAPs present in a generic population of ordnance are emitted when the ordnance is used or destroyed. These emission factors produced reasonable emissions estimates for each metallic HAP except lead; the lead emission factor appeared to be unreasonably high. To better quantify lead emissions from large arms ordnance usage, all of the lead present in the ordnance was assumed to have been emitted upon destruction. Other criteria pollutant and HAP emissions were estimated by multiplying the NEW by the number of rounds fired and by the appropriate emission factor.

Air emissions from the use of smoke devices (Unit ID O003-S) were estimated using the PM emission factors from Ref. 13 described above. All emission factors used are shown in Section 14.3 Tables 14.8 and 14.9.

* Note: AP-42 (Ref. 1) now provides a Chapter (15.0) dedicated to ordnance detonation. All but one of the Chapter 15.0 subsections presented are listed as draft. As these subsections are updated to final they should be used whenever possible as the basis for future emission calculations related to Fort Stewart ordnance detonation. AP-42, Chapter 15 was not used for this 2007 Emission Inventory Update.

The calculation used to estimate CO emissions from the use of one type of small arms ordnance is presented below:

Type of ordnance: 5.56 mm ball F/M16A2 (Department of Defense

Identification Code No. A059)

Net explosive weight: 0.0038 lb_{NEW}/round No. of rounds fired: 1,691,731 rounds/yr CO emission factor: 0.0385 lb/lb NEW

CO emissions = $(0.0038 \text{ lb}_{\text{NEW}}/\text{round}) * (1,691,731 \text{ rounds/yr}) * (0.0385 \text{ lb/lb}_{\text{NEW}})$ = 247.50 lb/yr

The detailed actual emission estimates from ordnance detonation are found in Section 14.3, Tables 14.4 and 14.5.

For EOD (Unit ID O101-S) a log of unexploded ordnance destroyed was available, however it did not provide a detailed enough description of the ordnance to determine the NEW. In addition, because of troop deployment and changing assignments personnel were not readily available to provide the more detailed NEW information needed. As a result emissions for this source category were not determined. However in Table 14-3 a general description of the unexploded ordnance destroyed is provided. Overall the amount of ordnance destroyed (approximately 40 rounds) is far less than one half of one percent of the total ordnance used on Fort Stewart. Thus the resulting emissions would be trivial relative to the emissions of all the other ordnance used/detonated in 2007. In addition, there was no data on the C4 explosive used to destroy unexploded ordnance.

Potential Emissions

Emissions from ordnance detonation operations are proportional to the quantity of ordnance used and destroyed. Ordnance usage and destruction were assumed proportional to the number of hours the installation operates per year. Actual installation operations were estimated to occur 2,080 hours per year. The installation could potentially operate 8,760 hours per year. Therefore, the potential quantities of ordnance used and destroyed were estimated by multiplying the actual quantities by the ratio of 8,760/2,080.

Potential hazardous air pollutant emissions from ordnance detonation operations are presented in Section 14.3, Tables 14.6 and 14.7. Fugitive criteria pollutant emissions from this source category are not included in installation-wide Title V potential-to-emit determinations.

Emissions Summary

Table 14.0 below provides the total emissions of criteria pollutants and combined HAP from Ordnance detonation at Fort Stewart.

TABLE 14.0 Emissions Summary* - Ordnance Denotation

Emission Type		СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC	НАР
Aatwal	lb/yr	12,465.65	1,016.26	57.33	63,524.55	63,524.55	63,524.55	416.93	692.39
Actual	ton/yr	6.23	0.51	0.03	31.76	31.76	31.76	0.21	0.35
Dodontial	lb/yr	52,499.56	4,280.03	241.44	267,536.10	267,536.10	267,536.10	1,755.91	2,805.46
Potential	ton/yr	26.25	2.14	0.12	133.77	133.77	133.77	0.88	1.40

^{*} Criteria pollutant lead is also a HAP and thus is included under the HAP category

Emission Source Updates

In 2007 the amount of ordnance used was approximately 37 percent (4,621,968 rounds) less than what was used in 2006.

14.3 DETAIL SOURCE AND EMISSION TABLES

Tables 14.1 through 14.9 below provide a summary of 2007 ordnance detonation, a detailed breakdown of emissions, and emission factors used.

TABLE 14.1 Small and Large Arms Usage for 2007

DODIC	NSN / Description	2007 Rounds/Units Expended	NEW ^a (lb/round)	Lead (lb/round)							
	SMALL ARMS - Unit ID O001-S										
A059	CTG 5.56MM BALL M855 F/M16A2 RIFLE	1,691,731	0.0038	4.4E-03							
A062	CTG 5.56MM BALL M855 LINKED	218,403	0.0039	4.4E-03							
A063	CTG 5.56MM TR M856 F/RIFLE M16A2	28,157	0.0036	3.9E-03							
A064	CTG 5.56MM BALL M855 1 TR M856 LINKED	877,967	0.0085	8.3E-03							
A065	CTG 5.56MM BALL PLASTIC M862	17,900	0.0013	-							
A068	CTG 5.56MM TR M196 FOR RIFLE M16	2,800	0.0046	-							
A075	CTG 5.56MM BLANK W/M27 LINKS (SAWS)	30,950	0.0011	1.0E-05							
A076	DUMMY CTG 5.56MM M232 SERIES	400	N/A	-							
A080	CTG 5.56MM BLANK M200 F/RIFLE M16	96,967	0.0016	1.0E-05							
A111	CTG 7.62MM BLANK M82 LINKED	18,940	0.0025	2.2E-05							
A130	CTG 7.62MM BALL M80 F/RIFLE M14 5/CLIP	19,750	0.0067	1.6E-02							
A131	CTG 7.62MM LINKED 4 BALL M80 1 TR M62	1,538,235	0.0079	1.3E-02							
A136	CTG 7.62MM SPEC BALL M118	1,882	0.0064	1.5E-02							
A143	CTG 7.62MM BALL M80 LINKED F/MG M60	196,858	0.0071	1.6E-02							
A151	CTG 7.62MM LINKED 4 BALL M80 1 TR M62 F	400	0.0067	2.2E-02							

DODIC	NSN / Description	2007 Rounds/Units Expended	NEW ^a (lb/round)	Lead (lb/round)
A165	CTG 7.62MM LINKED 4 BALL M80 1 TR M62	37,000	0.0067	2.6E-02
A191	CTG CAL .30 RIFLE BALL MATCH GRADE	6,090	-	
A254	CTG, 7.62MM	1,072	0.0039	2.0E-02
A260	CTG.9MM,SUBSONI	1,400	0.0007	-
A358	CTG 9MM TP-T M939	3,460	0.0012	0
A360	9MM BALL M1 (OLD)	144	0.0009	2.5E-04
A362	CTG, 9MM BALL MK144 MOD 0	340	0.0007	-
A363	CTG 9MM M882 BALL (NEW)	19,901	0.0009	1.4E-02
A531	CTG CAL.50 API M8	845	0.0358	1.6E-03
A532	.50 API M8 CTN PK	565	0.0329	-
A555	CTG CAL.50 LINKED BALL M2 OR M33	29,450	0.0342	8.0E-03
A557	CTG CAL.50 LINKED 4 BALL M2 OR M33 1	479,318	0.0424	8.0E-03
A577	.50 LKD 4 API 1API	3,466	0.0361	-
A598	CTG CAL.50 BLANK M1A1 W/M9 LINKS	9808	-	-
A606	CTG .50 CAL ARMOR PIERCING-INCENDIARY	732	0.0039	2.3E-03
AA11	CTG 7.62MM M118 L RANGE	13,270	1.5E-02	
AA12	CTG 9MM RED MARKING SESAM	102	0.0001	-
AA31	12 GAGE FIN STAB RUBBER	25,770	0.0008	-
AA33	5.56MM BALL COMMER PACK, CTG	2,103,029	4.4E-03	
AA38	SABOT ARM Piercing-Tracer (SLAP-T)	15,919	-	
AA45	CTG 5.56MM BALL M855,10/CLP-LF	2,250	1.1E-05	
AA49	CARTRIDGE, 9MM BALL M882	205,598	0.0009	1.4E-02
AA53	CTG 5.56MM.BALL MOLY COATED	4,420	0.0036	-
AA59	BALL,LONG RIF,LEAD FREE,PISTOL	6,680	-	-
AA68	CTG, 5.56MM SR TRNG M862	400	0.0013	-
QA66	CTG 5.56MM BALL	12	-	-
	LARGE ARMS – Unit ID O	002-S	ı	ı
A010	CTG 10 GAGE SHOTGUN BLANK	41	0.0038	-
A011	CTG 12 GAGE SHOTGUN #00 BUCKSHOT M19	5,696	0.0028	7.9E-03
A014	CTG 12 GAGE SHOTGUN NR 7 1/2	93	0.0027	-
A015	CTG, 12 GAGE #8 SHOT	140	0.0038	-
A017	CTG 12 GAGE #9 SHOT	40	0.0055	-
A023	CTG.12 GAGE, SLUG LOADED, w/Plastic Case	60	-	-
A792	20MM HEIT (VULCAN)	25	0.0182	-
A940	CTG 25MM TPDS-T M910	45,409	0.2261	2.6E-05
A976	CTG 25MM TP-T M793	32,553	0.2205	1.1E-04
AA60	Cartridge, 12 Gauge #00 Buckshot	40	0.0053	-
B118	CTG 30MM TP M788 (CTN PK)	29,934	0.1113	3.7E-04
B470	40MM HEDP HIVEL LCHD (M384)	208	0.1169	-
B519	CTG 40MM PRACTICE M781 W/WO/FUZE	38,402	0.0008	1.2E-06

DODIC	NSN / Description	2007 Rounds/Units Expended	NEW ^a (lb/round)	Lead (lb/round)
B535	CTG 40MM WHITE STAR PARACHUTE M583	24	0.2080	-
B542	CTG 40MM HEDP M430 W/FUZE M549 W/M16A2	6,432	0.0942	2.1E-05
B546	CTG 40MM HEDP M433 W/FUZE PIBD M550	926	0.1017	6.1E-05
B568	40MM HEDP LOWVEL LCHD (M406)	203	0.0780	8.3E-06
B571	CTG 40MM HE M383 W/M16A2 LINKS	1,783	0.1199	-
B578	CTG 40MM FIXED PRAC M387	30	0.0031	-
B584	40MM TP M918 (MK 19)	60,142	0.0131	6.0E-05
B627	CTG 60MM ILLUM M83A1 OR M83A2 W/F TIME	42	0.5806	-
B630	CTG 60MM W/P M302 SERIES W/FUZE	48	-	-
B642	CTG 60MM HE M720 W/FUZE MULTIOPTION	1,051	0.8869	3.6E-04
B643	CTG 60MM HE M888 W/FZ PD M935	129	0.9004	-
BA04	Ctg 60mm Illum XM767 IR	80	0.4057	-
BA07	CTG, 40MM FOAM RUBBER BATON	100	0.0020	-
BA08	CTG, 40MM RUBBER BALL	50	0.0012	-
BA11	CTG 40MM HI VELOC CANIST M1001	50	0.0124	-
BA15	CTG 60MM FULL RANGE PRACTICE M769	172	0.0813	-
BA17	CTG 60MM HE M783, M768	396	-	
C226	CTG 81MM ILLUM M301A3 W/FUZE TIME M84A1	25	1.7843	5.1E-03
C256	CTG 81MM HE M374A2 W/FUZE PD M524A6	473	2.4280	2.0E-04
C379	CTG 120MM HE M934 W/MO FZ M734 F/ MORTAR	600	7.9177	-
C382	CTG, 84MM HE, FFV 441B FOR RAAWS	78	1.6000	-
C384	CTG,84MM ILLUM FFV545B F/RAAWS	15	2.1303	-
C385	CTG,84MM HE FFV441B F/RAAWS	43	0.8741	-
C386	CTG,84MM TP FFV552 F/RAAWS	65	1.4430	-
C429	105MM HEP-T M393A1 M393E	20	12.2000	-
C444	105MM HE M1 W/FUZE	20	7.4500	-
C484	CTG 81MM ILLUM INFRARED	7	0.9636	-
C623	CTG 120MM HE M933 W/PD FZ M745 F/MORTAR	329	7.9200	0
C784	CTG 120MM TP-T M831 F/TNKGUN	1,823	13.9662	2.5E-05
C785	CTG 120MM TPCSDS-T M865 F/TNKGUN	2,192	19.6000	0
C868	CTG 81MM HE M821 W/MO FUZE (IUK)	329	2.3420	0
C869	CTG 81MM HE M889 IUK W/M935 PD FUZE	63	2.3536	-
C995	AT4 LTWT MULTI-PURPOSE WPN	363	1.8404	0
CA03	CTG 120MM WP M929A1 F/MORTAR M120/M121	273	1.4694	-
CA07	CTG 120MM IR ILLUM XM983	221	2.4551	-
CA09	CTG 120MM FULL RANGE PRACTICE (FRP) M931	528	1.3638	0
CA31	Cartridge, 120mm TP-T	57	16.4423	-
D505	PROJ 155MM ILLUM M485 F/HOW M1 M1A1 M45	584	6.2518	5.1E-05
D509	PROJ 155MM RAAMS M741	21	11.7423	-
D544	PROJ 155MM HE M107 SERIES W/SUPPL CHG	3,620	15.7100	3.9E-05
D550	PROJ 155MM WP M110 SERIES F/HOW	15	0.4600	-

DODIC	NSN / Description	2007 Rounds/Units Expended	NEW ^a (lb/round)	Lead (lb/round)
G878	FUZE HAND GRENADE PRACTICE M228	1,875	0.0045	6.7E-07
G881	GRENADE HAND FRAG M67 W/FUZE M213	40	0.4137	-
GG09	M84 NON LETHAL STUN GRENADE (M84)	18	0.0094	-
H185	RKT, MLRS, PRACTICE, SINGLE RD	40	1300.0000	-
H463	HYDRA 70 RKT MPSM PRAC	4,321	7.2640	-
HA12	ROCKET 2.75IN HE W/WHD M151 FZ M423 MTR	448	9.4380	-
HA13	ROCKET, 2.75 IN SIG PRAC M274 W/MTR MK66	32	7.2089	-
HA16	84MM HEAT	36	2.3959	-
K031	IGNITER ASSY F/MINE	50	-	-
K143	MINE APERS M18A1 T48E3 W/ACCS CAP BLAST	57	1.5700	3.1E-04
K145	MINE M18A1 W/O FIRING DEVICE & TEST SET	70	1.5000	-
K765	RIOT CONTROL AGENT CS CAPSULE	53		-
L116	KIT FLARE PERS DIST RED	120	0.0617	-
L312	SIGNAL ILLUM GROUND PARACHUTE M127 T73	52	0.2827	-
L386	CC TP	11	-	-
L601	SIMULATOR HAND GRENADE M116 SERIES	87	0.0813	1.3E-08
M023	CHARGE DEMOLITION BLOCK COMP C-4 1 1/4 LB	577	1.2500	0
M028	DEMOLITION KIT BANGALORE TORPEDO M1A2	10	118.3550	1.9E-07
M039	CHARGE DEMOLITION BLOCK 40 LB CRATERING	14	40.4300	0
M131	CAP BLASTING NON-ELECTRIC M7 SPECIAL	15	0.0028	1.4E-07
M421	CHARGE DEMOLITION SHAPE M3A1 40LB	14	1.6E-07	
M456	CORD DETONATING REINFORCED PLIOFILM	2,724	0.0070	0
M929	ROCKET MOTOR, MK83 MOD 0	70	0.0623	-
M933	ROCKET MOTOR, MK92 MOD 0/1	420	6.5000	-
M983	CHG, DEMO SHEET 15 FT	50	1.3400	-
ML47	CAP BLASTING NON-ELECTRIC M11	103	0.0029	1.4E-07
MN03	CAP BLASTING NON-ELECTRIC M13	23	-	1.4E-07
MN06	CAP BLASTING NON-ELECTRIC DELAY M14	25	0.0364	1.4E-07
MN08	IGNITER TIME BLASTING FUSE M81	62	0.0001	2.6E-07
MN90	DUAL NON-ELECTRIC BLASTING CAP ASSY M23	45	0.0110	-
PL95	GM, INTERCEPT-AERIAL, WPN RND	10	0.8700	-
PL96	GM, INTERCEPT-AERIAL, MSL RND (1 BCU)	12	0.8700	-
X455	DETA PRIME BOOSTER	15	0.0441	-
X471	MM51 ECT 600 GR	99	-	-
X604	DET, NONEL 20 FT CLEAR MINI-TU	15	-	-
X605	DET, NONEL 40 FT CLEAR MINI-TU	8	-	-
X606	DET, NENEL 60 FT CLEAR MINI-TU	15	-	-
X618	DET, NONEL 200 FT CLEAR MINI-T	113	-	-
X699	FLASH BANG, 9-BANG SOUND FLASH	85	-	-
X104	CTG, 12 GA BREECHING F/AUTO	99	0.0038	-

⁻ Data not available

TABLE 14.2 Smoke Device Usage for CY2007

DODIC	NSN / Description	2007 Rounds/Units Expended	NEW (lb/round)	Yield Factor
B508	CTG 40MM YELLOW SMOKE GROUND MARKER M716	923	0.1721	5 ^a
C276	CTG 81MM SMOKE WP M375A2 W/FUZE PD M524A6	80	2.3350	5
C624	CTG 120MM SMOKE WP XM929 W/PD FZ M745 F/MORTAR M12	147	1.4694	5
D446	SMOKE CANISTER,GREEN	1	0.1650	5 ^a
G930	GRENADE HAND SMOKE HC AN MB W/FUZE M201A1	20	1.2000	1 ^a
G940	GRENADE HAND M18 GREEN SMOKE W/FUZE M201A1	22	0.7200	1
G945	GRENADE HAND M18 YELLOW SMOKE W/FUZE M201A1	11	0.7200	1
G955	GRENADE HAND M18 VIOLET SMOKE W/FUZE M201A1	9	0.7200	1
G982	GRENADE, HAND SMOKE, TA, PRACTICE, M83	49	0.0148	1

^a Yield Factor assumed

TABLE 14.3
Explosive Ordnance Destroyed in CY2007

Explosive Orunance Destroyed in C 12007									
Description of Ordnance Destroyed	No. Rounds Destroyed								
Rifle grenade 2" dia. X12 long	3								
Rifle grenade 2" dia. X12 long	3								
Mortar round, 120mm	2								
M21 Anti Tank Mine	1								
155mm or smaller	4-5								
40MM Rounds	8-9								
RoundsTPT 3 rds HE	12								
40 MM HE round	1								
Vintage grenades	Several								
Damaged tank round	1								
84MM mortar round	1								
Mortar round	1								
Hand grenade	1								

TABLE 14.4
Actual Criteria Pollutant Emissions from Ordnance Detonation

Unit ID	Ordnance Type	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
O001-S	Small Arms	2,303.01	-	1	34.42	34.42	34.42	-
O002-S	Large Arms	10,162.64	1,016.26	57.33	62,799.90	62,799.90	62,799.90	416.93
O003-S	Smoke Devices	-	-	-	690.23	690.23	690.23	-
O101-S	EOD	0	0	0	0	0	0	0
Total	(lb/yr)	12,465.65	1,016.26	57.33	63,524.55	63,524.55	63,524.55	416.93
Total	(ton/yr)	6.23	0.51	0.03	31.76	31.76	31.76	0.21

Note: O001-S, O002-S, O003-S have been combined as a significant source.

TABLE 14.5
Actual Emissions of Hazardous Air Pollutants from Ordnance Detonation

Unit ID	Acetophenone	Antimony Compounds	Benzene	Bis(2-ethylhexyl) Phthalate	1,3-Butadiene	Cadmium Compounds	o-Cresol	Dibenzofuran	Dibutyl Phthalate	Dimethyl Phthalate	Ethylbenzene	Hexane	Naphthalene	Nickel Compounds	4-Nitrophenol	Phenol	POM	Styrene	Toluene	Xylenes	Lead
O001-S	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	34.42
O002-S	0.039	52.12	33.88	0.495	1.72	135.50	0.162	0.063	2.55	0.063	2.61	2.08	0.782	62.54	0.047	0.469	153.74	112.05	17.46	14.07	65.53
O003-S	-	-	ı	-	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
O101-S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (lb/yr)	0.039	52.12	33.88	0.495	1.72	135.50	0.162	0.063	2.55	0.063	2.61	2.08	0.782	62.54	0.047	0.469	153.74	112.05	17.46	14.07	99.95
Total (ton/yr)	<0.01	0.03	0.02	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.08	0.06	0.01	0.01	0.05

TABLE 14.6
Potential Criteria Pollutant Emissions from Ordnance Detonation

Unit ID	Cell No.	СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
O001-S	Small Arms	9,699.21	-	-	144.97	144.97	144.97	-
O002-S	Large Arms	42,800.35	4,280.03	241.44	264,484.18	264,484.18	264,484.18	1,755.91
O003-S	Smoke Devices	-	-	-	2,906.9	2,906.9	2,906.9	-
O101-S	EOD	0	0	0	0	0	0	0
Total	Total (lb/yr)		4,280.03	241.44	267,536.10	267,536.10	267,536.10	1,755.91
Total (ton/yr)		26.25	2.14	0.12	133.77	133.77	133.77	0.88

TABLE 14.7
Potential Emissions of Hazardous Air Pollutants from Ordnance Detonation

Unit ID	Acetophenone	Antimony Compounds	Benzene	Bis(2-ethylhexyl) Phthalate	1,3-Butadiene	Cadmium Compounds	0-Cresol	Dibenzofuran	Dibutyl Phthalate	Dimethyl Phthalate	Ethylbenzene	Hexane	Naphthalene	Nickel Compounds	4-Nitrophenol	Phenol	POM	Styrene	Toluene	Xylenes	Lead
O001-S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34.42
O002-S	0.165	219.49	142.67	2.09	7.24	570.67	0.680	0.263	10.75	0.263	10.97	8.78	3.292	263.39	0.198	1.98	647.49	471.90	73.53	59.26	275.96
O003-S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
O101-S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (lb/yr)	0.165	219.49	142.67	2.085	7.24	570.67	0.680	0.263	10.75	0.263	10.97	8.78	3.292	263.39	0.198	1.975	647.49	471.90	73.53	59.26	310.39
Total (ton/yr)	<0.01	0.11	0.07	<0.01	<0.01	0.29	<0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	0.13	<0.01	<0.01	0.32	0.24	0.04	0.03	0.16

TABLE 14.8
Emission Factors for Small Arms Ordnance Usage

Pollutant	Emission Factor ^a
СО	0.0385 (lb/lb NEW)
Lead Compounds	0.0006 (lb/lb Lead)
PM ^b	0.0006 (lb/lb Lead)
PM-10 ^b	0.0006 (lb/lb Lead)
PM-2.5 ^b	0.0006 (lb/lb Lead)

^a Source AP-42, Section 13.3 (Ref. 1) (Section 15.0 Ordnance Detonation, was not used because it is not yet final and the draft small arms subsection was not published until February 2008).

TABLE 14.9
Emission Factors for Large Arms Ordnance Use and Explosive Ordnance Destruction⁺

Pollutant	Emission Factor ^a (lb/lb NEW unless noted otherwise)
Criteria Poli	lutants
CO	0.039
Lead ^b	1 lb/lb lead present
NO _x c	0.0039
PM^d	0.241
PM-10	0.241
PM-2.5 ^d	0.241
SO_2	0.00022
VOC	0.0016
Hazardous Air	Pollutants
Acetophenone	1.5x10 ⁻⁷
Antimony Compounds	2.0x10 ⁻⁴
Benzene	1.3x10 ⁻⁴
Bis(2-ethylhexyl) Phthalate	1.9x10 ⁻⁶
1,3-Butadiene	6.6x10 ⁻⁶
Cadmium Compounds	5.2x10 ⁻⁴
o-Cresol	6.2x10 ⁻⁷
Dibenzofuran	2.4x10 ⁻⁷
Dibutyl Phthalate	9.8x10 ⁻⁶
Dimethyl Phthalate	2.4x10 ⁻⁷
Ethylbenzene	1.0x10 ⁻⁵
Hexane	8.0x10 ⁻⁶

published until February 2008).

b Lead emission factor provided; assumed PM, PM-10, and PM-2.5 factors equal the lead factor.

Pollutant	Emission Factor ^a (lb/lb NEW unless noted otherwise)
Lead Compounds ^b	1 lb/lb lead present
Naphthalene	3.0x10 ⁻⁶
Nickel Compounds	2.4x10 ⁻⁴
4-Nitrophenol	1.8x10 ⁻⁷
Phenol	1.8x10 ⁻⁶
POM ^e	5.9x10 ⁻⁴
Styrene	4.3x10 ⁻⁴
Toluene	6.7x10-5
Xylenes	5.4x10-5

⁺ Smoke device emissions based on PM emission factors given in the Table.

^a Emission factors from *Air Pathway Screening Assessments for Resource Conservation and Recovery Act, Subpart X Permitting*, Table 4.1.2.2-2, page 4.1.2.2-4, Table 4.1.2.2-5 and 4.1.2.2-6, pages 4.1.2.2-7 to 4.1.2.2-8 (Ref. 13). (AP-42, Section 15.0 Ordnance Detonation, was not used in 2007 because it is not yet final).

b All lead present in large arms ordnance and ordnance destroyed was assumed to have been emitted.

^c Includes emission factors for nitrogen oxide (NO) and NO₂.

d PM-10 emission factor provided; assumed PM and PM-2.5 equal PM-10.

^e POM emission factor listed as aromatics, including benzene. The benzene emission factor was subtracted from the emission factor listed in Ref. 13.

15.0 REFRIGERANT USAGE

Title V Source Designation(s)

_Significant HVAC units that have potential emissions $\geq 10,000$ lb/yr of any

regulated air pollutant, ≥1,000 lb/yr of any regulated HAP, or

≥2,500 lb/yr of a combination of regulated HAPs

HVAC units that are subject to any specific state or federal

standard or permit condition

<u>X</u> Insignificant HVAC units that are <u>not</u> subject to any specific state or federal

standard or permit condition that have potential emissions <10,000 lb/yr of any regulated air pollutant, <1,000 lb/yr of any regulated HAP, and <2,500 lb/yr of a combination of regulated

HAPs

<u>X</u> Trivial HVAC units that use a refrigerant not regulated by Title VI of the

CAAA and not classified as a HAP

Cold storage refrigeration equipment

15.1 BACKGROUND

Refrigerants including chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs) are used in numerous refrigeration units and heating, venting, and air conditioning (HVAC) units across Fort Stewart. The CFCs and HCFCs used at the installation are categorized as ozone depleting chemicals (ODCs) and are regulated under Title VI of the Clean Air Act. Because of the large number of refrigeration and HVAC units at the installation and the small quantities of CFCs or HCFCs released from each unit, this source category has been treated as an area source of fugitive emissions.

The Fort Stewart DPW and the GANG provided data on the types and quantities of refrigerants purchased for 2007. CFCs and HCFCs may have been added to stationary refrigeration and HVAC units by other organizations at the installation; however, GANG and DPW perform the vast majority of the maintenance operations conducted for stationary units.

For reporting purposes, all of the cold storage refrigeration and HVAC units at the installation have been grouped together (Unit ID R101-S). The Georgia EPD has designated cold storage refrigeration equipment as a "trivial" source of air pollution. However, the Georgia EPD has not provided specific guidance regarding the designation of HVAC units as "significant," "insignificant," or "trivial" sources. However, as per the Georgia Environmental Protection Division, *Major Source Operating Permit Application Introduction and Instructions*, any activity that is not subject to any specific state or federal standard or permit condition and generates potential emissions that are less than 10,000 lb/yr of any regulated air pollutant, less than 1,000 lb/yr of any regulated HAP, and less than 2,500 lb/yr of a combination of regulated HAPs is designated as an insignificant source. Thus the HVAC units at Fort Stewart have been designated as an insignificant source.

15.2 EMISSION ESTIMATES

Actual Emissions

Fort Stewart has an active recycling/reclamation program for refrigerants used in stationary units. A total of 2,478 lb of refrigerant was purchased by DPW during 2007, of which 2,400 lb was R-22 (an HCFC), 30 lb was R-134 A (an HFC), and 48 lb was R-404A (an HFC). GANG MATES used 60 lb of R-134a and 30 lb of R-22. GANG Maintenance did not order any refrigerant in 2007.

The refrigerants purchased have been assumed to been added to refrigerant units because of leak or repair. Thus, the amount of refrigerant added to units was assumed equal to the amount of refrigerant lost (emitted) to the atmosphere.

Potential Emissions

Emissions from HVAC units are proportional to the number of units in operation. Because the number of HVAC units on Fort Stewart is expected to remain relatively constant during the foreseeable future, potential emissions for this source category were assumed to be equal to actual emissions. However, fugitive ODC emissions from this source category are not included in installation-wide Title V potential-to-emit determinations.

Emissions Summary

A Summary of the refrigerants used and emitted on Fort Stewart is given in Table 15.0 below.

TABLE 15.0
Refrigerant Usage and ODC Emissions Summary

	Refrig	gerant	Quantity Used	Quantity	
Unit ID	ASHRAE No. Common/Trade Name		Quantity Used (lb/yr)	Emitted (lb/yr)	
D101 C	R-22	HCFC-22	2,430	2,430	
R101-S	R-134A*	HFC	90	N/A	
	R-404A*	HFC	48	N/A	
	Total (lb/yr)		2,538	2,430	

^{*} R-134A and R-404A are thus not categorized as an ODC and therefore their emissions are not reported.

Emission Source Updates

No significant changes were noted for refrigerant use during the 2007 inventory data collection activity.

16.0 FIRE FIGHTER TRAINING EXERCISES

Title V Source Designation(s)

_Significant Not applicable

<u>X</u>Insignificant Fire fighter training exercises

__Trivial Not applicable

16.1 BACKGROUND

Fire fighter training exercises are conducted at Fort Stewart using two fire simulators that use propane as the combustion fuel. One simulator is a two-story building (structure) and the other simulator is an aircraft. The simulators are mobile and are moved between Fort Stewart and Hunter Army Airfield. There is also a smoke generation machine, which uses a biodegradable product that does not have any air emissions. Actual propane usage data for 2007 was provided for Fort Stewart and Hunter Army Airfield combined. It was assumed one half of the total was used at Fort Stewart. There also was no breakdown on how much of the propane was burned at the building structure versus the aircraft simulator. This breakdown was available in 2006 and was used to estimate the 2007 distribution. Using the 2006 distribution it was estimated that 400 gallons of propane was burned at the aircraft simulator and 200 gallons in the building structure. Fire suppressants such as Halons and aqueous film forming foam (AFFF) were not used in fire fighter training exercises. Only water was used to extinguish the training fires.

Fire fighter training exercises are a source of fugitive emissions and have been designated as "insignificant" sources of air pollution by the Georgia EPD.

16.2 EMISSIONS ESTIMATES

Actual Emissions

Emissions from the burning of propane were estimated using pollutant emission factors from AP-42, Sections 1.5 and 13.5 (Ref. 1); these factors are presented in Section 16.3, Table 16.1. Actual emissions were estimated by multiplying the quantity of propane burned by the heating value of propane [90,500 Btu/gal) (Ref. 1)] and by the appropriate emission factors. For example, the calculation used to estimate actual CO emissions from the fire training exercises conducted in the two-story house simulator is presented below.

Unit ID: X101-S

Quantity of propane burned: 200 gal/yr

Heating value of propane: 90,500 Btu/gal

CO emission factor: 3.7x10⁻¹ lb/10⁶ Btu

CO emissions = $(200 \text{ gal/yr}) * (90,500 \text{ Btu/gal}) * (3.7x10^{-1} \text{ lb/}10^6 \text{ Btu})$ = 6.70 lb/yr

Potential Emissions

Because emissions from fire fighter training exercises are classified as "fugitive" emissions, criteria pollutants emissions from this source category are not included in facility-wide potential-to-emit determinations. Therefore, potential emissions were not calculated.

Emissions Summary

Table 16.0 below provides the total emissions from fire fighting training exercises at Fort Stewart.

TABLE 16.0 Emissions Summary – Fire Fighter Training Exercises

Emission Type	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
Actual (lb/yr)	20.09	3.69	0.032	187.88	187.88	187.88	3.42
Actual (ton/yr)	0.01	< 0.01	< 0.01	0.09	0.09	0.09	< 0.01

Emission Source Updates

No significant changes were noted for fire fighter training during the 2007 inventory data collection activity.

16.3 DETAILED SOURCE AND EMISSION TABLES

Tables 16.1 and 16.2 below show the emission factors used and a breakdown of fire training exercise emissions.

TABLE 16.1
Emission Factors for Propane Combustion During Fire Fighter Training Exercises

Pollutant	Emission Factor ^a (lb/10 ⁶ Btu)
СО	3.7x10 ⁻¹
NO _x	6.8x10 ⁻²
PM ^b	3.46
PM-10 ^c	3.46
PM-2.5°	3.46
SO ₂ ^d	5.9x10 ⁻⁴
VOC ^e	6.3x10 ⁻²

^a Emission factors, except for SO₂, from EPA Document AP-42, Section 13.5, Table 13.5-1 (Ref. 1). These emission factors are for industrial flares.

TABLE 16.2
Actual Emissions from Fire Fighter Training Exercises

II:4 ID			En	nissions (lb/	yr)		
Unit ID	CO	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC
X101-S	6.70	1.23	0.011	62.63	62.63	62.63	1.14
X102-S	13.39	2.46	0.021	125.25	125.25	125.25	2.28
Total (lb/yr)	20.09	3.69	0.032	187.88	187.88	187.88	3.42
Total (ton/yr)	0.01	<0.01	<0.01	0.09	0.09	0.09	<0.01

^b Emission factor for soot was provided; assumed that PM equals soot. The emission factor was given as a range: 0 to 274 μg/L of stack exhaust gases, depending upon the amount of smoke produced. Because propane is burned in the fire training exercises in order to produce smoke, the PM emission factor was assumed to equal 274 μg/L. Data presented in Flare Efficiency Study, Engineering-Science, Inc., Table 10, were used to convert the PM emission factor from units of μ g/L to units of lb/l06 Btu.

^c No PM-10 or PM-2.5 factors or size distribution data were provided; therefore, assumed PM-10 and PM-2.5 equaled PM

^d SO₂ emission factor based upon LPG combustion SO₂ factor from AP-42, Section 1.5 (Ref. 1).

^e Emission factor for THC as methane provided and the methane component of the THC was estimated to average 55 percent; therefore, the VOC emission factor was assumed to equal 45 percent of the THC factor.

17.0 WOODWORKING

Title V Source Designation(s)

Significant Woodworking operations that produce visible emissions in the

outdoor atmosphere or allow significant fugitive particulate

emissions to enter the atmosphere

 \underline{X} Insignificant Woodworking operations that are stationary provided that the

activity is performed indoors, no significant fugitive particulate emissions enter the environment, and no visible emissions enter the

outdoor atmosphere

X Trivial Repair or maintenance activities that are not related to the

source's primary business activity and do not otherwise trigger a permit modification or do not utilize control devices (i.e., required

to be listed in Title V permit application)

17.1 BACKGROUND

Fort Stewart conducts woodworking operations at several locations on the installation. Although most of the post's woodworking operations are conducted outdoors without the use of pollution control devices, three stationary, indoor woodworking operations were identified. For all operations, a cover is used to control fugitive emissions when saw dust is transferred from the collection hopper to a bin or trash dumpster. Data regarding the quantity of dust collected from those operations were obtained through emails with Fort Stewart personnel and through site visits. POCs providing the data are listed in Section 1.0.

No records are maintained on the quantity of dust captured from the woodworking operations. The quantity of dust captured was estimated based on the volume of the bin or dumpster into which the cyclone deposits the collected sawdust, the frequency of which the bin is emptied, and the density of sawdust. It was estimated that the dumpster fed by the cyclone at the DPW Carpentry Shop (Bldg. 1105, Unit ID C102-S) was emptied monthly in CY2007 when it was one-fourth full. [We have assumed that the dumpster gets full an average once every 4 months, or 3 times a year.] The dumpster volume is 175 ft³. The cyclone at C103-S (the shop used by GANG-MATES) empties into two bags that hold 55 gal (7.35 ft³) each. It was estimated that, on average, both bags are emptied every four months (six bags emptied per year). A sawdust density of 11.5 lb/ft³ was taken from the US Air Force Document: *Air Emissions Inventory Guidance Document for Stationary Sources at Air Force Installations* (Ref. 2, Chapter 35).

Bldg. 1065 has a small carpentry shop (C104-S) that builds pallets and crates, with a cyclone dust collector that empties into a 55-gallon drum. The POC of the shop estimated that it gets emptied once every 2 months or about six times per year. There are other carpentry activities at this shop that are controlled by unit-specific dust collection devices and a portable dust collection equipment that does not vent to the outside atmosphere. Likewise, Bldg. 10504 has a small carpentry shop with a vacuum system that empties into 60-gallon plastic bags that are emptied once a year, and which does not vent to the outside atmosphere. We have assumed that dust

emissions from these self-contained units are negligible, and constitute fugitive emissions. Accordingly, we have not estimated emissions from such sources.

An example calculation used to determine the quantity of sawdust collected at Bldg. 1105, Unit ID C102-S is shown below:

Unit ID: C102-S
Volume of collection device: 175 ft³ each
Frequency bins are emptied: 3 times/year
Density of sawdust: 11.5 lb/ft³

Sawdust Collected = $(175 \text{ ft}^3/\text{empty}) * (3 \text{ empties/yr}) * (11.5 \text{ lb/ft}^3)$ = 6,037.5 lb/yr

Information for woodworking activities is presented in Section 17.3, Table 17.1.

Cyclone dust collectors are installed for the carpentry shops located indoors to capture and control particulate emissions. The control device systems are integral components of the operational equipment (i.e., these woodworking activities do not occur without the operation of the control device systems). As per Georgia Rule 391-3-1-.03(10)(g)) these indoor operations are categorized as "insignificant" sources of air pollution as they are equipped with air pollution control devices, performed indoors and do not produce visible emissions in the outdoor atmosphere. Those operations that are conducted outdoors without the use of pollution control devices are categorized as "trivial" sources of air pollution and are not discussed further in this report. No visible emissions result from these operations.

17.2 EMISSIONS ESTIMATES

Actual Emissions

Woodworking operations are sources of particulate emissions. The quantity of particulate emissions emitted depends upon the quantity of sawdust produced and the efficiency of the control device; however, no data was available regarding the particulate control efficiency of these particular control devices.

A cyclone's particulate matter control efficiency increases with increasing particle size. Large diameter, low efficiency cyclones such as those used to control particulate emissions from Fort Stewart's woodworking operations typically capture at least 99 percent of the particulate emissions that are 200 microns in diameter or greater (Ref. 14, Chapter 3, Cyclones and Internal Separators Section, Figure 10). On a mass basis, the quantity of particles generated during woodworking operations that have a diameter below 200 microns is insignificant; therefore, the control efficiency of each woodworking cyclone was conservatively estimated to be 99 percent.

Particulate emissions from each of the woodworking operations were estimated using mass balance procedures as documented in Section 35 of the US Air Force Document: *Air Emissions Inventory Guidance Document for Stationary Sources at Air Force Installations* (Ref. 2). An

example calculation used to estimate the particulate emissions from woodworking operations conducted in Building 1105 (Unit ID C102) is shown below:

Unit ID: C102-S
Volume of Sawdust Collected: 6,037.5 lb/yr
Type of control device: Cyclone
Particulate control efficiency: 99 %w
Particulate matter emitted: 0.1 %w

PM emissions = (6.037.5 lb/yr) * (1.0-0.99) = 60.8 lb/yr

Based on data obtained from the USEPA, Factor Retrieval Information System, Version 6.25 (Ref. 15), 40 percent by weight of the particulate emissions from the woodworking cyclone is classified as PM-10; these emissions were also assumed to represent PM-2.5 emissions. All of the particulate emissions from baghouses were assumed to be classified as PM-10 and PM-2.5. Actual emissions from woodworking operations are presented in Section 17.3, Table 17.2.

Potential Emissions

Emissions from woodworking operations are proportional to the number of hours the operations are conducted per year. The number of hours per year that woodworking operations are conducted is assumed proportional to the number of hours the installation operates per year. Actual installation operations were estimated to occur 2,080 hours per year. Potentially, the installation could operate at 8,760 hours per year. Potential emissions were estimated by multiplying the actual emissions by the ratio of 8,760/2,080.

The use of air pollution control equipment should not be included in potential emission estimates unless the use of the control equipment is included as a federally enforceable condition in a permit. The use of particulate control equipment on Fort Stewart's woodworking operations is not federally enforceable. However, emission controls that are installed for the woodworking shops are integral components of the operational equipment. As such, woodworking operations are not conducted without the operation of the control device. Therefore, the use of control devices was included in the potential emission estimates. Potential emissions are presented in Table 17.3.

Emissions Summary

Table 17.0 summarizes actual and potential criteria pollutant emissions from woodworking at Fort Stewart. HAP emissions are assumed to be negligible. Detailed emission tables that present emissions for each unit are presented in Section 17.3 Tables 17.2 and 17.3.

TABLE 17.0 Emissions Summary – Woodworking Operations

Emission Type	PM	PM-10	PM-2.5
Actual (lb/yr)	70.52	28.21	28.21
Actual (ton/yr)	0.04	0.01	0.01
Potential (lb/yr)	296.99	118.80	118.80
Potential (ton/yr)	0.15	0.06	0.06

Emission Source Updates

There were no new sources installed in CY2007, and existing sources were not modified. However, this inventory has been updated to include the carpentry shop in Bldg. 1065, and has been assigned an ID number of C104-S

17.3 DETAILED SOURCE AND EMISSION TABLES

Tables 17.1 through 17.3 provide source and emission details for the woodworking activities conducted at Fort Stewart in 2007.

TABLE 17.1 Woodworking Activities Information for CY2007

Unit ID	Building Number	Capture Efficiency (%)	Actual Sawdust Collected (lb)	Potential Sawdust Collected (lb)
C102-S	1105	99	6,037.5	25,427.16
C103-S	10501	99	507.15	2,135.88
C104-S	1065	99	507.15	2,135.88

TABLE 17.2
Actual Emissions from Woodworking Operations

Unit ID	Bldg. No.		Emissions (lb/year)	
CIRC ID	Diug. 110.	PM	PM-10	PM-2.5
C102-S	1105	60.38	24.15	24.15
C103-S	10501	5.07	2.03	2.03
C104-S	1065	5.07	2.03	2.03
Total	(lb/yr)	70.52	28.21	28.21
Total ((ton/yr)	0.04 0.01 0.01		

TABLE 17.3
Estimated Potential Emissions from Woodworking Activities

Unit ID	Bldg. No.		Emissions (lb/year)			
CINC ID	Diag. 110.	PM	PM-2.5			
C102-S	1105	254.27	101.71	101.71		
C103-S	10501	21.36	8.54	8.54		
C104-S	1065	21.36	8.54	8.54		
Total	(lb/yr)	296.99	118.80	118.80		
Total ((ton/yr)	0.15 0.06 0.06				

18.0 SUMMARY OF RESULTS

Table 18.1 presents actual emission estimates for criteria pollutants and combined HAP by individual source category. As shown in the table, pollutant emission rates from the fugitive emission source category for prescribed burning and, to a much lesser degree, for ordnance detonation with respect to PM emissions are many times/orders of magnitude greater than the emission rates from the point source emission categories. Therefore, relatively small year-to-year changes in these fugitive source categories (particularly prescribed burning) will greatly affect Fort Stewart's total annual emissions, even if the level of activity for all the other point source categories remains relatively consistent from year to year. As a result, for comparison purposes, between years for the point source categories and with potential emissions, the actual emission totals are shown with and without prescribed burning and ordnance detonation.

If prescribed burning and ordnance detonation are not considered the pollutant with the highest emission rate is VOC (127.2 tpy). NO_x had the next highest emission rate (24.6 tpy). All other pollutants had emission rates less than 20 tpy. If prescribed burning is considered emission rates increase dramatically. For example, VOC has an emission rate of 351.7 tpy, NO_x had an emission rate of 176.8 tpy, and CO and PM (PM, PM-10, PM-2.5) had emission rates that exceeded 1,000 tpy.

If the VOC contributions made by prescribed burning and the landfills are not included, fueling operations (particularly AAFES gasoline dispensing, Unit ID F001-S and F002-S) and spray painting by DOR (Unit ID P001-S) accounts for the majority (approximately 63percent) of the VOC emissions. Miscellaneous chemical use also accounts for a significant amount of VOC emitted, approximately 10 tpy. In addition, if prescribed burning is not considered, a majority of the CO, NO_x and SO₂ emissions are due to the heating units at the CEP. Also, if both ordnance detonation and prescribed burning are not considered, PM emissions are the highest for spray painting and heating units. In general emissions were lower in 2007 when compared to 2006 due to 1) an increase natural gas combustion (less oil burned and no wood burned), 2) reduced paint usage 3) less gasoline dispensed, and 4) a significant decrease in prescribed burning.

Table 18.2 presents the base wide potential emissions for the criteria pollutants. The potential totals **do not include** criteria pollutants from fugitive emission source categories for prescribed burning, ordnance detonation, miscellaneous product usage, fire training exercises, wastewater treatment, and landfills without gas collection device(s). Emissions of criteria pollutants from these fugitive emission source categories are not included in installation-wide Title V potential-to-emit calculations. However, potential HAP emissions reflect emissions from all source categories including the fugitive emission sources.

The pollutant with the highest potential emission rate was NO_x (670.2 tpy). VOC, CO, and SO_2 all had potential emission rates exceeding 280 tpy. Since the criteria pollutant emission rates are above 100 tons per year, Fort Stewart continues to be a major source. Potential combined HAP emissions are estimated to be 89.6 tpy. Therefore, Fort Stewart also continues to be a major source for HAP. As a result, Fort Stewart must comply with Maximum Achievable Control

Technology (MACT)/National Emissions Standards for Hazardous Air Pollutants (NESHAP) requirements that apply to major HAP sources.

Table 18.3 presents the total quantity of the individual HAP. A total of 70 HAP were identified from the base-wide operations. None of the individual HAP exceeded 10,000 pounds. Excluding the landfill the source categories with the largest HAP emissions were spray paint activities and fueling operations. Without the landfill the HAP with the largest emission rate was MIBK (4,618.64 lb/yr). The high MIBK emission rate was the result of spray paint activities. However, the MIBK emissions were more than three times less than what was estimated in 2006. Table 18.4 provides a summary of ODC emissions.

TABLE 18.1 Facility-Wide Estimated Emissions of Criteria Pollutants and Combined HAP (lb/yr)

Source Category	СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC	НАР
Heating Units	35,326	44,809	3,763	970	925	911	2,462	827.95
Internal Combustion Engines	955	4,371	294	293	293	274	342	3.73
Engine Testing	23.8	108	8.81	5.18	5.01	4.88	6.09	0.074
Abrasive Blasting	-	-	-	562	562	562	-	-
Storage Tanks	-	-	-	-	-	-	13,004	948
Fuel Operations	-	-	-	-	-	-	71,911	5,290
Spray Paint Booths	-	-	-	7,073	3,303	3,303	37,845	9,742
Parts Cleaners	-	-	-	-	-	-	4,527	-
Miscellaneous Product Usage	-	-	-	-	-	-	20,030	2,549
Landfills	-	-	-	-	-	-	96,214	10,341
Wastewater Treatment	-	-	-	-	-	-	8,122	0.718
Prescribed Burning	18,432,240	303,371	-	2,777,822	1,998,221	1,998,221	448,434	4,967
Ordnance Detonation	12,466	1,016	57.3	63,525	63,525	63,525	417	692
Refrigeration	-		-	-	-	-	-	-
Fire Training	20.1	3.69	0.032	188	188	188	3.42	-
Woodworking	-	=	-	71	28.2	28.2	-	-
Total (lb/yr) ^a	18,481,032	353,679	4,124	2,850,508	2,067,050	2,067,017	703,317	35,362
Total (ton/yr) ^a	9,240.5	176.8	2.1	1,425.3	1,033.5	1,033.5	351.7	17.7
Total (lb/yr) ^b	36,325	49,291	4,066	9,161	5,304	5,271	254,466	29,703
Total (ton/yr) ^b	18.2	24.6	2.0	4.6	2.7	2.6	127.2	14.9

Note: Total values were summed prior to rounding (rounded values are shown in table).

^a Total with Prescribed Burning and Ordnance Detonation
^b Total without Prescribed Burning and Ordnance Detonation

TABLE 18.2 Facility-Wide Estimated Potential Emissions of Criteria Pollutants and Combined HAP (lb/yr)

Source Category	СО	NO _X	SO ₂	PM	PM-10	PM-2.5	VOC	НАР
Heating Units	905,332	532,681	491,093	15,657	13,108	11,737	33,598	52,009
Internal Combustion Engines	30,539	138,268	8,991	8,933	8,925	8,342	10,446	116
Engine Testing	153,429	669,509	67,704	13,611	11,189	9,354	17,897	307
Abrasive Blasting	-	-	_	2,377	2,377	2,377	-	-
Storage Tanks	-	-	_	-	-	-	28,045	1,995
Fuel Operations	-	-	-	-	-	-	306,726	22,461
Spray Paint Booths	-	-	_	61,586	28,761	28,761	234,403	74,640
Parts Cleaners	-	-	_	-	-	-	23,276	-
Miscellaneous Product Usage	-	-	_	-	-	-	-	10,736
Landfills	-	-	-	-	-	-	85,834	9,226
Wastewater Treatment	-	-	-	-	-	-	-	6.34
Prescribed Burning	-	-	-	-	-	-	-	4,967
Ordnance Detonation	-	-	_	-	-	-	-	2,805
Refrigeration	-	-	-	-	-	-	-	-
Fire Training	-	-	_	-	-	-	-	-
Woodworking	-	-	-	297	119	119	-	-
Total (lb/yr) ^a	1,089,300	1,340,458	567,788	102,462	64,479	60,689	740,224	179,268
Total (ton/yr) ^a	544.6	670.2	283.9	51.2	32.2	30.3	370.1	89.6

^a Totals **do not include** criteria pollutants from fugitive emission source categories- Prescribed Burning, Ordnance Detonation, Miscellaneous Product Usage, Wastewater Treatment, Fire Fighting Training, and Landfills without gas collection device(s). Emissions of criteria pollutants from these fugitive emission source categories are not included in installation-wide Title V potential-to-emit calculations. HAP emission totals reflect emissions from all source categories including the fugitive emission sources.

Note: Total values were summed prior to rounding (rounded values are shown in table).

TABLE 18.3
Facility-Wide Estimated Individual HAP Emissions

racinty-wide Estimated I		
Hazardous Air Pollutants	Actual (lb/yr)	Potential (lb/yr)
1,1,2,2- Tetrachloroethane	86.28*	76.97
1,3-Butadiene	1.76	8.34
2,2,4-TMP	589.49	2,277.52
2,3,7,8-Tetrachlorodibenzo-p-furans	0	1.1E-04
4-Nitrophenol	0.047	0.198
Acetaldehyde	0.726	1,044.39
Acetophenone	0.039	0.165
Acrolein	0.088	4,909.76
Acrylonitrile	155.18*	138.44
Antimony	0	9.69
Antimony Compounds	52.12	219.49
Arsenic	0.114	28.85
Benzene	950.94	7,903.95
Beryllium	0.026	2.46
Bis(2-ethylhexyl) Phthalate	0.495	2.09
Cadmium	822.23	830.18
Cadmium Compounds	135.50	570.67
Carbon Disulfide	20.42*	18.22
Carbon Tetrachloride	0.284	55.44
Carbonyl Sulfide	13.59*	12.13
Chlorine	0	968.86
Chlorobenzene	12.97	52.04
Chloroform	2.38	42.16
Chloromethane	28.24	53.40
Chromium	53.64	83.44
Chromium Compounds	226.66	1,172.39
Cobalt	0.036	8.15
Cobalt Compounds	202.87	1,808.53
Copper	0.041	62.26
Cumene	19.24	97.12
Dibenzofuran	0.063	0.263
Dibutyl Phthalate	2.55	10.75
Dichlorobenzene	0.516	2.54
Dichloromethane	0	355.66
Dimethyl Phthalate	0.063	0.263
Ethyl Chloride	37.24*	33.23
Ethylbenzene	561.26	2,398.71
Ethylene Dichloride	18.75	16.72

Hazardous Air Pollutants	Actual (lb/yr)	Potential (lb/yr)
Ethylidene Dichloride	107.39*	95.80
Formaldehyde	35.76	5,726.02
Hexamethylene Diisocyanate	15.93	78.48
Hexane	1,460.88	5,699.34
Hydrogen Chloride	0	23,301.60
Lead	367.84	641.18
Manganese	326.09	2,291.10
Mercury	0.133	5.93
Mercury Compounds	0.027	0.024
Methanol	2,549.24	10,736.22
Methyl Chloroform	29.61*	26.41
Methylene Chloride	561.15*	500.60
MIBK	4,618.64	37,872.77
MTBE	3,873.39	14,960.85
Naphthalene	173.20	1,650.39
Nickel	53.94	99.02
Nickel Compounds	62.54	263.39
o-Cresol	0.162	0.680
o-Xylene	0	30.66
Phenol	0.469	64.52
POM	3,599.88	4,117.27
Propionaldehyde	0	74.81
Propylene Dichloride	9.37	48.83
Selenium	0.114	8.90
Styrene	112.05	2,802.06
Tetrachloroethylene	285.54*	254.73
Toluene	9,628.73	26,252.40
Trichloroethylene	171.32*	152.84
Vinyl Chloride	211.67*	188.83
Vinylidene Chloride	9.00*	8.03
Xylenes	3,089.83	15,461.36
Zinc	12.51	577.93
Total (lb/yr)	35,362	179,268
Total (ton/yr)	17.68	89.63

^{*} Actual emission rate exceeds potential emission rate because only one of the five landfills had potential emissions.

TABLE 18.4 Facility-Wide Estimated ODC Emissions

Hazardous Air Pollutants	Actual (lb/yr)
Dichlorofluoromethane (R-21)	111.31
Chlorodifluoromethane (HCFC-22)	2476.35
Fluorotrichlormethane (R-11)	43.03
Dichlorodifluoromethane (R-12)	780.81
Carbon Tetrachloride	0.254
Methyl Chloroform	26.41
Total (lb/yr)	3,438.16
Total (ton/yr)	1.72

19.0 REFERENCES

- 1. U.S. Environmental Protection Agency. *Compilation of Air Pollutant Emission Factors Volume I* (AP-42), 5th Edition. Office of Air Quality Planning and Standards. Research Triangle Park, NC. August 2000.
- 2. U.S. Air Force. *Air Emissions Inventory Guidance Document for Stationary Sources at Air Force Installations*. Institute for Environment, Safety & Occupational Health Risk Analysis. Brooks Air Force Base, TX. May 1999.
- 3. U.S. Environmental Protection Agency. *Storage Tank Emissions Calculation Software*, Version 4.08 (TANKS4.0). Emissions Inventory and Factors Group. Office of Air Quality Planning and Standards. Research Triangle Park, NC. December 2000.
- 4. Useful Properties/Characteristics of JP-8 Fuel for Performing Air Emissions Inventories. Wright-Patterson AFB Lab., 1993.
- 5. USEPA/OAQPS, Technical Support Document for Potential to Emit Guidance Memo. Documentation of Emission Calculations. Tim Smith. April 1998.
- 6. U.S. Environmental Protection Agency. *Technical Guidance Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispensing Facilities: Volume I.* EPA-50/3-91-022a. Office of Air Quality Planning and Standards. Research Triangle Park, NC. November 1991.
- 7. Perry, Robert H., *Chemical Engineers Handbook*, Sixth Edition, McGraw-Hill, Inc., New York, NY, 1984.
- 8. U.S. Environmental Protection Agency. *Landfill Air Emissions Estimation Model-* "*LandGEM*", Windows Version 3.02. Office of Air Quality Planning and Standards. Research Triangle Park, NC. May 2005.
- 9. U.S. Environmental Protection Agency. *Procedures for the Preparation of Emissions Inventories for CO and Precursors of Ozone, Volume I: General Guidance for Stationary Sources*. EPA 450/4-91-016. Office of Air Quality Planning and Standards. Research Triangle Park, NC. May 1991.
- 10. U.S. Army Defense Ammunition Center. *Munitions Items Disposition Action System* (MIDAS). Central Library Version 74, August 2004.
- 11. U.S. Army Armament-Munitions and Chemical Command. *Ammunitions Book Complete*, Rock Island, May 1995.
- 12. *Hazard Classification of U.S. Military Explosives and Munitions*. U.S. Army Defense Ammunition Center. Mcalester, OK. Revision 13, March 2007.
- 13. Department of the Army. *Air Pathway Screening Analysis for Resource Conservation and Recovery Act Subpart X Permitting*. U.S. Environmental Center. Aberdeen Proving Ground, MD. May 1995.

- 14. Air & Waste Management Association. *Air Pollution Engineering Manual*. Edited by Buonicore, Anthony J. and Davis, Wayne T. Van Nostrand Reinhold. New York, New York, 1992.
- 15. U.S. Environmental Protection Agency. *Factor Information Retrieval System*, Version 6.25 (FIRE). Office of Air Quality Planning and Standards. Research Triangle Park, NC. December 2005.

Other Resources

CH2M HILL. Draft Calendar Year 2006 Air Emission Inventory for the Department of the Army Headquarters 3rd Infantry Division (Mechanized) and Fort Stewart. January 2008.

Georgia Environmental Protection Division. *Major Source Operating Permit Application Introduction and Instructions*. Air Protection Branch. Atlanta, GA. November 1998.

Georgia Department of Natural Resources. Environmental Protection Division. Georgia Rules for Air Quality Control, Chapter 391-3-1 (effective July 25, 2007).

Versar, Inc. 2006 Air Emission Inventory Fort Stewart. Georgia. March 2008.

Greenhouse Gas Inventory Fort Stewart, GA



FORT STEWART, GA

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LIST OF COMMONLY USED ACRONYMS AND ABBREVIATIONS

BTU British Thermal Unit

CAS# Chemical Abstract Service Number

CH₄ Methane

CO₂ Carbon Dioxide

CO₂e Carbon Dioxide Equivalent CNG Compressed Natural Gas

E-85 Ethanol 85

GAEPD Georgia Environmental Protection Division

GHG Greenhouse Gas

GWP Global Warming Potential

GRP The Climate Registry's General Reporting Protocol Version 1.1

GSA U.S. General Services Administration

Ft. Stewart Fort Stewart

HFC Hydrofluorocarbons kWh Kilowatt-Hour

LPG Liquefied Petroleum Gas

Lbs Pounds

MMCF Millions of Cubic Feet
mpg Miles Per Gallon
MT Metric Ton
MWh Megawatt-Hour

 $\begin{array}{lll} \text{MWh} & \text{Megawatt-Hou} \\ \text{N}_2\text{O} & \text{Nitrous Oxide} \\ \text{NG} & \text{Natural Gas} \end{array}$

OH- Hydroxyl Radical PFC Perfluorocarbons

POV Privately Owned Vehicle(s)

Protocol California Climate Action Registry General Reporting Protocol, Version 2.2 (March 2007)

SAR Second Assessment Report of the Intergovernmental Panel on Climate Control

SF₆ Sulfur Hexafluoride

Tons 1 ton (metric) = 2,204.62 pounds; 1 ton (metric) = 1,000 kg

USEPA United States Environmental Protection Agency

VMT Vehicle Miles Traveled

EXECUTIVE SUMMARY

The state of Georgia does not have a program or policy requiring the reduction of greenhouse gases (GHG), but Georgia is following the activities associated with the development of a national policy. Congress has directed the United States Environmental Protection Agency (USEPA) to promulgate a rule requiring mandatory reporting of greenhouse gas emissions under the Consolidated Appropriations Act, 2008 (H.R. 2764; Public Law 110–161). The USEPA is also charged with creating the reporting threshold and determining the reporting frequency for greenhouse gas emissions. The proposed rule is scheduled to be ready for review by October 2008 and finalized by June 2009. As of May 21, 2007, the state of Georgia became a member of The Climate Registry. The Climate Registry is a non-profit organization formed by 39 states to develop a standardized methodology for the reporting of greenhouse gas emissions. More information on The Climate Registry can be found at www.theclimateregistry.org. In light of this pending regulation, Fort Stewart contracted GEOMET Technologies to generate a greenhouse gas emissions inventory for Fort Stewart; this report contains the results of the effort.

Fort Stewart is located north of the City of Hinesville, Georgia, in parts of Bryan, Evans, Liberty, Long, and Tattnall Counties. The towns of Glennville, Claxton, Pembroke, Eden, and Richmond Hill are adjacent to Fort Stewart's western, northwestern, northern, northeastern, and eastern boundaries, respectively. Fort Stewart is situated on 279,270 acres of coastal plain and is about 39 miles from east to west and 19 miles from north to south. The northeast boundary of the installation is 10 miles from the City of Savannah, Georgia.

In June 1940, the U.S. Army established an anti-aircraft artillery training center at the current location of Fort Stewart. The installation originally was named Camp Stewart in honor of the Revolutionary War hero General Daniel Stewart. Camp Stewart was renamed Fort Stewart Antiaircraft Artillery and Tank Training Center in April 1956. The U.S. Army designated the training center as U.S. Army Garrison, Fort Stewart in 1972.

Fort Stewart's mission is to provide the 3rd Infantry Division (Mechanized), and tenant activities with the support necessary to effectively train, mobilize, and deploy a mechanized infantry division and follow-on Active Component and Reserve Component units while providing a high standard quality of life. The current force structure at Fort Stewart includes the following primary tenant units: 1st Battalion, 58th Aviation Regiment; 1st Battalion, 75th Ranger Regiment; 3rd Battalion, 160th Special Operations Regiment; 15th Air Support Operations Squadron; 188th Infantry Brigade; Army and Air Force Exchange Service (AAFES); Defense Commissary Agency; Defense Reutilization and Marketing Organization (DRMO); U.S. Army Dental Activity; U.S. Army Medical Department Activity; Winn Army Community Hospital (WACH); and the Georgia Army National Guard (GANG). All base activities were considered in generating the greenhouse gas report.

The guidelines outlined in the California Climate Action Registry General Reporting Protocol Version 2.2 (Protocol) were used to quantify the greenhouse gas emissions for several sources at Fort Stewart. The California Climate Action Registry is closely related to The Climate Registry and the two entities worked together to finalize The Climate Registry's General Reporting Protocol Version 1.1 (GRP). These guidelines are in line with the World Resources Institute's policies on greenhouse gas inventories and therefore are acceptable to the United States Environmental Protection Agency. Greenhouse gas inventories, although not yet mandatory, are helpful in that they provide a record of greenhouse gas emissions. This greenhouse gas report is a preliminary effort and thus is not certifiable by the standards set forth in the California Climate Action Registry (CCAR) or The Climate Registry certification protocols. Certification is a third party process required of registered CCAR participants.

As inventories are compiled in the years following the baseline inventory assessment, reductions in greenhouse gas emissions can be evaluated. Having a baseline inventory will also assist Fort Stewart, when greenhouse gas reporting regulations are put in place. Additionally it can be used to show further proof of the Fort Stewart's environmental commitment.

Table 1 shows that the CO₂ equivalent (CO₂e) emissions for CY2006 from Ft. Stewart were 497,715 metric tons. This baseline inventory indicates that the mobile source sector accounts for the largest part of Fort Stewart's greenhouse gas emissions at 65% of the total greenhouse gas inventory. The electricity use source sector accounts for another 29% of the inventory, and the stationary combustion source sector accounts for a mere 6% of the inventory. Within the stationary source sector, wood combustion makes up the majority of the emissions, followed by natural gas combustion, with a small contribution from fuel oil and propane fuel combustion.

Table 1: Emissions Estimate & Comparison

Source Sector	Emissions (MMt CO ₂ e)			
Source Sector	Ft. Stewart	Hunter AAF		
Electricity	0.144	0.047		
Transportation	0.326	0.046		
Fuel Combustion (Stationary Source)	0.028	0.005		
Waste	N/A	N/A		
Agriculture	N/A	N/A		
All others	N/A	N/A		
Industrial process	N/A	N/A		
TOTAL	0.498	0.098		

Measures that we identified to reduce Fort Stewart's greenhouse gas emissions include updating the age of the fleet and conducting an energy audit for the base.

INTRODUCTION

Greenhouse gas inventories assist organizations in the accounting of emissions over a certain time period. The inventories typically account for six gases: carbon dioxide (CO_2) ; methane (CH_4) ; nitrous oxide (N_2O) ; sulfur hexafluoride (SF_6) ; eight varieties of hydrofluorocarbons (HFC); and six varieties of perfluorocarbons (PFC). These gases occur naturally and are also human induced, and are a part of the Kyoto Protocol – an international agreement to reduce greenhouse gas emissions in the atmosphere.

This greenhouse gas report is a preliminary effort and thus is not certifiable by the standards set forth in the California Climate Action Registry or The Climate Registry certification protocols. Certification is a third party process required of registered CCAR participants. A multitude of assumptions were made, especially in the mobile source sector. This was necessary because Fort Stewart is not a part of the registry and the greenhouse gas emission inventory was conducted in order to give a general overview of where Fort Stewart's GHG emissions are generated. These assumptions were necessary to complete the task within the scope of the project, and it was beyond the scope to conduct an in-depth analysis of the mobile sector. A certifiable greenhouse gas emission inventory would require extensive site visits to gather the necessary data. In the future this task may be required.

Rating Scale and Reporting Requirements for Greenhouse Gases

The six GHG gases are rated on a scale called global warming potential (GWP). The GWP is a CO₂-based scale for non-CO₂ emissions. It compares the ability of each gas to cause radiative forcing with that of CO₂. Radiative forcing is a change in the atmospheric balance of incoming and outgoing radiation. The GWP of CO₂ is 1, as CO₂ is the base against which all other GHG pollutants are measured. Methane has a GWP of 21 and nitrous oxide has a GWP of 310. This means that one ton of CH₄ is equivalent to 21 tons of CO₂ and one ton of N₂O is equivalent to 310 tons of CO₂. The synthetic (fluorinated) gases, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride, are powerful greenhouse gases in that their global warming potentials are quite high compared to those of the other gases. The synthetic gases have GWP ranging from 1,300 to 23,900, with one anomaly in the synthetic gases having a GWP of 140 (HFC152a difluoroethane). Currently there is no mandate to report greenhouse gas emissions to the United States Environmental Protection Agency (USEPA). There is, however, a voluntary reporting structure in some states, and the USEPA has drafted guidelines for states to quantify their greenhouse gas emissions (State Workbook: Methodologies for Estimating Greenhouse Gas Emissions, 1995). The USEPA also has guidelines for states to construct State Action Plans to address greenhouse gas emissions (States Guidance Document: Policy Planning to Reduce Greenhouse Gas Emissions, 1998).

Sources and Sinks of Greenhouse Gases

Greenhouse gases are the result of both human activities and the natural carbon cycle. The greenhouse gases of significance at Ft. Stewart are carbon dioxide, methane, nitrous oxide and hydrofluorocarbons. The other fluorinated gases are not accounted for in the Ft. Stewart 2006 base year inventory. Greenhouse gases originate from many sources.

Carbon dioxide is emitted through the combustion process with the burning of fossil fuels, solid waste, and wood products. Carbon dioxide also is emitted through some non-energy production processes such as cement production. Carbon dioxide is removed from the atmosphere through natural processes when it is absorbed by plants.

Methane is emitted through the production of coal, natural gas and oil and as a by-product of coal mining and incomplete fossil fuel combustion. Methane also is released through natural processes such as animal and municipal solid waste decomposition as well as in the cultivation of rice. Methane is removed from the atmosphere through interaction with the hydroxyl radical (OH-) and eventually is converted to CO₂.

Nitrous oxide is emitted through human activities such as fossil-fuel combustion, agricultural fertilization, and the treatment of waste water. It is produced naturally by several means, such as soil microbial action and manure decomposition. Nitrous oxide is removed from the atmosphere by the photolytic action of the sun in the stratosphere.

The fluorinated gases are wholly synthetic and are emitted from various industrial processes. They can be used as substitutions for ozone-depleting substances and are usually used in smaller quantities. Despite their limited use, their high global warming potentials make them potent greenhouse gases.

1.0 METHODOLOGIES

The greenhouse gas inventory was created by following the methods outlined in the *California Climate Action Registry Protocol Version 2.2(Protocol)*. The steps to create a greenhouse gas inventory include: establishing organizational boundaries; defining the entity; establishing a baseline; gathering data; and calculating the emissions. The boundaries for Ft. Stewart are considered to be the entire base. Fort Stewart's organizational structure is management-controlled and the level of control of the facility is wholly owned. This means that all the operations within Ft. Stewart's boundaries are fully controlled by Ft. Stewart and all the resultant greenhouse gas emissions must be reported. The choice of a baseline year is left to the entity and can be any year from 1990 forward. The baseline year chosen by Ft. Stewart is calendar year 2006, because it is the year for which the data are most readily available for evaluation.

The greenhouse gas emissions at Ft. Stewart are from both direct and indirect sources. The direct emission sources include mobile combustion, stationary combustion and fugitive emissions. The only indirect emission source is electricity use. The greenhouse gas emission sources specific to Ft. Stewart are listed below.

Direct Sources:

- Combustion of fuel for boilers (stationary);
- Combustion of fuel for emergency generators (stationary);
- Mobile combustion (mobile); and

Indirect Sources:

• Electricity use.

The greenhouse gas emissions were calculated using fuel consumption for the stationary combustion sector, vehicle miles traveled and fuel consumption for the mobile combustion sector. Annual electricity consumption was obtained in order to calculate emissions from the electricity use source sector. Emission factors were obtained from the appendices in the *Protocol*.

The final step in calculating emissions in a greenhouse gas inventory was to convert the emissions of methane and nitrous oxide to carbon dioxide equivalents (CO₂e). This step was accomplished by applying the global warming potential factor to the emissions for each gas. The total CO₂ emissions were summed with the CO₂e emissions of methane and nitrous oxide and reported as total metric tons of CO₂e emissions.

1.1 DIRECT EMISSION SOURCES

Direct emissions sources are described in the *Protocol* as emissions from sources that are owned or controlled by the reporting organization. Within the direct emission sources are the source

sectors of mobile combustion, stationary combustion and fugitive emissions. The methodologies used to evaluate the emissions emanating from these source sectors are described below.

1.1.1 MOBILE COMBUSTION

Fort Stewart's mobile emissions were derived using the EPA model MOBILE6.2. MOBILE6.2 is a model for predicting emissions of hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NO_x), carbon dioxide (CO₂), particulate matter (PM), and toxics from cars, trucks, and motorcycles under various conditions. This model uses data obtained through vehicle registrations and state emissions programs to generate emission factors for mobile sources. For this effort, the CCAR emissions factors were used to verify MOBILE6.2 emission factors and to generate N₂O emissions since they are not accounted for in MOBILE6.2. Usually mobile combustion is accounted for in terms of both on-road and off-road vehicles. At Fort Stewart, the on-road vehicle fleet consists of government (GSA) and privately owned vehicles (POV) as well as military vehicles. The off-road vehicles are not accounted for in this inventory because the data was not available.

On-Road Vehicles

MOBILE6.2 was used to generate two scenarios for Fort Stewart. Both scenarios included vehicles residing on base and vehicles visiting the base. The difference between the two scenarios is that Scenario I only accounts for the vehicle miles traveled on the base while Scenario II includes travel on and off the base within a distance of 45 miles (the distance to Hunter Army Airfield and nearby towns).

MOBILE6.2 produced emissions factors for both scenarios based on several inputs to the model including: external conditions, vehicle fleet characteristics, gasoline specifications, fuel commands specific to air toxics, state programs and alternative emissions regulations, and control measures. All of these inputs are essential to generating emission factors for the mobile source sector. The defaults for the model were used where site specific values were not attainable or would not benefit the model. One such example is in the vehicle age distribution. The vehicle registration data obtained from Ft. Stewart staff provided inputs for passenger vehicles, light-duty trucks and motorcycles; MOBILE6 default values were used for the remaining classes of vehicles, as data were not available from Fort Stewart.

According to CCAR protocol, the emission factors for mobile on-road combustion are based on one of two variables – either fuel use or vehicle miles traveled (VMT). Carbon dioxide emissions are directly related to the amount of fuel consumed by a vehicle. Therefore its emission factor (10.15 kg/gallon diesel and 8.81 kg/gallon gasoline) is based on fuel consumption. The USEPA maintains a website that provides fuel economy data for most of the gasoline-fueled vehicles in the country. The vehicles on the website range in model year from 1985 to the present model year (www.fueleconomy.gov/feg/). The fuel economies, reported in

miles per gallon (mpg), relate how efficiently a given vehicle uses fuel within average operating conditions. Average operating conditions for a vehicle are considered to be 45% highway driving and 55% city driving. The cumulative miles traveled and the fuel economy both were used to calculate fuel consumption.

The emission factor used for methane and nitrous oxide is based on cumulative vehicle miles traveled and is expressed as mass of pollutant per unit distance traveled. This approach is used because the combustion emissions of CH₄ and N₂O depend more on the emission control technologies in a given vehicle.

Table 2 below summarizes the on-road vehicle data and the associated emission factors for CH_4 and N_2O (for passenger vehicles) as generated through the MOBILE6.2 model and as presented in the California Climate Action Registry General Reporting Protocol.

Table 2
On-Road Fleet Emission Factors for Methane and Nitrous Oxide

	MOBILE6.2		California Climate Action Registry			
G .		EF (g/mi)			Mr. 1-137	
	Scenario		CH ₄	N ₂ O	Model Year	
	January week-day	0.06	0.06	0.08	1984-1991	
1	January weekend-day	0.06	0.06	0.07	1992	
1	July week-day	0.05	0.05	0.05	1993	
	July weekend-day	0.05	0.05	0.04	1994-1999	
	January week-day	0.05	0.04	0.04	2000– present	
2	January weekend-day	0.04				
	July week-day	0.04				
	July weekend-day	0.04				
	AVERAGE EF	0.05	0.05	0.06		

^{*(}g/mi) = grams per mile.

In order to compare MOBILE6.2 outputs with the emissions generated through the methodology used in the California Climate Action Registry General Reporting Protocol, we made an effort to calculate the emissions due to mobile sources at Fort Stewart based on fuel use and VMT. Appendix A shows the VMT by vehicle type, age, and fuel type.

We estimated average fuel efficiency of each vehicle class by taking the highest and lowest fuel efficiency by class (passenger cars, trucks and motorcycles) for both highway and city driving. Once average fuel efficiency was established, we calculated the gallons of gasoline used in that year by dividing vehicle miles traveled by average fuel efficiency (miles per gallon). The CCAR methodology requires the model year of each vehicle in the fleet to be known. Table 2 of the technical report "Mobile Source Air Emissions Inventory for 2008: Fort Stewart, Georgia" contains the vehicle age mix for the POV at Fort Stewart. Accordingly we weighted each vehicle class by the age mix factor and applied the CCAR emission factors. Table 3 summarizes the findings for CCAR versus MOBILE6.2 emissions.

Table 3
CCAR vs. MOBILE6 Emissions

P	Collutants	CH ₄	N ₂ O	CH ₄	N ₂ O	CO ₂		
		Gra	ams		Tonnes			
	MOBILE6.2	2,737,832	n/a	3.02	n/a	27,826		
Scenario I	CCAR	2,422,977	2,603,476	2.67	2.87	25,703		
	M6/CCAR ratio	2,737,832	2,941,785	3.02	3.24	n/a		
*CO	₂ e emissions			63.38	1,005.26	27,826		
	MOBILE6.2	24,485,407	n/a	30.33	n/a	316,075		
Scenario II	CCAR	27,514,528	29,564,209	26.99	32.59	291,874		
	M6/CCAR ratio	24,485,407	26,309,436	26.99	29.00	n/a		
*CO ₂ e emissions				566.80	8,990.37	316,075		

^{*}In reporting CO₂e emissions the values obtained from the MOBILE6 model for CH₄ and CO₂ emissions are used and the value for N₂O obtained through the M6/CCAR ratio is used; N₂O and CH₄ are also multiplied by their respective GWP.

The MOBILE model generates an emission factor for NO_x ; however NO_x is comprised of NO (nitric oxide) and NO_2 (nitrogen dioxide) both reactive oxides of nitrogen. Nitrous Oxide (N_2O) is a stable form of nitrogen and oxygen. MOBILE6.2 does not generate an emission factor for nitrous oxide, thus the emissions of N_2O were calculated based on the ratio of the MOBILE6.2 model's methane emissions to that obtained using the CCAR methodology. It was found that the difference between M6 and CCAR was approximately 12%. This is most likely due to the many assumptions made regarding the fleet characteristics. This 12% was applied to the CCAR emissions of N_2O to generate a value representative of the MOBILE6.2 model.

The emissions generated for Scenario II are an order of magnitude greater than those generated for Scenario I. This is the result of Scenario II having a greater vehicle count than Scenario I. Scenario II is the more inclusive scenario in that it accounts for emissions for which Fort Stewart is directly and indirectly responsible. It accounts for all delivery and visiting vehicles as well as the GSA and military vehicle fleet. The *Protocol* defines the emissions generated by delivery vehicles and the like as "optional indirect" emissions. These emissions are not required to be reported but help to give a better understanding of the entity's greenhouse gas emission impacts. Scenario II was therefore used in the final evaluation of greenhouse gases for Fort Stewart as it is most representative of the true impact Fort Stewart has on greenhouse gas emissions in the state.

1.1.2 STATIONARY COMBUSTION

The stationary combustion sources contributing to greenhouse gas emissions consist of boilers and generators. The boilers and generators are permitted by Georgia Environmental Protection Division (GAEPD). Included in the permit are operating parameters and operating limits for the units. These limits are imposed to protect air quality in Georgia. Permitted fuels are wood, natural gas, liquefied petroleum gas, and distillate fuel oil (FO#2, JP-8, diesel). Each fuel has to be considered on an individual basis when calculating GHG emissions generated from its combustion. Fort Stewart staff keeps a monthly log of fuel use and electric generation. This log was acquired to calculate the greenhouse gas emissions attributable to the combustion of fuels.

Table 4 summarizes the annual fuel use and the emissions resulting from fuel combustion. Appendix A shows the monthly distribution of fuel usage for the different types of fuel.

Table 4
Fuel Consumption and Emissions Summary for Stationary Combustion Sources

	Fuel	Emissions					
Fuel Type	Consumption (tons, gallon, or MMBtu)*	CO ₂ (MT)	N ₂ O (MTCO ₂ e)	CH ₄ (MTCO ₂ e)	Total (MTCO ₂ e)		
Wood	12,021	19,129.62	17.51	88.71	19,235.84		
FO#2	60,886	617.99	1.89	1.79	621.67		
LPG	75,967	452.00	2.35	1.60	455.95		
NG	141,316	7,496.81	4.38	17.51	7,518.70		

^{*} Wood is in metric tons; FO#2 and LPG consumption is expressed in gallons; NG consumption is expressed in MMBtu.

1.2 INDIRECT EMISSION SOURCES

Emissions from indirect emission sources are described in the *Protocol* as emissions that occur as a result of an organization's actions, but are produced by sources owned or controlled by another entity. These sources can be electricity use, district heating and cooling, or imported steam and electricity from a co-generation plant. Additional indirect sources of emissions are activities not directly controlled by the entity. The only indirect emission source included in this inventory is electricity use. Electricity use also was identified as a possible source for energy savings. Electricity consumption is tabulated by Ms. Denise Kelley on a monthly basis. The consumption data were obtained to evaluate greenhouse gas emissions due to electricity use.

1.2.1 ELECTRICITY USE

Electricity consumption is a result of energy use by office machines, lights, air conditioners and electrified vehicles. Fort Stewart's consumption is expressed in megawatt hours (MWh) on the monthly compilation worksheet supplied by Ms. Kelley. Table 5 below provides a month-bymonth summary of the greenhouse gas emissions resulting from electricity use.

Table 5
Electricity Consumption and Emissions, by Month (CY2006)

Month	Electricity Consumption	Emissions (lbs)			Total Emissions
Month	(kWh)	CO_2	CH ₄	N ₂ O	(MTCO ₂ e)
Jan	14,724,148	10,428.96	0.09	0.15	14,724,148
Feb	12,891,198	9,130.70	0.08	0.13	12,891,198

March	Electricity	Em	Total Emissions		
Month	Consumption (kWh)	CO ₂	CH ₄	N ₂ O	(MTCO ₂ e)
Mar	13,018,238	9,220.69	0.08	0.13	13,018,238
Apr	15,907,008	11,266.77	0.09	0.16	15,907,008
May	16,010,274	11,339.91	0.09	0.16	16,010,274
Jun	19,507,959	13,817.29	0.11	0.20	19,507,959
Jul	21,955,897	15,551.14	0.13	0.23	21,955,897
Aug	22,112,695	15,662.20	0.13	0.23	22,112,695
Sep	21,216,558	15,027.47	0.12	0.22	21,216,558
Oct	16,040,510	11,361.33	0.09	0.16	16,040,510
Nov	14,202,410	10,059.42	0.08	0.15	14,202,410
Dec	14,955,083	10,592.53	0.09	0.15	14,955,083
TOTAL	202,541,978	143,458	1.19	2.08	202,541,978

Appendix B provides sample calculations for GHG emissions from electricity consumption.

1.2.2 ADDITIONAL INDIRECT SOURCES

The *Protocol* describes other indirect sources of emissions at the Ft. Stewart facility as employee commuting, off-site waste disposal (including transport of the wastes), production of purchased raw materials, product use and disposal, outsourced activities and contracting. Some of these indirect sources were considered in this report, particularly employee commutes, deliveries, and contractor traffic. However, our calculations were based on vehicle registration data, and included many assumptions. In the future, if a more thorough greenhouse gas inventory is needed, it would be advisable to conduct a more thorough data collection effort for these sources in order to have a complete account of activities.

2.0 GHG INVENTORY SUMMARY

There are multiple sources of greenhouse gas emissions at Ft. Stewart. A summary of emissions by source sector and fuel type is provided in Table 6 below. Note that the mobile combustion sector makes up the bulk of the greenhouse gas emissions, followed by the electricity use sector and the stationary combustion sector.

Table 6
Summary of GHG Emissions by Source Sector and Fuel Type

Source Sector	Emissions Type	Fuel Type	CO ₂ (MT)	N ₂ O (MTCO ₂ e)	CH ₄ (MTCO ₂ e)	TOTAL (MTCO ₂ e)
	Direct	Wood	19,129.62	17.51	88.71	19,235.84
Stationary External	Direct	NG	7,496.81	4.38	17.51	7,518.70
Combustion	Direct	Fuel Oil	617.99	1.89	1.79	621.67
	Direct	Propane	452.00	2.35	1.60	455.95
Stat. Generators	Direct	Diesel	123.90	0	0	123.90
Mobile Comb.	Direct/Indirect	Gasoline/Diesel	316,075.00	8,989.96	566.80	325,631.76
Electric Use	Indirect	Electricity	143,458.43	24.89	643.65	144,126.97
Total			487,353.75	9,040.98	1,320.06	497,714.80

^{*}Values based on Scenario II in Mobile6.2 evaluation.

Mobile Combustion

The emissions generated from the mobile combustion sector account for about 65% of the total greenhouse gas inventory. This is over half of the greenhouse gas emissions generated by Fort Stewart. The direct carbon dioxide emissions account for 97% of the CO₂e emissions, leaving methane and nitrous oxide accounting for only 3% of the total CO₂e emissions. The mobile data that was made available was a sampling of the actual data for Fort Stewart. The absence of the actual data for the military and GSA vehicle fleets could impact the mobile sector's total greenhouse gas emissions. We advise that in the future the mobile combustion sector be closely monitored for growth, and that more exact data be gathered to facilitate a more accurate inventory of this sector. When a more thorough inventory is sought the GSA and military vehicle data will be pertinent in assessing the true impact of the mobile source sector on Fort Stewart's greenhouse gas emissions. The mobile source sector also is important in that it is a key sector where reductions may be sought through simple measures such as vehicle retrofits and fleet modernization.

Electricity Use

The source with the second greatest emissions is electricity use. Greenhouse gas emissions generated from electricity use account for 29% of the carbon-dioxide-equivalent emissions at Ft.

Stewart. In this source sector, as in most, direct carbon dioxide emissions comprise the bulk of the CO₂e emissions, with methane and nitrous oxide making a minuscule contribution. The direct carbon dioxide emissions account for 99.5% of the total greenhouse gas emissions generated as a result of electricity use, with methane and nitrous oxide emissions combined accounting for just half a percent.

Stationary Combustion

The smallest contributor to the greenhouse gas emissions generated at Ft. Stewart is the stationary combustion source sector. This sector accounts for less than 6% of the greenhouse gas emissions. As with electricity use, in this sector the direct carbon dioxide emissions account for the bulk of total greenhouse gas emissions. Direct carbon dioxide emissions are more than 99% of the total GHG emissions, with N_2O and CH_4 contributing the remaining amounts.

2.1 POSSIBLE REDUCTIONS

In the mobile combustion source sector there are many options for reducing greenhouse gas emissions. The fleet data made available for this study consisted of privately owned vehicles, therefore Ft. Stewart has little to no control over the age of these vehicles. The vehicles of concern are owned by personnel and Ft. Stewart cannot influence these owners to exchange them for newer models any time in the near future. Upgrading the government-owned fleet would be one of the easiest ways to reduce the greenhouse gas emissions generated by the mobile source sector. Additionally the purchase of alternative-fuel vehicles may reduce the emissions in the mobile combustion source sector; but again individual preference will prevail in this matter. The age of the fleet is crucial in evaluating greenhouse gas emissions; therefore for future efforts it is pertinent that not only the number and types of vehicle be known but the model years as well.

Reductions may be identified in the electricity use sector's emissions by conducting an energy audit. Such an effort will indicate areas of energy inefficiency which, if addressed, could help in reducing electricity consumption.

APPENDIX A

TABLES FOR VEHICLE MILES TRAVELED AND STATIONARY SOURCE FUEL CONSUMPTION

Table A - 1
Scenario II On-Road Fleet Vehicle Miles Traveled (VMT)

Vehicle Type	Fuel	Model Year	VMT
		2000-present	94,541,749.40
		1994-1999	67,425,751.07
Passenger Cars	na alina	1993	7,851,498.02
Tassenger Cars	gasoline	1992	6,515,933.93
		1984-1991	21,288,082.27
		1980-1983	4,714,945.98
		1996-present	2,603,637.14
Motorcycles	gasoline	1966-1995	271,343.95
		2000-present	168,312,809.64
	gasoline	1994-1999	90,118,843.09
Light Duty Trucks		1993	8,009,245.44
		1992	6,733,698.94
		1984-1991	18,628,911.61
		1980-1983	4,864,875.01

Table A - 2
Fuel Oil Consumption and Emissions

	Fuel Oil		Emissions	
Month	Consumption (Gallons)	CO ₂ (MT)	N ₂ O (MTCO ₂ e)	CH ₄ (MTCO ₂ e)
Jan-06	9,782	99.29	0.30	0.29
Feb-06	9,461	96.03	0.29	0.28
Mar-06	10,746	109.07	0.33	0.32
Apr-06	3,193	32.41	0.10	0.09
May-06	2,984	30.29	0.09	0.09
Jun-06	0	0.00	0.00	0.00
Jul-06	1,564	15.87	0.05	0.05
Aug-06	250	2.54	0.01	0.01
Sep-06	2,919	29.63	0.09	0.09
Oct-06	4,195	42.58	0.13	0.12
Nov-06	4,846	49.19	0.15	0.14
Dec-06	10,946	111.10	0.34	0.32
TOTAL	60,886	617.99	1.89	1.79

Table A - 3
LPG Consumption and Emissions

Month	LPG Usage(gallon)	CO ₂ (MT)	N ₂ O (MTCO ₂ e)	CH ₄ (MTCO ₂ e)	Total (MTCO ₂ e)
Jan-06	18,890	112.40	0.59	0.40	113.38
Feb-06	8,840	52.60	0.27	0.19	53.06
Mar-06	14,218	84.60	0.44	0.30	85.34
Apr-06	7,391	43.98	0.23	0.16	44.36
May-06	1,985	11.81	0.06	0.04	11.91
Jun-06	2,322	13.82	0.07	0.05	13.94
Jul-06	965	5.74	0.03	0.02	5.79
Aug-06	0	0.00	0.00	0.00	0.00
Sep-06	2,144	12.76	0.07	0.05	12.87
Oct-06	2,297	13.67	0.07	0.05	13.79
Nov-06	12,485	74.29	0.39	0.26	74.93
Dec-06	4,430	26.36	0.14	0.09	26.59
TOTAL	75,967	452.00	2.35	1.60	455.95

Table A - 4
Natural Gas Consumption and Emissions

Month	Month NG Usage (MMcf)		CO ₂ (MT)	N ₂ O (MTCO ₂ e)	CH ₄ (MTCO ₂ e)
Jan-06	17,466.00	17,989.98	954.37	0.56	2.23
Feb-06	17,227.00	17,743.81	941.31	0.55	2.20
Mar-06	18,017.00	18,557.51	984.48	0.58	2.30
Apr-06	12,545.00	12,921.35	685.48	0.40	1.60
May-06	5,864.00	6,039.92	320.42	0.19	0.75
Jun-06	4,854.00	4,999.62	265.23	0.15	0.62
Jul-06	4,299.00	4,427.97	234.90	0.14	0.55
Aug-06	4,753.00	4,895.59	259.71	0.15	0.61
Sep-06	0.00	0.00	0.00 0.00		0.00
Oct-06	Oct-06 14,182.00		774.93	0.45	1.81
Nov-06	Nov-06 16,193.00		16,678.79 884.81		2.07
Dec-06	21,800.00	22,454.00	1,191.18	0.70	2.78
TOTAL	137,200	141,316	7,496.81	4.38	17.51

APPENDIX B

SAMPLE CALCULATIONS

GREENHOUSE GAS SAMPLE EMISSIONS CALCULATION

Example A: Formulae used for calculating greenhouse gas emissions from electricity use source sector.

$$\begin{array}{c} \text{Total CO}_2 \\ \text{Emissions} \\ \text{(MT)} \end{array} = \begin{array}{c} \text{Electricity} \\ \text{Use} \\ \text{(kWh)} \end{array} \times \begin{array}{c} \text{Electricity} \\ \text{Emission} \\ \text{Factor} \\ \text{(lbs CO}_2\text{/kWh)} \end{array} \div \begin{array}{c} 2,204.62 \\ \text{lbs/MT} \end{array}$$

$$\begin{array}{c} \text{Total N}_2\text{O} \\ \text{Emissions} \\ \text{(MT)} \end{array} = \begin{array}{c} \text{Electricity} \\ \text{Electricity} \\ \text{Emission} \\ \text{Emission} \\ \text{(lbs} \\ \text{(lbs} \\ \text{N}_2\text{O/kWh)} \end{array} \div \begin{array}{c} 2,204.62 \\ \text{lbs/MT} \end{array}$$

$$\begin{array}{c} \text{MT of} \\ \text{CO}_2\text{e} \end{array} = \begin{array}{c} \text{MT of} \\ \text{Non-CO}_2 \text{ GHG} \end{array} \times \begin{array}{c} \text{GWP} \\ \text{(*SAR, 1996)} \end{array}$$

Intergovernmental Panel on Climate Change's Second Assessment Reports (SARs)

Example B: Greenhouse gas emissions calculation for electricity use source sector.

- i). CO₂ Emissions:
 - CO₂ Emission factor = 1,164.19lb/MWh
 - CO_2 Emissions = 1.16 lb/kWh x 46,168,000 kWh = 53,748,324 lb
 - CO_2 Emissions = 53,748,324 lb/2204.62 lb/metric ton = 24,379.86 metric tons
- ii). N₂O Emissions:
 - N_2O Emission factor = 0.0192 lb/ MWh

$$1 \text{ MWh} = 1000 \text{ kWh}$$

$$0.0192 \text{ lb/MWh} / 1,000 \text{ kWh/MWh} = 1.92 \text{ x } 10^{-5} \text{ lb/kWh}$$

$$N_2O$$
 Emissions = 1.92 x 10^{-5} lb/kWh x 46,168,000 kWh = 886 lb

$$N_2O$$
 Emissions = 886 lb / 2,204.62 lb/metric ton = 0.40 metric tons

$$CO_2e$$
 (for N_2O) = 0.40 metric tons x 310 = 124.64 metric tons

iii). Methane (CH₄) Emissions:

$$1 \text{ MWh} = 1000 \text{ kWh}$$

$$0.0137 \text{ lb/MWh} / 1,000 \text{ kWh/MWh} = 1.37 \text{ x } 10^{-5} \text{ lb/kWh}$$

$$CH_4$$
 Emissions = 1.37 x 10^{-5} lb/kWh x $46,168,000$ kWh = 633 lb

The GWP of CH₄ is 21

$$CO_2e$$
 (for CH_4) = 0.29 metric tons x 21 = 6.02 metric tons

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Phone: 301-428-9898

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TO: Tressa Rutland, David Montano, Ft. Stewart

FROM: Rahul Chettri DATE: April 24, 2008

RE: Preliminary PSD Analysis: 5th BCT Construction

CC: Radhika Narayanan, GEOMET

A. EXECUTIVE SUMMARY

This findings report in memo format presents the results of our preliminary analysis for planned construction of the 5th BCT Compound at Ft. Stewart. We conducted our analysis in 4 stages:

- 1. Identification of emission sources We identified emission sources through relevant documentation (e.g., Form 1391) and discussions with key personnel involved in the planning process at Ft. Stewart. These include Fred Cavedo, Will Ingram (Master Planning), and Fred Louis (Energy). Based on this process we identified fuel combustion for comfort heat (e.g., boilers) as the primary source of pollutant emissions.
- 2. Estimation of typical energy demand at Ft. Stewart We estimated the typical energy demand per ft² at Ft. Stewart from data on past energy usage and fuel consumption. These data were provided to us by Fred Loius via telephone, but we are still awaiting the data via email or printed format. In the interest of preparing a timely analysis we proceeded with our analysis based on data that we have not fully been able to vet.
- 3. Application of typical energy demand values to the 5th BCT project We estimated the energy demands for the project by applying the typical energy demand values for Ft. Stewart to the project based on its planned square footage. Fred Cavedo and Fred Louis indicated that they would prepare a preliminary assessment of energy demand for the project after discussions with Will Ingram and a review of engineering data for the 4th BCT project that is underway. However, we have not yet received those estimates, and we have proceeded with our own analysis.
- 4. Estimation of emissions Based on the energy demand for the project we calculated the rated heat capacity that boilers and furnaces would be required to have. After discussions with Fred Cavedo we scaled these values up to account for boiler inefficiencies and heating seasons that are more severe than average. We estimated the quantities of fuel that would be required to satisfy the energy demand, and applied AP-42 emission factors to obtain emission estimates.

Our analysis showed that only 3 pollutants are emitted at noticeable rates – SO₂ and NO_x from fuel combustion, and CO from natural gas combustion. The pollutant emission rates are well below the respective significance level thresholds for PSD. In fact, the margins between expected emissions and the PSD significance levels are so great that the 5th BCT project could double in scope and still not trigger PSD.



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B. DISCUSSION OF ANALYSIS & RESULTS

1. Outline of Methodology

We undertook several steps to determine the applicability of Prevention of Significant Deterioration (PSD) to the planned construction of the 5th BCT Compound at Ft. Stewart. As part of our methodology we were required to make a number of assumptions. These assumptions are discussed in the context of our methodology, which is outlined below:

a. <u>Identifying Sources of Emissions</u>

We expect that most of the emissions from the planned construction will come from fuel combustion for the purpose of producing comfort heat. To that end we met with Will Ingram in Master Planning, and with Fred Cavedo. Through our discussions with them and a review of Form 1391 documents we ascertained the following:

- Most of the construction will be associated with buildings, storage areas, and parking
 areas. Buildings will be for a Brigade HQ and Company Ops, barracks, a dining facility
 (DFAC), a fitness center, vehicle maintenance shops, and child development centers.
- No decision has been made on whether the project will include a central energy plant (CEP) or will use decentralized heat. If the project includes a CEP it will most likely serve the Brigade HQ and Company Ops buildings, while the barracks, DFAC, fitness center, and other living spaces will have decentralized heat.
- While Will Ingram indicated that the fuel of choice for comfort heating would be natural gas, Fred Cavedo was not as confident. Aside from the expense of constructing the 3-mile pipeline from Ft. Stewart's cantonment area to the 5th BCT Compound, Fred indicated that their current contract with the natural gas supplier may impose some constraints. If natural gas is not an option, then fuel oil or electric heat would be the alternative sources of energy (although both Will and Fred believe that fuel oil will not be used). Wood is not being considered as a fuel option. Other sources of energy, including geothermal and propane will likely not be strongly considered.
- Air conditioning will almost certainly use electric chillers (as opposed to the steam absorption chillers at Ft. Stewart's CEP, which are driven by the boilers). The vehicle maintenance facilities (VMF) will only have heat and no A/C.
- No peak-shaving is planned. Electricity in the area is typically not priced higher for peak usage, and there is no economic advantage to generating electricity on-site.
- There will be some back-up power generation, but neither Will nor Fred knew what the designed power output will be. Will indicated that the Brigade HQ building will probably have a gen-set unit that is similar to the one that is planned for the temporary 5th BCT building being constructed at B618-619. We have been trying to get the design specs for this temporary emergency generator from Jana Turner, but as of 4/24/2008 we have not received that information.



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- The facility will likely have a couple of lift stations, which will include back-up generators at each station. No information on their design was available. These generators, along with the one planned for the Brigade HQ building, will have some small fuel storage tanks.
- The VMF will probably have some solvent degreasers, but will not have any engine testing equipment.
- Among the typical sources at an Army installation that are <u>not</u> being planned are paint booths, landfills, and waste-water treatment plants.

Based on the information collected during our site visit and discussions with key personnel, we concluded that the most significant source of emissions would be fuel combustion for comfort heat. There will be some emissions from emergency power generation and from solvent degreasing, but these are likely to be small when compared to those from fuel combustion for comfort heat.

b. Estimating Typical Energy Demand at Ft. Stewart

To estimate emissions from fuel combustion it was first necessary to estimate the quantity of fuel that will be needed to satisfy the comfort heating requirements of the 5th BCT Compound. We have spoken with Fred Cavedo and Fred Loius for such an estimate, but they indicated that it was too early in the design process to have such an estimate. They promised to prepare a preliminary estimate based on the building design to date and the typical energy requirements per square foot of space (including using data derived by Engineering during the design of the 4th BCT project). As of 4/24/2008 we have not received that information.

We proceeded with our own estimate of typical energy demand, and produced two separate estimates of typical energy demand at Ft. Stewart, as outlined below:

- We used Department of Commerce estimates for monthly heating degree days (from *Historical Climatography Series No. 5-1*) to determine that Georgia has 2,884 average heating days per year. This number represents the product of the number of degrees below 65° F and the number of days in which the temperature dropped below 65° F. [The Department of Commerce assumes that comfort heat is necessary when temperatures drop below that point.] Using data from http://www.americansolar.com/products-guide.html we ascertained that when the average heating degree days is less than 4,000 the typical energy demand is 15,900 BTU per occupied square feet.
- We used data on fuel combusted during FY2006 at Ft. Stewart and Hunter AAF (a separate value for Ft. Stewart was not available), calculated the energy produced from that fuel, and divided the FY2006 square footage for both these facilities by that energy value. We arrived at an average of 29,610 BTU per square feet. The data on fuels combusted, plus the results of our calculations, are shown in Table 1.



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TABLE 1: ESTIMATED FY06 ENERGY DEMAND AT FT. STEWART & HAAF

Fuel	Quantity	Units	Heat Value	Units	MMBtu/yr				
Wood	18514	tons/yr	4,500	Btu/lb	166,626				
FO #2	445337	gal/yr	140,000	Btu/gal	62,347				
NG	94481	MCF/yr	1,020	Btu/ft3	96,371				
Propane	144111	gal/yr	90,500	Btu/gal	13,042				
TOTA	338,386								
FY2006 S	11,428,000								
Energy U	se Per Square	Foot (BTU/	ft ²)		29,610				

Notes: Data on fuel usage and square footage were provided by Fred Loius by telephone. As of 4/24/2008 no data had been provided via email, despite numerous requests.

We have discussed these estimates with Fred Cavedo who generally concurs.

c. Estimating Energy Demand for the 5th BCT Compound

To estimate energy demand for the 5th BCT Compound we applied the typical energy demand per square foot (derived above) to the planned square footage of the project. We assumed that the CY2006 estimate of demand for Ft. Stewart and Hunter AAF would be more representative of the demand at the 5th BCT Compound. Also, being the higher of the two values, we are being conservative in the estimate of emissions.

Using data from Form 1391 documentation we identified the planned building square footage for the project and estimated energy demand. In doing so we made some assumptions:

- Fuel combustion will only be used for comfort heat (including space heat and hot water), and will not be used for air-conditioning and cooling. This is consistent with what we were told during our data collection phase.
- All enclosed spaces will be heated. This includes vehicle maintenance facilities, storage buildings, and the unmanned aerial vehicle hangar. The only spaces that will not be heated are the vehicle parking areas and the open secure storage facility. In reality, some of the storage areas may not be heated. However, these account for a small fraction of the overall planned square footage, and we have conservatively included them.
- The Child Development Centers would not need to be included in the PSD analysis, especially if they have their own source of heat. (The CDC are not integral to the functioning of the 5th BCT, and as such EPA allows their exclusion from permit analyses.) However, if there is a central heat plant it will be impractical to separate out the heat used by the CDC, so we have included them here.

Table 2 shows the planned building square footage for the project.



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TABLE 2: PLANNED BUILDING SQUARE FOOTAGE OF THE 5^{TH} BCT COMPOUND

Type of Facility	Area (ft ²)	Area (yard²)
Primary Facility		
Barracks	527,040	
Dining Facility	26,500	
Primary Facility		
Company Operations Facilities	364,777	
Covered Hardstand	66,555	
Primary Facility		
Brigade Headquarters	40,100	
Battalion Headquarters	106,900	
Primary Facility		
Vehicle Maintenance Shops	159,870	
Organizational Vehicle Parking		155,511
Organizational Storage Facility	2,300	
Oil Storage Building	2,820	
HAZMAT Storage Building	2,820	
Unmanned Aerial Vehicle Hangar	9,000	
Distro Company Storage	8,000	
Distro Open Secure Storage		445
Primary Facility		
Physical Fitness Facility	64,799	
Indoor Swimming Pool	15,528	
Primary Facility		
Child Development Ctr, 0-5 Yrs	15,850	
Child Development Ctr, 6-10 Yrs	13,929	
Total area of buildings	1,426,788	

We applied the estimated typical energy demand per square foot to the data for building square footage, assumed a typical duration of a heating season (i.e., 4 months), and estimated the total annual energy demand. While doing this we made allowances for boiler inefficiencies, transmission losses, and heating seasons that are more severe than average. We discussed this methodology with Fred Cavedo, who indicated that we could safely assume that the actual demand that will be estimated for planning purposes will be 25% greater than the value based strictly on square footage. Accordingly, we have scaled our energy demand values up by 25%. The results of this exercise are shown in Table 3.



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TABLE 3: ESTIMATED ENERGY DEMAND FOR THE $\mathbf{5}^{\text{TH}}$ BCT COMPOUND

Type of Facility	Area (ft²)	Energy Demand	Boiler Rating (MMBtu/hr)	Boiler Rating: 25% Scaled
		(MMBtu)		(MMBtu/hr)
Primary Facility				
Barracks	527,040	15605.8	5.34	6.68
Dining Facility	26,500	784.7	0.27	0.34
Primary Facility				
Company Operations Facilities	364,777	10801.1	3.70	4.62
Covered Hardstand	66,555	1970.7	0.67	0.84
Primary Facility				
Brigade Headquarters	40,100	1187.4	0.41	0.51
Battalion Headquarters	106,900	3165.3	1.08	1.36
Primary Facility				
Vehicle Maintenance Shops	159,870	4733.8	1.62	2.03
Organizational Storage Facility	2,300	68.1	0.02	0.03
Oil Storage Building	2,820	83.5	0.03	0.04
HAZMAT Storage Building	2,820	83.5	0.03	0.04
Unmanned Aerial Vehicle Hangar	9,000	266.5	0.09	0.11
Distro Company Storage	8,000	236.9	0.08	0.10
Primary Facility				
Physical Fitness Facility	64,799	1918.7	0.66	0.82
Indoor Swimming Pool	15,528	459.8	0.16	0.20
Primary Facility				
Child Development Ctr, 0-5 Yrs	15,850	469.3	0.16	0.20
Child Development Ctr, 6-10 Yrs	13,929	412.4	0.14	0.18
-				
TOTAL	1,426,788	42,248	14.47	18.09

2. Emissions Estimates

Based on the energy demand estimates in the previous section, we estimated emissions under four scenarios, as follows:

• We assumed that there would be a central energy plant that would supply heat to the entire 5th BCT Compound, would use natural gas exclusively, and the total heat input rating required (i.e., 18.09 MMBtu/hr) would be in a single boiler. This is probably not what will be implemented in the event that there is a CEP. Fred Cavedo indicated that the heat input will likely be split into two boilers, with a third boiler serving as a back-up during periods of repair or maintenance on the primary boilers. Regardless, we estimated emissions under this scenario to see if it would result in the worst-case scenario.



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- We assumed that there would be a central energy plant that would supply heat to the entire 5th BCT Compound, would use fuel oil exclusively, and the total heat input rating required (i.e., 18.09 MMBtu/hr) would be in a single boiler. Although both Will Ingram and Fred Cavedo indicated that there is a very small likelihood that fuel oil will be used, we have proceeded with this scenario to see if it would result in the worst-case scenario.
- We assumed that the heat capacity for the compound would be split into smaller units, rather than having a single large boiler. We have assumed two units of 9 MMBtu/hr each, as this would be representative of any combination of boilers below 10 MMBtu/hr and over 0.3 MMBtu/hr. To simplify the analysis we have assumed that all boilers will be greater than 0.3 MMBtu/hr. (Emission factors differ for heating units below 0.3 MMBtu/hr, those between 0.3 and 10 MMBtu/hr, and those greater than 10 MMBtu/hr.) In reality, if there is decentralized heating some of the buildings (particularly storage areas) will probably have small space heaters, and will likely have small water heaters. However, in the absence of any data to indicate how much of the heat capacity will be in units less than 0.3 MMBtu/hr we have assumed that it will all be in units greater than 0.3 MMBtu/hr. (This will not significantly affect our analyses, as such small units will probably make up a very small fraction of the overall heat capacity.) Under this scenario we have assumed that the only fuel used will be natural gas.
- We have assumed two units of 9 MMBtu/hr each, and have assumed that the only fuel used will be fuel oil.

If fuel oil is used as a back-up fuel, the most likely scenario will be one in which natural gas is mainly used (as long as natural gas is economical) and fuel oil will be used occasionally. However, the scenarios listed above present us with the worst-case scenario for each pollutant, and will help us to identify if there is a possibility that PSD will be triggered.

To estimate emissions, we applied AP-42 emission factors to the relevant quantities of fuel combusted under the four scenarios. The results are presented in Table 4.

TABLE 4: ESTIMATED EMISSIONS FROM FUEL COMBUSTION FOR COMFORT HEAT

Scenario	Capacity	Fuel Type / illiadi i doi		Energy Use	Emission Rate (ton/yr)					
Occitatio	(MMBtu/hr)	1 del Type	Consumption	onsumption (MMBtu/yr)	TSP	PM10	SO2	CO	VOC	NOx
I	18	Natural Gas	51,773,944	52809.42	0.05	0.05	0.02	2.17	0.14	1.29
II	18	Fuel Oil #2	377,210.2	52809.42	0.38	0.19	13.39	0.94	0.06	3.77
III	9 each	Natural Gas	51,773,944	52809.42	0.05	0.05	0.02	2.17	0.14	1.29
IV	9 each	Fuel Oil #2	377,210	52809.42	0.38	0.20	13.39	0.94	0.06	3.77

Notes: Natural gas burners are assumed to use low-NOx technology Fuel Oil sulfur content is assumed to be 0.5%

3. Results

In general, pollutant emission rates are the same for boilers at or below 10 MMBtu/hr and those above 10 MMBtu/hr. The exception is particulate emissions when combusting fuel oil, which is



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evident from Table 4 (although only marginally so). The table also points out the pollutants emitted at noticeable rates $-SO_2$ and NO_x from fuel combustion, and CO from natural gas combustion. What is evident is that under each of the scenarios the pollutant emission rates are well below the respective significance level thresholds for PSD, which are as follows:

CO = 100 tpy
 NO_x = 40 tpy
 SO₂ = 40 tpy
 VOC = 40 tpy
 PM = 25 tpy
 PM10 = 15 tpy

Furthermore, it is clear that the margins between expected emissions and the PSD significance levels are so great that the 5th BCT project could double in scope and still not trigger PSD. Additionally, emission rates of SO₂ (the pollutant of greatest concern) are not likely to be as high as estimated here for the simple reason that it is not currently the fuel of choice for the project. And even if it is used, the SO₂ emissions can be lowered by using fuel oil with a lower sulfur content.

Note that we have not included emissions from internal combustion sources (i.e., emergency generators) because we have no information on what their rated capacities will likely be. Based on moderately sized engines (i.e., 600 hp-hr and smaller), which will probably be adequate for the Brigade HQ building and the lift stations, the emissions for 500 hours of operation will not be high enough to trigger PSD when added to those from the boilers.

Other sources of emissions, such as solvent degreasers, will not contribute significantly to the pollutants of concern. Additionally, we do not have any information on the types and numbers of such sources that will be installed. Accordingly, we have not estimated emissions from such sources. We will update our analysis when such data become available.

Please call me at (727) 791-7884 if you have any questions. After we have received the preliminary energy demand estimates from Fred Cavedo and Fred Louis we will update our analysis as relevant.



APPENDIX H

FACILITIES IN PROJECT FOOTPRINTS

FY 2011 – 2014 Project List						
FY	Proposed Project	Supporting Infrastructure	Square Footage	Acreage		
		RANGE FACILITIES				
		120				
		Classroom Building	800			
		Range Operations and Storage Building	800			
		Range Control Tower	248			
2011	Multipurpose Machine Gun	Vault Latrine	120			
	Range	Covered Bleachers	536			
		Covered Mess	800			
		Supporting access roads / parking / material lay-down		3		
		Range Footprint (Alternative B & C)		250		
		Approximate Total Acreage		255		
		Ammunition Breakdown Building	120			
		Classroom Building	800			
		Range Operations and Storage Building	800			
		Range Operations Tower	248			
2011	Infantry Platoon Battle	Latrine	200			
	Course	Bleacher Enclosure	536			
		Covered Mess	800			
		Supporting access roads / parking / material lay-down		3		
		Range Footprint (Alternative B & C)		1000		
		Approximate Total Acreage		1005		
		Ammunition Breakdown Building	120			
•		Classroom Building	800			
2011	Modified Record Fire Range	Range Operations and Storage Building	800			
		Range Control Tower	256			

		Vault Latrine, wet	364	
		Bleacher Enclosure	535	
		Covered Mess	800	
		Supporting access roads / parking / material lay-down		2
		Range Footprint (Alternative B & C)		25
		Approximate Total Acreage		30
		Ammunition Breakdown Building	185	
		Classroom Building	800	
	Range Operations and Storage Building	800		
		Range Operations Tower	290	
2012		Vault Latrine	200	
2013	2013 Infantry Squad Battle Course	Bleacher Enclosure	726	
		Covered Mess	800	
		Supporting access roads / parking / material lay-down		3
		Range Footprint (Alternative B)		270
		Range Footprint (Alternative C)		700
	Approxi	mate Total Acreage (Alternative B)		275
	Approxi	mate Total Acreage (Alternative C)		705
		Ammunition Breakdown Building	185	
		Classroom Building	800	
		Range Operations and Storage Building	800	
		Range Control Tower	290	
2013	Qualification Training Range	Vault Latrine	200	
	Bleacher Enclosure	726		
		Covered Mess	800	
		Supporting access roads / parking / material lay-down		3
		Range Footprint (Alternative B & C)		250
		Approximate Total Acreage		255

		Ammunition Breakdown Building	185	
		Ammunition Loading Dock	283	
		Instrumentation Dock	900	
		Classroom Building	1,056	
		Operations/Storage Building	800	
	Disital Multinumass	Range Operations Tower	960	
2013	Digital Multipurpose Training Range	Range Operations Center	2,000	
		Vault Latrine	200	
		Covered Mess	800	
		Bivouac Area	4,320	
		Supporting access roads / parking / material lay-down		3
		Range Footprint (Alternative B & C)		1,000
		Approximate Total Acreage		1,005
2013	10 Meter / 25 Meter Zero	Ammunition Breakdown Building	185	
	Range	Range Operations and Storage Building	800	
		Range Control Tower	290	
		Vault Latrine	200	
		Bleacher Enclosure	726	
		Covered Mess	800	
		Supporting access roads / parking / material lay-down		2
		Range Footprint (Alternative B & C)		2
		Approximate Total Acreage		5
		Ammunition Breakdown Building	185	
		Classroom Building	800	
2013	Combat Pistol Qualification	Range Operations and Storage Building	800	
	Course	Range Operations Tower	290	
		Vault Latrine	200	
		Bleacher Enclosure	726	

		Covered Mess	800	
		Supporting access roads / parking / material lay-down		2
		Range Footprint (Alternative B & C)		2
		Approximate Total Acreage		5
		Ammunition Breakdown Building	185	
		Classroom Building	800	
		Range Operations and Storage Building	800	
		Range Control Tower	290	
2013	Known Distance Range	Vault Latrine	200	
		Bleacher Enclosure	726	
		Covered Mess	800	
		Supporting access roads / parking / material lay-down		3
		Range Footprint (Alternative B & C)		80
		85		
		Ammunition Breakdown Building	185	
		Range Operations and Storage Building	800	
		Range Operations Tower	290	
		Vault Latrine	200	
2013	Fire and Movement Range	Bleacher Enclosure	726	
		Covered Mess	800	
		Supporting access roads / parking / material lay-down		2
		Range Footprint (Alternative B & C)		10
		Approximate Total Acreage		15
		Ammunition Breakdown Building	185	
2012	M PC ID ID	Classroom Building	800	
2013	Modified Record Fire Range	Range Operations and Storage Building	800	
		Range Operations Tower	290	

		Vault Latrine	200		
		Bleacher Enclosure	726		
		Covered Mess	800		
		Supporting access roads / parking / material lay-down		2	
		Range Footprint (Alternative B & C)		25	
		Approximate Total Acreage		30	
		Range Operations and Storage Building	800		
2011	a	Vault Latrine	200		
2014	Convoy Live Fire Range	Supporting access roads / parking / material lay-down		1	
		Engagement Boxes (Alternative B & C)		60	
		Approximate Total Acreage		65	
	G	ARRISON FACILITIES			
		Company Operations Facilities	78,537		
	10 th Engineering Battalion Complex	Covered Hardstand	15,996		
		Battalion HQs with Classrooms	17,477		
2011		Supporting access roads / parking / material lay-down (Alternative B)		50	
		Supporting access roads / parking / material lay-down (Alternative C)		30	
	Approxi	mate Total Acreage (Alternative B)		55	
	Approxi	mate Total Acreage (Alternative C)		35	
		UAVS Maintenance Hanger	129,36 0		
2011	Sky Warrior Unmanned Aerial Systems Facilities	Supporting access roads / parking / material lay-down (Alternative B)		30	
		Supporting access roads / parking / material lay-down (Alternative C)		20 35	
	Approximate Total Acreage (Alternative B)				
	Approxi	mate Total Acreage (Alternative C)		25	

Legend for all tables in this section indicated below:

LEGEND

■ Not Feasible – Unacceptable limitations

• = Feasible – Minor limitations and challenges

✓ = Feasible – No limitations or challenges

n/a = Not Applicable

¹ For this criterion, that may arise for mitigating potential environmental impacts. It represents only the relative cost of construction for each particular location.

Summary of Screening Analysis for FY11 MPMGR

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	•	•
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	?	?	•
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	>	×
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	>	×
Does this course of action avoid and minimize adverse environmental impacts?	•	0	0	?
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	>	×
Does this course of action require a new dudded impact area to be established?	n/a	•	>	0
Does this course of action minimize construction costs for the range? 1	•	?	0	0
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	>	•
Summary of Course of Action Feasibility	×	0	0	×

Summary of Screening Analysis for FY11 IPBC

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	•	>
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	?	?	0
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	?	?	×
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	•	0
Does this course of action avoid and minimize adverse environmental impacts?	>	?	0	0
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	?	?	?
Does this course of action require a new duded impact area to be established?	n/a	•	~	0
Does this course of action minimize construction costs for the range? 1	•	0	0	0
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	>	~
Summary of Alternative Feasibility	×	0	0	X

Summary of Screening Analysis for FY11 MRFR

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	,	,
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	•	•	>
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	0	×
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	•	>
Does this course of action avoid and minimize adverse environmental impacts?	>	?	•	~
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	•	>
Does this course of action require a new duded impact area to be established?	n/a	•	•	~
Does this course of action minimize construction costs for the range? 1	•	?	0	0
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	•	~
Summary of Alternative Feasibility	×	?	0	×

Summary of Screening Analysis for FY13 DMPTR

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated (Existing MPRC)	COA Eliminated (Old AGR)
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	•	•	•
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	•	•	•	0
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	•	×	×
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	•	•	?
Does this course of action avoid and minimize adverse environmental impacts?	•	?	0	•	0
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	•	•	•
Does this course of action require a new duded impact area to be established?	n/a	•	•	•	0
Does this course of action minimize construction costs for the range? 1	~	?	?	2	0
Does this course of action meet Force Protection and Anti-Terrorism	n/a	•	•	>	~

measures?					
Summary of Alternative Feasibility	×	?	0	×	×

Summary of Screening Analysis for FY1 QTR

Criteria	No-Action	Alternative	Alternative	COA			
Cinceria	140-Action	В	С	Eliminated			
Can the Army standard design in TC 25-8 for							
this range be accommodated under this course of action within allowable waivers or	×	✓	>	~			
modifications?							
modifications:							
Can the Surface Danger Zone (SDZ) for this	,			_			
range be accommodated without infringing on	n/a	~	y	×			
adjacent training facilities or ranges?							
Has the range been sited to maximize use of							
the installation's Training Area for future							
requirements by leaving the maximum amount	n/a	~	~	×			
of suitable contiguous land mass available for							
future needs?							
Is the terrain susceptible to wildfires which							
could cause safety issues to nearby Interstates	n/a	✓	~	~			
or State Highways or lengthy shutdowns?							
Does this course of action avoid and minimize	J	?	0	?			
adverse environmental impacts?	·		9	ш			
Does this course of action require either							
electrical power lines or fiber optic cable in	n/a	,	¥	,			
excess of 10,000 feet, or for water lines to be	, ,		·	·			
constructed?							
Does this course of action require a new	n/a	J	J	J			
duded impact area to be established?	11/4		*	*			
Does this course of action minimize	٠,	?	?	?			
construction costs for the range? 1	•		ŭ	Ш			
Does this course of action meet Force	n/a	•	y	J			
Protection and Anti-Terrorism measures?	11/4	•	•	*			
Summary of Alternative Feasibility	X	?	0	×			

Summary of Screening Analysis for FY13 KDR

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	>	•
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	?	?	?
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	>	>
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	>	>
Does this course of action avoid and minimize adverse environmental impacts?	>	?	0	×
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	>	>
Does this course of action require a new duded impact area to be established?	n/a	•	>	>
Does this course of action minimize construction costs for the range? 1	•	?	?	?
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	>	>
Summary of Alternative Feasibility	×	?	0	×

Summary of Screening Analysis for FY13 ISBC

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	,	,
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	•	•	>
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	•	0
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	•	>
Does this course of action avoid and minimize adverse environmental impacts?	>	?	0	×
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	•	>
Does this course of action require a new duded impact area to be established?	n/a	•	•	?
Does this course of action minimize construction costs for the range? 1	•	•	?	0
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	•	~
Summary of Alternative Feasibility	×	?	0	×

Summary of Screening Analysis for FY13 FMR

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	•	>
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	•	•	>
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	•	×
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	•	>
Does this course of action avoid and minimize adverse environmental impacts?	~	•	?	>
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	•	>
Does this course of action require a new duded impact area to be established?	n/a	•	~	>
Does this course of action minimize construction costs for the range? 1	>	•	?	~
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	•	~
Summary of Alternative Feasibility	×	~	?	×

Summary of Screening Analysis for FY13 MRFR

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	•	*
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	•	•	>
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	•	*
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	•	>
Does this course of action avoid and minimize adverse environmental impacts?	>	?	0	×
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	•	>
Does this course of action require a new duded impact area to be established?	n/a	•	•	>
Does this course of action minimize construction costs for the range? 1	•	•	?	?
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	•	~
Summary of Alternative Feasibility	×	•	0	×

Summary of Screening Analysis for FY13 CPQC

Criteria	No-Action	Alternative B	Alternative C
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	>
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	•	>
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	>
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	>
Does this course of action avoid and minimize adverse environmental impacts?	>	?	?
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	>
Does this course of action require a new duded impact area to be established?	n/a	•	>
Does this course of action minimize construction costs for the range? 1	•	•	•
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	•
Summary of Alternative Feasibility	×	?	2

Summary of Screening Analysis for FY13 10/25 Meter Zero Range

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	•	•
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	•	?	•
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	•	×
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	•	>
Does this course of action avoid and minimize adverse environmental impacts?	>	?	?	?
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	•	>
Does this course of action require a new duded impact area to be established?	n/a	•	•	>
Does this course of action minimize construction costs for the range? 1	•	•	•	~
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	•	>
Summary of Alternative Feasibility	×	?	?	×

Summary of Screening Analysis for FY14 CLFR

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can the Army standard design in TC 25-8 for this range be accommodated under this course of action within allowable waivers or modifications?	×	•	•	>
Can the Surface Danger Zone (SDZ) for this range be accommodated without infringing on adjacent training facilities or ranges?	n/a	•	0	0
Has the range been sited to maximize use of the installation's Training Area for future requirements by leaving the maximum amount of suitable contiguous land mass available for future needs?	n/a	•	?	0
Is the terrain susceptible to wildfires which could cause safety issues to nearby Interstates or State Highways or lengthy shutdowns?	n/a	•	•	>
Does this course of action avoid and minimize adverse environmental impacts?	•	?	?	×
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	•	>	>
Does this course of action require a new duded impact area to be established?	n/a	•	•	0
Does this course of action minimize construction costs for the range? 1	•	•	>	>
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	>	>
Summary of Alternative Feasibility	×	?	0	X

Summary of Screening Analysis for FY11 UAS Facilities

Criteria	No-Action	Alternative B	Alternative C	COA Eliminated
Can personnel travel easily to site from the cantonment area?	n/a	•	?	×
Does this course of action accommodate all supporting facilities, access roads, and parking areas?	×	•	?	0
Has the facility been sited above the water table to reduce potential flooding?	n/a	?	?	?
Does the site adversely impact the prescribed burning program?	n/a	~	>	~
Does this course of action avoid and minimize adverse environmental impacts?	•	?	0	0
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	?	?	?
Is the facility sited in an appropriate land use category?	n/a	•	~	~
Does this course of action minimize construction costs for the facility? 1	~	?	?	?
Does this course of action meet Force Protection and Anti-Terrorism measures?	n/a	•	~	•
Summary of Alternative Feasibility	×	?	0	×

Summary of Screening Analysis for FY11 10th ENG BN Complex

Criteria	No-Action	Alternative B	Alternative C
Can personnel travel easily to site from the cantonment area?	n/a	•	~
Does this course of action accommodate all supporting facilities, access roads, and parking areas?	×	•	?
Has the facility been sited above the water table to reduce potential flooding?	n/a	~	0
Does the course of action adversely impact the prescribed burning program?	n/a	•	>
Does this course of action avoid and minimize adverse environmental impacts?	•	?	0
Does this course of action require either electrical power lines or fiber optic cable in excess of 10,000 feet, or for water lines to be constructed?	n/a	?	?
Is the facility sited in an appropriate land use category?	n/a	~	~
Does this course of action minimize construction costs for the facility? 1	•	?	?
Does this course of action meet Force Protection and Anti- Terrorism measures?	n/a	•	~
Summary of Alternative Feasibility	×	?	0

APPENDIX I

NOISE



DEPARTMENT OF THE ARMY

US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-EON

2 6 AUG 2009

MEMORANDUM FOR Environmental Office (IMSE-STW-PWE/Ms. Amber Franks), Directorate of Public Works, 1550 Frank Cochran Drive, Fort Stewart, GA 31314-4928

SUBJECT: Operational Noise Consultation, No. 52-EN-0C0Y-09, Digital Multi-Purpose Training Range Operational Noise Contours for Fort Stewart, GA; August 2009

- 1. We are enclosing 2 copies of the consultation.
- 2. Please contact us if this consultation or any of our services did not meet your needs or expectations.
- 3. The point of contact is Ms. Kristy Broska, Environmental Protection Specialist or Ms. Catherine Stewart, Program Manager, Operational Noise, USACHPPM, at DSN 584-3829, Commercial (410) 436-3829, or email: kristy.broska@us.army.mil or catherine.stewart@us.army.mil.

FOR THE COMMANDER:

Encl

DONALD F. ARCHIBALD COL. MS

Director, Environmental Health Engineering

CF:

AEC, IMAE-TSP (Ms. Booher)

U.S. Army Center for Health Promotion and Preventive Medicine



OPERATIONAL NOISE CONSULTATION
NO. 52-EN-0C0Y-09
DIGITAL MULTI-PURPOSE TRAINING RANGE
OPERATIONAL NOISE CONTOURS
FORT STEWART, GEORGIA
AUGUST 2009













Distribution authorized to U.S. Government agencies only; protection of privileged information evaluating another command; Aug 09. Other requests for this document shall be referred to Environmental Office (IMSE-STW-PWE/Ms. Amber Franks), Directorate of Public Works, 1550 Frank Cochran Drive, Fort Stewart, GA 31314-4928

Preventive Medicine Survey: 40-5fl

Readiness Thru Health



DEPARTMENT OF THE ARMY

US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY OPERATIONAL NOISE CONSULTATION NO. 52-EN-0C0Y-09 DIGITAL MULTI-PURPOSE TRAINING RANGE OPERATIONAL NOISE CONTOURS FORT STEWART, GEORGIA AUGUST 2009

1. PURPOSE. To provide Fort Stewart noise contours for the projected Digital Multi-Purpose Training Range (DMPTR).

2. CONCLUSIONS.

a. Existing Operating Environment.

- (1) The existing demolition and large caliber operating environment would not generate Noise Zone II or Noise III contours that beyond the boundary or into the Fort Stewart housing area.
- (2) The existing operating environment has a moderate risk of generating noise complaints near Old River Road and Highway 204 (Fort Argyle Road). The moderate risk of noise complaints also extends into the Fort Stewart housing area.

b. Projected Operating Environment.

- (1) The projected operating environment would generate a Noise Zone II contour that extends slightly beyond the northern boundary into an undeveloped area. The projected operating environment under the Course of Action 1 (COA1) location would not generate a Noise Zone II contour that in the Fort Stewart housing area. The projected operating environment under the Course of Action 2 (COA2) location would generate a Noise Zone II contour that extends into the Fort Stewart housing area. The projected operating environment would not generate a Noise III contour that extends beyond the boundary or into the Fort Stewart housing area.
- (2) The projected complaint risk contours are identical to the existing complaint risk contours with the exception of the area around the proposed DMPTR. The projected operating environment has a moderate risk of generating noise complaints near Old River Road and Highway 204 (Fort Argyle Road). The moderate risk of noise complaints also extends into the Fort Stewart housing area.

3. RECOMMENDATION.

- a. Include the information from this consultation in the appropriate Fort Stewart National Environmental Policy Act (NEPA) documentation.
- b. Although no Federal Law prohibits the Department of Defense training and testing activities from making noise, the Services have always tried to be good neighbors. Due to the risk of noise complaints, Fort Stewart should continue its operational noise management and outreach programs to inform the public of possible noise from training. Fort Stewart should monitor both the noise environment and any proposed land use changes surrounding the installation.

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OPERATIONAL NOISE CONSULTATION NO. 52-EN-0C0Y-09 DIGITAL MULTI-PURPOSE TRAINING RANGE OPERATIONAL NOISE CONTOURS FORT STEWART, GEORGIA AUGUST 2009

- 1. REFERENCES. A list of the references used in this consultation is in Appendix A. A glossary of terms and abbreviations used are in Appendix B. Appendix C contains the Noise Zone Descriptions and Land Use Guidelines used in this consultation.
- 2. AUTHORITY. This consultation was funded by the Army Environmental Command, Aberdeen Proving Ground, MD.
- 3. PURPOSE. To provide Fort Stewart noise contours for the projected Digital Multi-Purpose Training Range (DMPTR). Appendix D contains the range location maps.
- 4. DEMOLITION AND LARGE CALIBER WEAPONS OPERATIONS.

a. General.

- (1) The noise simulation program used to assess demolition and large caliber weapons (20mm and greater) noise is the Blast Noise Impact Assessment (BNOISE2) program (U.S. Army 2003). The BNOISE2 program requires operational data concerning the types of weapons fired from each range or firing point (including demolitions), the number and types of ammunition fired from each weapon, the location of targets for each range or firing point and the amount of propellant used to reach the target. Existing records on range utilization along with reasonable assumptions are used as BNOISE2 inputs.
- (2) The assessment period used to create the Fort Stewart C-weighted Day-Night average sound Level (CDNL) contours was 250 days. The complaint risk contours show the predicted peak levels for individual rounds (metric term is PK15(met)). Since the contours are based on peak levels rather than a cumulative or average level, the size of the contours will not change if the number of rounds fired increases.
- (3) The inputs used to generate the demolition and large caliber noise contours for this consultation were created using the data summarized in Appendix E. The projected operating environment consists of the existing operating environment activity plus a proposed DMPTR. The difference between the Course of Action 1 (COA1) and Course of Action 2 (COA2) projected operating environment is the location and orientation of the DMPTR.

b. Existing Operating Environment.

- (1) Figure 1 contains the noise contours for the existing operating environment. This contour was developed using the existing operating environment table (Table E-1) in Appendix E. The Land Use Planning Zone (LUPZ) 57 decibel (dB) CDNL noise contour extends approximately 2,500 meters beyond the northern boundary and approximately 1,200 meters beyond the southern boundary. The LUPZ (57 dB CDNL) contour encompasses the Fort Stewart housing area. The Noise Zone II (62 dB CDNL) and Noise Zone III (70 dB CDNL) contours do not extend beyond the boundary or into the Fort Stewart housing area.
- (2) Figure 2 contains the complaint risk contours for the existing operating environment. The moderate complaint risk contour (PK15(met) 115 dB) extends approximately 2,000 meters beyond the northeastern boundary crossing Old River Road and Highway 204 (Fort Argyle Road) and approximately 1,400 meters beyond the southeastern boundary towards Highway 196. The moderate complaint risk contour (PK15(met) 115 dB) extends approximately 400 meters into the Fort Stewart housing area. The high complaint risk contour (PK15(met) 130 dB) extends approximately 200 meters beyond the northeastern boundary near the aerial gunnery ranges.

c. Projected Operating Environment.

(1) Proposed Course of Action 1 Location.

- (a) Figure 3 contains the CDNL noise contours for the DMPTR COA1 location. These contours were developed using the projected operating environment table (Table E-2) in Appendix E. The COA1 projected operating environment creates a LUPZ (57 dB CDNL) noise contour that extends approximately 2,500 meters beyond the northern boundary, encompassing the town of Pembroke and approximately 4,000 meters beyond the southern boundary, into Hinesville. The Noise Zone II (62 dB CDNL) extends beyond the northern boundary approximately 1,300 meters. The Noise Zone III (70 dB CDNL) contour does not extend beyond the boundary.
- (b) Figure 4 contains the complaint risk contours for the DMPTR COA1 location. The projected complaint risk contours are identical to the existing complaint risk contours with the exception of the area around the proposed DMPTR. The moderate complaint risk contour (PK15(met) 115 dB) extends approximately 2,000 meters beyond the northeastern boundary and approximately 1,400 meters beyond the southeastern boundary. The moderate complaint risk contour (PK15(met) 115 dB) extends approximately 400 meters into the Fort Stewart housing area. The high complaint risk contour (PK15(met) 130 dB) extends approximately 200 meters beyond the northeastern boundary near the aerial gunnery ranges.

Figure Redacted

FIGURE 1. FORT STEWART
EXISTING OPERATING ENVIRONMENT
DEMOLITION AND LARGE CALIBER OPERATIONAL NOISE CONTOURS

Figure Redacted

FIGURE 2. FORT STEWART EXISTING OPERATING ENVIRONMENT COMPLAINT RISK CONTOURS

Figure Redacted

FIGURE 3. FORT STEWART
PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 1 LOCATION
DEMOLITION AND LARGE CALIBER OPERATIONAL NOISE CONTOURS

Figure Redacted

FIGURE 4. FORT STEWART
PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 1 LOCATION
COMPLAINT RISK NOISE CONTOURS

(2) <u>Proposed Course of Action 2 Location.</u>

- (a) Figure 5 contains the CDNL noise contours for the DMPTR COA2 location. These contours were developed using the projected operating environment table (Table E-2) in Appendix E. The COA2 projected operating environment creates a LUPZ (57 dB CDNL) noise contour that extends approximately 2,500 meters beyond the northern boundary, encompassing the town of Pembroke and approximately 4,000 meters beyond the southern boundary, into Hinesville. The Noise Zone II (62 dB CDNL) extends beyond the northern boundary approximately 2,000 meters and approximately 1,000 meters into the Fort Stewart housing area. The Noise Zone III (70 dB CDNL) contour does not extend beyond the boundary or into the Fort Stewart housing area.
- (b) Figure 6 contains the complaint risk contours for the DMPTR COA2 location. The projected complaint risk contours are identical to the existing complaint risk contours with the exception of the area around the proposed DMPTR. The moderate complaint risk contour (PK15(met) 115 dB) extends approximately 2,000 meters beyond the northeastern boundary and approximately 1,400 meters beyond the southeastern boundary. The moderate complaint risk contour (PK15(met) 115 dB) extends approximately 400 meters into the Fort Stewart housing area. The high complaint risk contour (PK15(met) 130 dB) extends approximately 200 meters beyond the northeastern boundary near the aerial gunnery ranges.

d. Land Use Compatibility.

- (1) Per Army Regulation (AR) 200-1, noise sensitive land uses, such as housing, schools, and medical facilities are acceptable within the LUPZ and the Noise Zone I, normally not recommended in Noise Zone II, and not recommended in Noise Zone III (U.S. Army 2007). Land use surrounding Fort Stewart varies from undeveloped to residential.
- (2) The existing operating environment would not generate Noise Zone II or Noise III contours that beyond the boundary or into the Fort Stewart housing area.
- (3) The projected operating environment would generate Noise Zone II contour that extends slightly beyond the northern boundary into an undeveloped area. The projected operating environment would generate Noise Zone II contour that extends into the Fort Stewart housing area. The projected conditions would result in noise sensitive land uses in Noise Zone II, on and off post, which is strongly discouraged in AR 200-1 (U.S. Army 2007). In order to account for an up tempo training scenario, the projected operating environment was based upon a 50 percent night utilization at the DMPTR. The actual utilization of night rounds would be less (anticipated actual utilization would be less than 20 percent night). Therefore, the Noise Zone II contours would be smaller and would not extend beyond the boundary or into the Fort Stewart housing area.

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FIGURE 5. FORT STEWART
PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 2 LOCATION
DEMOLITION AND LARGE CALIBER OPERATIONAL NOISE CONTOURS

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FIGURE 6 FORT STEWART
PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 2 LOCATION
COMPLAINT RISK NOISE CONTOURS

5. CONCLUSIONS.

a. Existing Operating Environment.

- (1) The existing demolition and large caliber operating environment would not generate Noise Zone II or Noise III contours that beyond the boundary or into the Fort Stewart housing area.
- (2) The existing operating environment has a moderate risk of generating noise complaints near Old River Road and Highway 204 (Fort Argyle Road). The moderate risk of noise complaints also extends into the Fort Stewart housing area.

b. Projected Operating Environment.

- (1) The projected operating environment would generate a Noise Zone II contour that extends slightly beyond the northern boundary into an undeveloped area. The projected operating environment under the COA1 location would not generate a Noise Zone II contour that extends into the Fort Stewart housing area. The projected operating environment under the COA2 location would generate a Noise Zone II contour that extends into the Fort Stewart housing area. The projected operating environment would not generate a Noise III contour that extends beyond the boundary or into the Fort Stewart housing area.
- (2) The projected complaint risk contours are identical to the existing complaint risk contours with the exception of the area around the proposed DMPTR. The projected operating environment has a moderate risk of generating noise complaints near Old River Road and Highway 204 (Fort Argyle Road). The moderate risk of noise complaints also extends into the Fort Stewart housing area.

6. RECOMMENDATION.

- a. Include the information from this consultation in the appropriate Fort Stewart NEPA documentation.
- b. Although no Federal Law prohibits the Department of Defense training and testing activities from making noise, the Services have always tried to be good neighbors. Due to the risk of noise complaints, Fort Stewart should continue its operational noise management and outreach programs to inform the public of possible noise from training. Fort Stewart should monitor both the noise environment and any proposed land use changes surrounding the installation.

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APPENDIX A

REFERENCES

- 1. The U.S. Army, 2003, U.S. Army Construction Engineering Research Laboratories, BNOISE2 Computer Model, Version 1.3.2003-07-03.
- 2. The U.S. Army, 2007, Army Regulation 200-1, Environmental Protection and Enhancement, Chapter 14 Operational Noise.

APPENDIX B

GLOSSARY OF TERMS, ACRONYMS & ABBREVIATIONS

B-1. GLOSSARY OF TERMS.

Average Sound Level - the mean-squared sound exposure level of all events occurring in a stated time interval, plus ten times the common logarithm of the quotient formed by the number of events in the time interval, divided by the duration of the time interval in seconds.

C-Weighted Sound Level - a quantity, in decibels, read from a standard sound level meter with C-weighting circuitry. The C-scale incorporates slight de-emphasis of the low and high portion of the audible frequency spectrum.

Day-Night Average Sound Level (DNL) - the 24-hour average frequency-weighted sound level, in decibels, from midnight to midnight, obtained after addition of 10 decibels to sound levels in the night from midnight up to 7 a.m. and from 10 p.m. to midnight (0000 up to 0700 and 2200 up to 2400 hours).

Decibels (**dB**) – a logarithmic sound pressure unit of measure.

Land Use Planning Zone (**LUPZ**) - DNL noise contours represent an annual average that separates the Noise Zone II from the Noise Zone I.

Noise – any sound without value.

PK15(met) - the maximum value of the instantaneous sound pressure for each unique sound source, and applying the 15 percentile rule accounting for meteorological variation.

B-2. GLOSSARY OF ACRONYMS AND ABBREVIATIONS.

BNOISE2 Blast Noise Impact Assessment CDNL C-weighted Day-Night Level

COA1 Course of Action 1 COA2 Course of Action 2

dB Decibels

DMPTR Digital Multi-Purpose Training Range

LUPZ Land Use Planning Zone

NEPA National Environmental Policy Act PK15(met) Unweighted Peak, 15 percent Metric

USACHPPM U.S. Army Center for Health Promotion and Preventive Medicine

APPENDIX C

NOISE ZONE DESCRIPTIONS

- C-1. REFERENCE. U.S. Army, 2007, Army Regulation 200-1, Environmental Protection and Enhancement, Chapter 14 Operational Noise.
- C-2. For a detailed explanation of Noise Zone Descriptions and Land Use Guidelines see Army Regulation 200-1, Chapter 14 (U.S. Army 2007).
- C-3. Day Night Level (DNL). The DNL is used to describe the cumulative or total noise exposure during a prescribed time period. The DNL is the energy average noise level calculated with a 10 decibel penalty for operations occurring between 2200 and 0700.
- C-4. The PK15(met) Noise Contour Description. The PK15(met) is the peak sound level, factoring in the statistical variations caused by weather, that is likely to be exceeded only 15 percent of the time (i.e., 85 percent certainty that sound will be within this range). This "85 percent solution" gives the installation and the community a means to consider the areas impacted by training noise without putting stipulations on land that would only receive high sound levels under infrequent weather conditions that greatly favor sound propagation. The PK15(met) does not take the duration or the number of events into consideration, so the size of the contours will remain the same regardless of the number of events.

C-5. Land Use Guidelines.

- a. The Noise Zone III consists of the area around the noise source in which the level is greater than 70 decibels (dB) C-weighted day-night average sound level (CDNL) for large caliber weapons. Noise-sensitive land uses (such as housing, schools, and medical facilities) are not recommended within Noise Zone III.
- b. The Noise Zone II consists of an area where the DNL is between 62 and 70 dB CDNL for large caliber weapons. Land within Noise Zone II should normally be limited to activities such as industrial, manufacturing, transportation, and resource production. However, if the community determines that land in Noise Zone II (attributable to small arms or aviation) areas must be used for residential purposes, then noise level reduction (NLR) features of 25 to 30 decibels should be incorporated into the design and construction of *new* buildings to mitigate noise levels. For large caliber weapons, NLR features can not adequately mitigate the low-frequency component of large caliber weapons noise.

- c. The Noise Zone I includes all areas around a noise source in which the day-night sound level is less than 62 dB CDNL for large caliber weapons. This area is usually acceptable for all types of land use activities.
- d. The Land Use Planning Zone (LUPZ) DNL noise contours (57 dB CDNL or 60 dB ADNL) represent an annual average that separates the Noise Zone II from the Noise Zone I. Taking all operations that occur over the year and dividing by the number of training days generates the contours. But, the noise environment varies daily and seasonally because operations are not consistent through all 365 days of the year. In addition, the Federal Interagency Committee on Urban Noise document states "Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider." For residential land uses, depending on attitudes and other factors, a 57 CDNL may be considered by the public as an impact on the community environment. In order to provide a planning tool that could be used to account for days of higher than average operations and possible annoyance, the LUPZ contour is being included on the noise contour maps.
 - e. See Table C-1 for land use guidelines.

TABLE C-1. Land Use Planning Guidelines.

Noise Zones	Large-Caliber Weapons (CDNL)
LUPZ	57 – 62
Ι	< 62
II	62 - 70
III	> 70

- C-6. Complaint Risk Guidelines for Demolition Activity and Large Caliber Weapons.
- a. The peak contours show the expected level that one would get on a sound level meter when a weapon was fired. Since weather conditions can cause noise levels to vary significantly from day to day (even from hour to hour) the programs calculate a range of peak levels. By plotting the PK15(met) contour, events would be expected to fall within the contours 85 percent of the time. This metric represents the best available scientific quantification for assessing the complaint risk of large caliber weapons ranges. The complaint risk areas for PK15(met) noise contours are defined as follows:

- (1) The high risk of complaint consists of the area around the noise source in which PK15(met) is greater than 130 dB for large caliber weapons.
- (2) The moderate risk of complaint area consists of where the PK15(met) noise contour is between 115 dB and 130 dB for large caliber weapons.
- (3) The low risk of complaint area is where the PK15(met) noise level is less than 115 dB for large caliber weapons.
 - b. See Table C-2 for complaint risk guidelines.

TABLE C-2. Complaint Risk Guidelines.

	Large Caliber Weapons
Risk of Complaints	PK15(met) dB Noise Contour
Low	< 115
Moderate	115 - 130
High	> 130

APPENDIX D

FORT STEWART RANGE LOCATION MAPS

Operational Noise Consultation, No. 52-EN-0C0Y-09, Fort Stewart, GA: August 09)

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FIGURE D-1. FORT STEWART – EXISTING RANGE LOCATIONS

Operational Noise Consultation, No. 52-EN-0C0Y-09, Fort Stewart, GA: August 09
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FIGURE D-2. FORT STEWART – COURSE OF ACTION 1 RANGE LOCATION
FIGURE D-2. FOR FILWARI - COURSE OF ACTION FRANCE EXCATION
D-3

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FIGURE D-3. FORT STEWART – COURSE OF ACTION 2 RANGE LOCATION	
D-4	

APPENDIX E

DEMOLITION AND LARGE CALIBER RANGE UTILIZATION

E-1. Table E-1 lists the ranges and type of weapons utilized to develop the existing demolition and large arms noise contours.

TABLE E-1. Fort Stewart – Existing Operating Environment – Demolition and Large Caliber Weapons Utilization.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
AGR 2	30mm Gun, HE	385	385
	30mm Gun, Inert	4,063	4,062
	40mm Grenade, HE (M129/L60)	211	0
	40mm Grenade, HE (M203)	40	0 -
	Rocket, AT-4, HE	9	0
	Rocket, RAAWS, HE	16	0
	Rocket, RAAWS, Inert	- 5	0
	Rocket, 2.75" - Hydra 70, HE	86	86
	Rocket, 2.75" - Hydra 70, Inert	37	36
	Demolition, Bangalore, M028	1 1	0
AGR 3	40mm Grenade, HE (M129/L60)	6	0
	40mm Grenade, HE (M203)	239	0
	40mm Grenade, HE (MK19)	11	0
	60mm Mortar, HE	20	19
	Rocket, AT-4, HE	6	0
	Rocket, RAAWS, HE	4	0
	Rocket, RAAWS, Inert	7	0
	Rocket, 2.75" - Hydra 70, Inert	6	0
HELLFIRE Z	Missile, Hellfire, HE	200	150
UZON	20mm Gun, HE	409	409
	30mm Gun, HE	6	0
	40mm Grenade, HE (M129/L60)	710	0
	40mm Grenade, HE (M203)	3,891	0
	40mm Grenade, HE (MK19)	4,499	0
	60mm Mortar, HE	51	50
	Rocket, AT-4, HE	350	114
	Rocket, Dragon, HE	I	0
	Rocket, RAAWS, HE	46	0
	Rocket, RAAWS, Inert	8	0
	Rocket, 2.75" - Hydra 70, HE	8	0
	Missile, Javelin, HE	1	0
CQB	Demolition, C4 (1.25 lbs)	250	0

TABLE E-1. Fort Stewart – Existing Operating Environment – Demolition and Large Caliber Weapons Utilization, cont'd.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
Demo Range	Demolition, Bangalore, M026	177	0
a viii viiii ge	Demolition, Bangalore, M028	97	0
	Demolition, Block C2 (0.5 lbs)	167	0
	Demolition, C2 (2 lbs)	1	Ø
	Demolition, C4 (1.25 lbs)	1,261	0
	Demolition, Cratering Charge (55 lbs)	40	- 0
	Demolition, HBX-1 (4.25 lbs)	5	0
	Demolition, PETN (2 lbs)	16	0
	Demolition, Shaped Charge (0.857 lb)	3	Ō
	Demolition, Shaped Charge (15 lbs)	12	O O
	Demolition, Shaped Charge, (0.02 lb)	5	0
	Demolition, Shaped Charge, (0.07 lb)	1	0
	Demolition, Shaped Charge, (0.1287 lb)	3	0
	Demolition, Sheet (0.875 lb)	12	0
	Demolition, Sheet 19 ft (1 lb per ft)	10	0
	Demolition, Sheet 25 ft (0.8 lb per ft)	13	0
	Demolition, Sheet 38 ft (0.5 lb per ft)	4	0
	Demolition, TNT (1 lb)	88	0
	Mine, Anti-tank Heavy, M19	4	0
Road Crater Site	Demolition, Cratering Charge (40 lbs)	26	Ω
	Demolition, Cratering Charge (56 lbs)	1	0
	Demolition, Shaped Charge (40 lbs)	268	0
Steel Cutting Bunker	Demolition, C4 (1,25 lbs)	150	0
FP-1	155mm Howitzer, HE	166	166
1.5	155mm Howitzer, Inert	24	24
FP-2	155mm Howitzer, HE	210	209
73.	155mm Howitzer, Inert	30	30
FP-3	155mm Howitzer, HE	166	166
	155mm Howitzer, Inert	24	24
FP-5	155mm Howitzer, HE	208	207
	155mm Howitzer, Inert	30	30
FP-13	155mm Howitzer, HE	83	83
4.0	155mm Howitzer, Inert	12	12
FP-17	155mm Howitzer, HE	42	41
nprovi	155mm Howitzer, Inert	6	6
FP-19	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-20	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6

TABLE E-1. Fort Stewart – Existing Operating Environment – Demolition and Large Caliber Weapons Utilization cont'd.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
FP-24	155mm Howitzer, HE	249	249
22.7	155mm Howitzer, Inert	36	36
FP-29	155mm Howitzer, HE	457	456
nc. 403	155mm Howitzer, Inert	66	66
FP-30	155mm Howitzer, HE	747	747
	155mm Howitzer, Inert	108	108
FP-35	155mm Howitzer, HE	291	290
	155mm Howitzer, Inert	42	42
FP-40	155mm Howitzer, HE	291	290
	155mm Howitzer, Inert	42	42
FP-41	155mm Howitzer, HE	249	249
	155mm Howitzer, Inert	36	36
FP-101	105mm Howitzer, HE	67	67
3,-107	105mm Howitzer, Inert	2	4
	155mm Howitzer, HE	166	166
	155mm Howitzer, Inert	24	24
FP-106	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-107	155mm Howitzer, HE	42	41
20-176	155mm Howitzer, Inert	6	6
FP-141	155mm Howitzer, HE	42	41
7.77	155mm Howitzer, Inert	6	6
FP-143	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-145	155mm Howitzer, HE	145	124
	155mm Howitzer, Inert	18	18
FP-212	155mm Howitzer, HE	125	124
	155mm Howitzer, Inert	18	18
FP-213	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-255	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-256	155mm Howitzer, HE	291	290
	155mm Howitzer, Inert	42	42
FP-310	155mm Howitzer, HE	42	41
2 200	155mm Howitzer, Inert	6	6
FP-318	155mm Howitzer, HE	83	83
A.F. Hall	155mm Howitzer, Inert	12	12

TABLE E-1. Fort Stewart – Existing Operating Environment – Demolition and Large Caliber Weapons Utilization, cont'd.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
MP-1	60mm Mortar, HE	33	32
	60mm Mortar, Inert	2	2
	81mm Mortar, HE	307	306
	81mm Mortar, Inert	180	180
	120mm Mortar Inert	152	152
	120mm Mortar, HE	237	236
	120mm Tank, Inert	17	16
MP-2	81mm Mortar, HE	307	306
	81mm Mortar, Inert	180	180
	120mm Mortar Inert	152	152
	120mm Mortar, HE	237	236
MP-3	60mm Mortar, HE	422	421
	60mm Mortar, Inert	50	49
	81mm Mortar, HE	307	306
	81mm Mortar, Inert	180	180
	120mm Mortar Inert	152	152
	120mm Mortar, HE	237	236
OP-1	120mm Tank, Inert	27	0
	155mm Howitzer, HE	2	0
OP-4	155mm Howitzer, HE	26	0
	40mm Grenade, HE (MK19)	84	0
	Hand Grenade, Fragmentation	18	0
	Mine, Claymore, M18A1	8	0
	Missile, TOW, HE	16	0
	Rocket, Dragon, HE	2	0
	Rocket, RAAWS, Inert	6	0
AIA	Bomb, 500 lb (MK82)	20	0
Red Cloud - Alpha	120mm Tank, Inert	205	204
	25mm Gun, Inert	326	326
Red Cloud - Echo	25mm Gun, Inert	104	103
Red Cloud - Hotel	120mm Tank, Inert	521	520
777 21201 27007	25mm Gun, Inert	1,227	1,227
Red Cloud - MPRC	120mm Tank, Inert	723	722
	25mm Gun, Inert	13,538	13,537
	30mm Gun, Inert	3,360	3,360
	Hand Grenade, Fragmentation		0
	Mine, Claymore, M18A1	1	0
	Rocket, RAAWS, Inert	12	2
Red Cloud - DMPRC	120mm Tank, Inert	1_740	1,740

E-2. Table E-2 lists the ranges and type of weapons utilized to develop the projected demolition and large caliber noise contours. The projected operating environment is cumulative and therefore includes the existing activity and the projected activity as appropriate. Only one table of projected utilization is shown as the difference between the Course of Action 1 (COA1) and Course of Action 2 (COA2) projected operating environment is the location and orientation of the DMPTR.

TABLE E-2. Fort Stewart – Projected Operating Environment – Demolition and Large Caliber Weapons Utilization.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
AGR 2	30mm Gun, HE	385	385
	30mm Gun, Inert	4,063	4,062
	40mm Grenade, HE (M129/L60)	211	0
	40mm Grenade, HE (M203)	40	0
	Rocket, AT-4, HE	9	0
	Rocket, RAAWS, HE	16	0
	Rocket, RAAWS, Inert	5	0
	Rocket, 2.75" - Hydra 70, HE	86	86
	Rocket, 2.75" - Hydra 70, Inert	37	36
	Demolition, Bangalore, M028	-1	0
AGR 3	40mm Grenade, HE (M129/L60)	6	0
	40mm Grenade, HE (M203)	239	0
	40mm Grenade, HE (MK19)	11	0
	60mm Mortar, HE	20	19
	Rocket, AT-4, HE	6	0
	Rocket, RAAWS, HE	4	0
	Rocket, RAAWS, Inert	7	0
1	Rocket, 2.75" - Hydra 70, Inert	6	0
HELLFIRE Z	Missile, Hellfire, HE	200	150
LUZON	20mm Gun, HE	409	409
	30mm Gun, HE	6	0
	40mm Grenade, HE (M129/L60)	710	0
	40mm Grenade, HE (M203)	3,891	0
	40mm Grenade, HE (MK19)	4,499	0
	60mm Mortar, HE	51	50
	Rocket, AT-4, HE	350	114
	Rocket, Dragon, HE	1	0
	Rocket, RAAWS, HE	46	0
	Rocket, RAAWS, Inert	8	0
	Rocket, 2.75" - Hydra 70, HE	8	0
	Missile, Javelin, HE	1	0

TABLE E-2. Fort Stewart – Projected Operating Environment – Demolition and Large Caliber Weapons Utilization, cont'd.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
Demo Range	Demolition, Bangalore, M026	177	0
3 - 1/2 - 12-9/	Demolition, Bangalore, M028	97.	0
	Demolition, Block C2 (0.5 lbs)	167	0
	Demolition, C2 (2 lbs)	1	Ö
	Demolition, C4 (1.25 lbs)	1,261	0
	Demolition, Cratering Charge (55 lbs)	40	0
	Demolition, HBX-1 (4.25 lbs)	- 5	0
	Demolition, PETN (2 lbs)	16	0
	Demolition, Shaped Charge (0.857 lb)	3	0
	Demolition, Shaped Charge (15 lbs)	12	0
	Demolition, Shaped Charge, (0.02 lb)	- 5	0
	Demolition, Shaped Charge, (0.07 lb)	1	0
	Demolition, Shaped Charge, (0.1287 lb)	3	0
	Demolition, Sheet (0.875 lb)	12	0
	Demolition, Sheet 19 ft (1 lb per ft)	10	0
	Demolition, Sheet 25 ft (0.8 lb per ft)	13	0
	Demolition, Sheet 38 ft (0.5 lb per ft)	4	0
	Demolition, TNT (1 lb)	88	0
	Mine, Anti-tank Heavy, M19	4	0
Road Crater Site	Demolition, Cratering Charge (40 lbs)	26	0
	Demolition, Cratering Charge (56 lbs)	1	0
	Demolition, Shaped Charge (40 lbs)	268	0
Steel Cutting Bunker	Demolition, C4 (1.25 lbs)	150	0
FP-1	155mm Howitzer, HE	166	166
1.92	155mm Howitzer, Inert	24	24
FP-2	155mm Howitzer, HE	210	209
	155mm Howitzer, Inert	30	30
FP-3	155mm Howitzer, HE	166	166
7-	155mm Howitzer, Inert	24	24
FP-5	155mm Howitzer, HE	208	207
177	155mm Howitzer, Inert	30	30
FP-13	155mm Howitzer, HE	83	83
7.7%	155mm Howitzer, Inert	12	12
FP-17	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-19	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-20	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6

TABLE E-2. Fort Stewart – Projected Operating Environment – Demolition and Large Caliber Weapons Utilization, cont'd.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
FP-24	155mm Howitzer, HE	249	249
75	155mm Howitzer, Inert	36	36
FP-29	155mm Howitzer, HE	457	456
	155mm Howitzer, Inert	66	66
FP-30	155mm Howitzer, HE	747	747
	155mm Howitzer, Inert	108	108
FP-35	155mm Howitzer, HE	291	290
	155mm Howitzer, Inert	42	42
FP-40	155mm Howitzer, HE	291	290
	155mm Howitzer, Inert	42	42
FP-41	155mm Howitzer, HE	249	249
	155mm Howitzer, Inert	36	36
FP-101	105mm Howitzer, HE	67	67
1-101	105mm Howitzer, Inert	2	4
	155mm Howitzer, HE	166	166
	155mm Howitzer, Inert	24	24
FP-106	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-107	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	б	6
FP-141	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-143	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-145	155mm Howitzer, HE	145	124
	155mm Howitzer, Inert	18	18
FP-212	155mm Howitzer, HE	125	124
	155mm Howitzer, Inert	18	18
FP-213	155mm Howitzer, HE	42	41
	155mm Howitzer, Inert	6	6
FP-255	155mm Howitzer, HE	42	41
F1-200	155mm Howitzer, Inert	6	6
FP-256	155mm Howitzer, HE	291	290
. 400	155mm Howitzer, Inert	42	42
FP-310	155mm Howitzer, HE	42	41
11-310	155mm Howitzer, HE.	6	6
rp 310			
FP-318	155mm Howitzer, HE 155mm Howitzer, Inert	83	83 12

TABLE E-2. Fort Stewart – Projected Operating Environment – Demolition and Large Caliber Weapons Utilization, cont'd.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
MP-1	60mm Mortar, HE	33	32
	60mm Mortar, Inert	2	2
	81mm Mortar, HE	307	306
	81mm Mortar, Inert	180	180
	120mm Mortar Inert	152	152
	120mm Mortar, HE	237	236
	120mm Tank, Inert	17	16
MP-2	81mm Mortar, HE	3,07	306
	81mm Mortar, Inert	180	180
	120mm Mortar Inert	152	152
	120mm Mortar, HE	237	236
MP-3	60mm Mortar, HE	422	421
	60mm Mortar, Inert	50	49
	81mm Mortar, HE	307	306
	81mm Mortar, Inert	180	180
	120mm Mortar Inert	152	152
1	120mm Mortar, HE	237	236
OP-1	120mm Tank, Inert	27	0
	155mm Howitzer, HE	2	0
OP-4	155mm Howitzer, HE	26	0
	40mm Grenade, HE (MK19)	84	0
	Hand Grenade, Fragmentation	18	0
	Mine, Claymore, M18A1	8	0
	Missile, TOW, HE	16	0
	Rocket, Dragon, HE	2	.0
	Rocket, RAAWS, Inert	6	0
AIA.	Bomb, 500 lb (MK82)	20	0
Red Cloud - Alpha	120mm Tank, Inert	205	204
ASCENIES 200675.	25mm Gun, Inert	326	326
Red Cloud - Echo	25mm Gun, Inert	104	103
Red Cloud - Hotel	120mm Tank, Inert	521	520
Red Cloud - Hotel	25mm Gun, Inert	1,227	1,227
Red Cloud - MPRC	120mm Tank, Inert	723	722
ind cloud in its	25mm Gun, Inert	13,538	13,537
	30mm Gun, Inert	3,360	3,360
	Hand Grenade, Fragmentation	1	0
	Mine, Claymore, M18A1	1	0
	Rocket, RAAWS, Inert	12	2
Red Cloud - DMPRC	120mm Tank, Inert	1.740	1,740

TABLE E-2. Fort Stewart – Projected Operating Environment – Demolition and Large Caliber Weapons Utilization, cont'd.

Firing Location	Weapon and Ammunition Type	DayShots 0700-2200	NightShots 2200-0700
Red Cloud - Proposed	120mm Tank, Inert	5,068	5,068
DMPTR ^	25mm Gun, Inert	186,666	186,666

[^] New activity under projected operating environments COA1 and COA2.



DEPARTMENT OF THE ARMY

US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE 5158 BLACKHAWK ROAD ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-EON

2 7 JUL 2009

MEMORANDUM FOR Environmental Office (IMSE-STW-PWE/Ms. Amber Franks), Directorate of Public Works, 1550 Frank Cochran Drive, Fort Stewart, GA 31314-4928

SUBJECT: Operational Noise Consultation, No. 52-ON-0BY6-09, Operational Noise Contours for Fort Stewart, GA, July 2009

- 1. We are enclosing 2 copies of the consultation.
- 2. Please contact us if this consultation or any of our services did not meet your needs or expectations.
- 3. The point of contact is Ms. Kristy Broska, Environmental Protection Specialist or Ms. Catherine Stewart, Program Manager, Operational Noise, USACHPPM, at DSN 584-3829, Commercial (410) 436-3829, or email: kristy.broska@us.army.mil or catherine.stewart@us.army.mil.

FOR THE COMMANDER:

Encl

DONALD F. ARCHIBALD

COL, MS

Director, Environmental Health Engineering

CF:

AEC, IMAE-TSP (Ms. Booher)

U.S. Army Center for Health Promotion and Preventive Medicine



OPERATIONAL NOISE CONSULTATION NO. 52-ON-0BY6-09 OPERATIONAL NOISE CONTOURS FORT STEWART, GEORGIA JULY 2009





Distribution authorized to U.S. Government agencies only; protection of privileged information evaluating another command; July 09. Other requests for this document shall be referred to Environmental Office (IMSE-STW-PWE/Ms. Amber Franks), Directorate of Public Works, 1550 Frank Cochran Drive, Fort Stewart, GA 31314-4928

P

M

Preventive Medicine Survey: 40-5fl

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DEPARTMENT OF THE ARMY

US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

EXECUTIVE SUMMARY
OPERATIONAL NOISE CONSULTATION
NO. 52-ON-0BY6-09
OPERATIONAL NOISE CONTOURS
FORT STEWART, GEORGIA
JULY 2009

- 1. PURPOSE. To provide Fort Stewart noise contours for the projected range facilities.
- 2. CONCLUSIONS.
- a. The existing small caliber ranges generate Noise Zone II contours that extend slightly beyond the northern and southern boundaries. There are small clusters of residential areas within these Noise Zone II contours. The existing small caliber ranges generate a Noise Zone II contour that extends into the Fort Stewart housing area.
- b. The proposed small caliber ranges generate Noise Zone II contours that extend slightly beyond the northern and southern boundaries. There are small clusters of residential areas within these Noise Zone II contours. The proposed Course of Action 1 (COA1) Convoy Live Fire (CLFX) facility and the Course of Action 2 (COA2) Fire and Movement (FM) facility generate a Noise Zone III contour that extends slightly beyond the northern boundary. However, there are no noise sensitive land uses within the noise contour.
- 3. RECOMMENDATIONS. Include the information from this consultation in the appropriate Fort Stewart National Environmental Policy Act (NEPA) documentation.

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OPERATIONAL NOISE CONSULTATION NO. 52-ON-0BY6-09 OPERATIONAL NOISE CONTOURS FORT STEWART, GEORGIA JULY 2009

- 1. REFERENCES. A list of the references used in this consultation is in Appendix A. A glossary of terms and abbreviations used are in Appendix B. Appendix C contains the Noise Zone Descriptions and Land Use Guidelines used in this consultation.
- 2. AUTHORITY. This consultation was funded by the Army Environmental Command, Aberdeen Proving Ground, MD.
- 3. PURPOSE. To provide Fort Stewart noise contours for the projected range facilities. Appendix D contains the range location maps.
 - a. The Course of Action 1 (COA1) projected operating environment includes:
 - (1) Projected Facilities Northern Fort Stewart:
 - Fiscal Year (FY) 14 Convoy Live Fire (CLFX)
 - FY13 Fire and Movement (FM) Range
 - FY11 Infantry Platoon Battle Course (IPBC)
 - (2) Projected Facilities Central Fort Stewart:
 - FY13 Infantry Squad Battle Course (ISBC)
 - FY11 Modified Record Fire (MRF) Range
 - (3) Projected Facilities Southern Fort Stewart:
 - FY13 25 Meter Zero Range
 - FY13 Known Distance (KD) Range
 - FY13 MRF Range
 - FY11 Multi-Purpose Machine Gun (MPMG) Range
 - FY13 Qualification Training (QTR) Range

- b. The Course of Action 2 (COA2) projected operating environment includes:
 - (1) <u>Projected Facilities Northern Fort Stewart:</u>
 - FY14 CLFX
 - FY13 FM Range
 - FY11 IPBC
 - FY13 KD Range
 - (2) Projected Facilities Central Fort Stewart:
 - FY13 ISBC
 - FY11 MRF Range
 - (3) <u>Projected Facilities Southern Fort Stewart:</u>
 - FY13 25 Meter Zero Range
 - FY13 MPMG Range
 - FY13 MRF Range
 - FY13 QTR Range
- 4. SMALL CALIBER WEAPONS OPERATIONS.

a. General.

- (1) The noise simulation program used to assess small caliber weapons (.50 caliber and below) noise is the Small Arms Range Noise Assessment Model (SARNAM) (U.S. Army 2003). The SARNAM program requires operational data concerning types of weapons fired from each range, firing points, distance to targets, berms, and safety baffles.
- (2) The contours for small arms operations at Fort Stewart were created using PK15(met) as prescribed in Army Regulation (AR) 200-1 (U.S. Army 2007). The contours show the predicted peak levels for individual rounds (metric term is PK15(met)). Since the contours are based on peak levels rather than a cumulative or average level, the size of the contours will not change if the number of rounds fired increases.
- (3) The inputs used to generate the small caliber noise contours for this consultation were created using the data summarized in Appendix E. Due to the location of several of the existing ranges that utilize small caliber weapons, only those existing ranges that had to potential to impact noise sensitive land uses were analyzed.

b. Existing Operating Environment.

- (1) Figures 1 3 contain the small caliber weapons contours for the existing operating environment. These contours were developed using the existing operating environment tables (Tables E-1-E-3) in Appendix E.
- (2) The Zone II [PK15(met) 87 dB] noise contour extends less than 1,000 meters beyond the northeastern boundary towards Fort Argyle and Old River Roads. The Zone II [PK15(met) 87 dB] noise contour extends approximately 700 meters into the Fort Stewart Bryan Village North and Liberty Woods housing areas. The Zone II [PK15(met) 87 dB] noise contour extends approximately 1,300 meters beyond the southern boundary towards State Highway 196. The Zone III [PK15(met) 104 dB] noise contours do not extend beyond the boundary or into the Fort Stewart housing area.

c. Projected Operating Environments.

(1) Proposed COA1 Facilities.

- (a) Figures 4-6 contain the small caliber weapons contours for the COA1 projected operating environment. These contours were developed using the projected operating environment COA1 tables (Table E-4 E-6) in Appendix E.
- (b) The COA1 projected operating environment creates a Zone II [PK15(met) 87 dB] noise contour that extends less than 1,000 meters beyond the northern boundary. The Zone II [PK15(met) 87 dB] noise contour extends less than 1,000 meters beyond the northeastern boundary towards Fort Argyle and Old River Roads. The Zone II [PK15(met) 87 dB] noise contour extends approximately 700 meters into the Fort Stewart Bryan Village North and Liberty Woods housing areas. The Zone II [PK15(met) 87 dB] noise contour extends approximately 1,300 meters beyond the southern boundary towards State Highway 196. The COA1 projected operating environment creates a Zone III [PK15(met) 104 dB] noise contour that extends approximately 50 meters beyond the northern boundary.
- (c) The proposed COA1 facilities in the northern area of Fort Stewart create a new Noise Zone II contour that extends slightly beyond the northern boundary. The proposed COA1 facilities in the central area of Fort Stewart do not change the noise contours in the Bryan Village North and Liberty Woods housing areas. The proposed COA1 facilities in the southern area of Fort Stewart create slight changes to the Noise Zone II contour that extends beyond the southern boundary. The proposed COA1 CLFX facility in the northern area of Fort Stewart creates a Noise Zone III contour that extends slightly beyond the northern boundary.

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FIGURE 1. FORT STEWART – NORTHERN AREA EXISTING OPERATING ENVIRONMENT SMALL CALIBER NOISE CONTOURS

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FIGURE 2. FORT STEWART – CENTRAL AREA EXISTING OPERATING ENVIRONMENT SMALL CALIBER NOISE CONTOURS	

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FIGURE 3. FORT STEWART – SOUTHERN AREA EXISTING OPERATING ENVIRONMENT SMALL CALIBER NOISE CONTOURS
6

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FIGURE 4. FORT STEWART – NORTHERN AREA PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 1 SMALL CALIBER NOISE CONTOURS

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FIGURE 5. FORT STEWART – CENTRAL AREA PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 1 SMALL CALIBER NOISE CONTOURS

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FIGURE 6. FORT STEWART – SOUTHERN AREA PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 1 SMALL CALIBER NOISE CONTOURS

(2) Proposed COA2 Facilities.

- (a) Figures 7-9 contain the small caliber weapons contours for the COA2 projected operating environment. These contours were developed using the projected operating environment COA2 tables (Table E-7 E-9) in Appendix E.
- (b) The COA2 projected operating environment creates a Zone II [PK15(met) 87 dB] noise contour that extends less than 1,000 meters beyond the northern boundary. The Zone II [PK15(met) 87 dB] noise contour extends less than 1,000 meters beyond the northeastern boundary towards Fort Argyle and Old River Roads. The Zone II [PK15(met) 87 dB] noise contour extends approximately 700 meters into the Fort Stewart Bryan Village North and Liberty Woods housing areas. The Zone II [PK15(met) 87 dB] noise contour extends approximately 2,300 meters beyond the southern boundary towards State Highway 196. The COA2 projected operating environment creates a Zone III [PK15(met) 104 dB] noise contour that extends approximately 50 meters beyond the northern boundary.
- (c) The proposed COA2 facilities in the northern area of Fort Stewart create a new Noise Zone II contour that extends slightly beyond the northern boundary. The proposed COA2 facilities in the central area of Fort Stewart do not change the noise contours in the Bryan Village North and Liberty Woods housing areas. The proposed COA2 facilities in the southern area of Fort Stewart create changes to the Noise Zone II contour that extends beyond the southern boundary. The proposed COA2 FM facility in the northern area of Fort Stewart creates a Noise Zone III contour that extends slightly beyond the northern boundary.

d. Land Use Compatibility.

- (1) Per AR 200-1, noise sensitive land uses, such as housing, schools, and medical facilities are acceptable within the Noise Zone I, normally not recommended in Noise Zone II, and not recommended in Noise Zone III (U.S. Army 2007). Land use surrounding Fort Stewart varies from undeveloped to residential.
- (2) The existing small caliber ranges generate a Noise Zone II contours that extend slightly beyond the northern and southern boundaries. There are small clusters of residential areas within these Noise Zone II contours. The existing small caliber ranges generate a Noise Zone II contour that extends into the Fort Stewart housing area.
- (3) The proposed small caliber ranges generate Noise Zone II contours that extend slightly beyond the northern and southern boundaries. There are small clusters of residential areas within these Noise Zone II contours. The proposed COA1 CLFX facility and the COA2 FM facility in the northern area of Fort Stewart generate a Noise Zone III contour that extends slightly beyond the northern boundary. However, there are no noise sensitive land uses within the noise contour.

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Operational Noise S	tudy, No.	52-ON-0BY6-09.	Ft. Stewart.	GA: Jul 09

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FIGURE 7. FORT STEWART – NORTHERN AREA PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 2 SMALL CALIBER NOISE CONTOURS

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FIGURE 8. FORT STEWART – CENTRAL AREA PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 2 SMALL CALIBER NOISE CONTOURS

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FIGURE 9. FORT STEWART – SOUTHERN AREA PROJECTED OPERATING ENVIRONMENT COURSE OF ACTION 2 SMALL CALIBER NOISE CONTOURS

5. GRENADE LAUNCHER ACTIVITY.

a. Tables 1 and 2 contain the complaint risk criterion for the launch noise of the 40mm grenade launchers. The distances and levels listed represent a conservative approach and were calculated based upon hearing conservation criteria (U.S. Army 1999) and a known measurement (U.S. Army 1984). This data represents the best available scientific quantification for assessing the complaint risk for the launch noise of the 40mm grenade launcher until a detailed noise measurement study is completed.

TABLE 1. Complaint Risk to the Side of the 40mm Grenade Launcher, Inert* Round.

	Distance from	
Risk of Complaints	Grenade Launcher	Noise Level dBP
Low	> 300 meters [^]	< 115 dB
Moderate	65 - 300 meters [^]	115 dB
High	< 65 meters [^]	>130 dB
Risk of hearing damage for unprotected ears	< 19 meters ⁺	>140 dB

^{* --} Inert is defined as any round that does not make noise upon impact, such as smoke, illum, TP

TABLE 2. Complaint Risk to the Rear of the 40mm Grenade Launcher, Inert* Round.

	Distance from	
Risk of Complaints	Grenade Launcher	Noise Level dBP
Low	> 110 meters [^]	< 115 dB
Moderate	25 - 110 meters [^]	115 dB
High	< 25 meters [^]	>130 dB
Risk of hearing damage for unprotected ears	< 7 meters ⁺	>140 dB

^{* --} Inert is defined as any round that does not make noise upon impact, such as smoke, illum, TP

- b. The proposed range development includes ranges which could fire the 40mm Training Practice (TP) rounds.
- (1) The proposed COA1 IPBC is oriented to the south and more than 230 meters from the northern boundary. The proposed COA2 IPBC is oriented to the southeast and more than 700 meters from the northern boundary. The proposed COA2 FM range is oriented to the south and approximately 350 meters from the northern boundary. See Appendix D for range location maps.

^{^ –} Calculated value

⁺⁻ Known value, hearing conservation criteria.

^{^—} Calculated value

⁺⁻ Known value, hearing conservation criteria.

- (2) There are additional proposed ranges which may fire the 40mm TP rounds. However, these ranges are a minimum of 2,000 meters from any noise sensitive land uses.
- c. Based upon Tables 1 and 2 and the location and orientation of the proposed ranges, the risk of complaints from the grenade launchers would be low.

6. CONCLUSIONS.

- a. The existing small caliber ranges generate Noise Zone II contours that extend slightly beyond the northern and southern boundaries. There are small clusters of residential areas within these Noise Zone II contours. The existing small caliber ranges generate a Noise Zone II contour that extends into the Fort Stewart housing area.
- b. The proposed small caliber ranges generate Noise Zone II contours that extend slightly beyond the northern and southern boundaries. There are small clusters of residential areas within these Noise Zone II contours. The proposed COA1 CLFX facility and the COA2 FM facility generate a Noise Zone III contour that extends slightly beyond the northern boundary. However, there are no noise sensitive land uses within the noise contour.
- 7. RECOMMENDATION. Include the information from this consultation in the appropriate Fort Stewart NEPA documentation.

KRISTY BROSKA

Mity Broska

Environmental Protection Specialist

Operational Noise

APPROVED:

CATHERINE STEWART

Program Manager Operational Noise

APPENDIX A

REFERENCES

- 1. U.S. Army, 1984, Army Environmental Hygiene Agency, Environmental Noise Assessment No. 52-34-0442-84, Noise Measurement Study, Camp Bullis, Texas, 27 February–2 March 1984.
- 2. U.S. Army, 1999, Center for Health Promotion and Preventive Medicine, Health Hazard Assessment Report on the 40mm XM1001 Canister Cartridge for the MK-19 Mod 3 Grenade Machine Gun, No. 69-37-2735-00, November 1999.
- 3. U.S. Army, 2003, U.S. Army Construction Engineering Research Laboratories, SARNAM Computer Model, Version 2.6.2003-06-06.
- 4. U.S. Army, 2007, Army Regulation 200-1, Environmental Protection and Enhancement, Chapter 14 Operational Noise.

APPENDIX B

GLOSSARY OF TERMS, ACRONYMS & ABBREVIATIONS

B-1. GLOSSARY OF TERMS.

Decibels (**dB**) – a logarithmic sound pressure unit of measure.

Noise – any sound without value.

PK15(met) - the maximum value of the instantaneous sound pressure for each unique sound source, and applying the 15 percentile rule accounting for meteorological variation.

B-2. GLOSSARY OF ACRONYMS AND ABBREVIATIONS.

COA1 Course of Action 1 COA2 Course of Action 2 CLFX Convoy Live Fire

CPQC Combat Pistol Qualification Course

dB Decibels

FM Fire and Movement

FY Fiscal Year

IPBC Infantry Platoon Battle Course ISBC Infantry Squad Battle Course

KD Known Distance

LUPZ Land Use Planning Zone MPMG Multi-Purpose Machine Gun

MRF Modified Record Fire

NEPA National Environmental Policy Act PK15(met) Unweighted Peak, 15 percent Metric

QTR Qualification Training Range

SARNAM Small Arms Range Noise Assessment Model

TP Training Practice

USACERL U.S. Army Construction Engineering Research Laboratories USACHPPM U.S. Army Center for Health Promotion and Preventive Medicine

APPENDIX C

NOISE ZONE DESCRIPTIONS

- C-1. REFERENCE. U.S. Army, 2007, Army Regulation 200-1, Environmental Protection and Enhancement, Chapter 14 Operational Noise.
- C-2. For a detailed explanation of Noise Zone Descriptions and Land Use Guidelines see Army Regulation 200-1, Chapter 14 (U.S. Army 2007).
- C-3. Day Night Level (DNL). The DNL is used to describe the cumulative or total noise exposure during a prescribed time period. The DNL is the energy average noise level calculated with a 10 decibel penalty for operations occurring between 2200 and 0700.
- C-4. The PK15(met) Noise Contour Description. The PK15(met) is the peak sound level, factoring in the statistical variations caused by weather, that is likely to be exceeded only 15 percent of the time (i.e., 85 percent certainty that sound will be within this range). This "85 percent solution" gives the installation and the community a means to consider the areas impacted by training noise without putting stipulations on land that would only receive high sound levels under infrequent weather conditions that greatly favor sound propagation. The PK15(met) does not take the duration or the number of events into consideration, so the size of the contours will remain the same regardless of the number of events.

C-5. Land Use Guidelines.

- a. The Noise Zone III consists of the area around the noise source in which the level is greater than 70 decibels (dB) C-weighted day-night average sound level (CDNL) for large caliber weapons, greater than 104 PK15(met) for small caliber weapons, or greater than 75 dB A-weighted DNL. Noise-sensitive land uses (such as housing, schools, and medical facilities) are not recommended within Noise Zone III.
- b. The Noise Zone II consists of an area where the DNL is between 62 and 70 dB CDNL for large caliber weapons, between 87 and 104 PK15(met) for small caliber weapons, or between 65 and 75 dB ADNL. Land within Noise Zone II should normally be limited to activities such as industrial, manufacturing, transportation, and resource production. However, if the community determines that land in Noise Zone II (attributable to small arms or aviation) areas must be used for residential purposes, then noise level reduction (NLR) features of 25 to 30 decibels should be incorporated into the design and construction of *new* buildings to mitigate noise levels. For large caliber weapons, NLR features can not adequately mitigate the low-frequency component of large caliber weapons noise.

- c. The Noise Zone I includes all areas around a noise source in which the day-night sound level is less than 62 dB CDNL for large caliber weapons, less than 87 PK15(met) for small arms weapons, or less than 65 dB ANDL. This area is usually acceptable for all types of land use activities.
- d. The Land Use Planning Zone (LUPZ) DNL noise contours (57 dB CDNL or 60 dB ADNL) represent an annual average that separates the Noise Zone II from the Noise Zone I. Taking all operations that occur over the year and dividing by the number of training days generates the contours. But, the noise environment varies daily and seasonally because operations are not consistent through all 365 days of the year. In addition, the Federal Interagency Committee on Urban Noise document states "Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider." For residential land uses, depending on attitudes and other factors, a 57 CDNL or 60 ADNL may be considered by the public as an impact on the community environment. In order to provide a planning tool that could be used to account for days of higher than average operations and possible annoyance, the LUPZ contour is being included on the noise contour maps.
 - e. See Table C-1 for land use guidelines.

TABLE C-1. Land Use Planning Guidelines.

Noise Zones	Large-Caliber Weapons (CDNL)	Small Arms PK15(met)
LUPZ	57 – 62	NA
Ι	< 62	<87
II	62 - 70	87-104
III	> 70	>104

- C-6. Complaint Risk Guidelines for Demolition Activity and Large Caliber Weapons.
- a. The peak contours show the expected level that one would get on a sound level meter when a weapon was fired. Since weather conditions can cause noise levels to vary significantly from day to day (even from hour to hour) the programs calculate a range of peak levels. By plotting the PK15(met) contour, events would be expected to fall within the contours 85 percent of the time. This metric represents the best available scientific quantification for assessing the complaint risk of large caliber weapons ranges. The complaint risk areas for PK15(met) noise contours are defined as follows:

- (1) The high risk of complaint consists of the area around the noise source in which PK15(met) is greater than 130 dB for large caliber weapons.
- (2) The moderate risk of complaint area consists of where the PK15(met) noise contour is between 115 dB and 130 dB for large caliber weapons.
- (3) The low risk of complaint area is where the PK15(met) noise level is less than 115 dB for large caliber weapons.
 - b. See Table C-2 for complaint risk guidelines.

TABLE C-2. Complaint Risk Guidelines.

	Large Caliber Weapons
Risk of Complaints	PK15(met) dB Noise Contour
Low	< 115
Moderate	115 - 130
High	> 130

APPENDIX D

FORT STEWART RANGE LOCATION MAPS

Operational Noise Study, No. 52-ON-0BY6-09, Ft. Stewart, GA; Jul 09
Figure Redacted
FIGURE D-1. FORT STEWART – NORTHERN AREA EXISTING RANGE LOCATIONS
D-2

Figure Redacted

FIGURE D-2. FORT STEWART – NORTHERN AREA PROPOSED COURSE OF ACTION 1 RANGE LOCATIONS

Figure Redacted

FIGURE D-3. FORT STEWART – NORTHERN AREA PROPOSED COURSE OF ACTION 2 RANGE LOCATIONS

Operational Noise Study, No. 52-ON-0BY6-09, Ft. Stewart, GA; Jul 09
Figure Redacted
FIGURE D-4. FORT STEWART – CENTRAL AREA EXISTING RANGE LOCATIONS
D-5

Figure Redacted

FIGURE D-5. FORT STEWART – CENTRAL AREA PROPOSED COURSE OF ACTION 1 RANGE LOCATIONS

Figure Redacted

FIGURE D-6. FORT STEWART – CENTRAL AREA PROPOSED COURSE OF ACTION 2 RANGE LOCATIONS

Operational Noise Study, No. 52-ON-0BY6-09, Ft. Stewart, GA; Jul 09
Figure Redacted
FIGURE D-7. FORT STEWART – SOUTHERN AREA EXISTING RANGE LOCATIONS
D-8

Figure Redacted

FIGURE D-8. FORT STEWART – SOUTHERN AREA PROPOSED COURSE OF ACTION 1 RANGE LOCATIONS

Figure Redacted

FIGURE D-9. FORT STEWART – SOUTHERN AREA PROPOSED COURSE OF ACTION 2 RANGE LOCATIONS

APPENDIX E

SMALL CALIBER RANGE UTILIZATION

E-1. The contours show the predicted peak levels for individual rounds (metric term is PK15[met]). Since the contours are based on peak levels rather than a cumulative or average level, the size of the contours will not change if the number of rounds fired increases or decreases.

E-2. Tables E-1 – E-3 list the ranges and type of weapons utilized to develop the existing small arms noise contours.

TABLE E-1. Fort Stewart – Northern Area Existing Operating Environment - Small Caliber Weapons Utilization.

	/sc	2/2/		Existing Ranges
PISTOL, 9 MM	1 A	N N	1	
RIFLE, 5.56 MM	V	V	N	
RIFLE, 5,56 MM, BLANK	1	V	V	
RIFLE, .30 CAL	V			
MACHINE GUN, 7.62 MM	\ \	V	V	
MACHINE GUN, 7.62 MM, BLANK	V	V		
MACHINE GUN, .50 CAL	1	1	V	

TABLE E-2. Fort Stewart – Central Area Existing Operating Environment - Small Caliber Weapons Utilization.

				_	1	existin
			/	/	/	XISTIN 80 AS
		/	/	//	/	/
		100	life	Ford	100	84
	/	ALTRICA ST	Charite	Clifford	Delta	9/
PISTOL, 38 CAL	13	13	13,	13	V	1
PISTOL, 357 CAL					V	
PISTOL, 9 MM	V	*	V	1	V	
PISTOL: .40 CAL	N					
PISTOL, .45 CAL					V	
TRAINER AT4, 9MM TPT	V					
TRAINER SMAW, 9MM TPT	V	, .				
RIFLE, .22 CAL			V		V	
RIFLE, .270 CAL					V	
RIFLE, 5.56 MM	1	V	V	V		
RIFLE, 5.56 MM, BLANK		V	V	V		
RIFLE, .30 CAL						LI.
RIFLE, .308 CAL					V	
RIFLE, .30/30 CAL					V	4
RIFLE, .30-06 CAL					1	
MACHINE GUN, 7.62 MM	V	V	V		- 4	1
MACHINE GUN, 7.62 MM, BLANK			1			
MACHINE GUN, .50 CAL						V
MACHINE GUN, .50 CAL, BLANK						
SHOTGUN, 10 GAUGE					V	
SHOTGUN, 12 GAUGE	V	V	V	V	V	
SHOTGUN, 12 GAUGE, NON-LETHAL			V			7
SHOTGUN, 28 GAUGE			V			
SHOTGUN, 410 GAUGE	1					

TABLE E-3. Fort Stewart – Southern Area Existing Operating Environment - Small Caliber Weapons Utilization.

			/	E	Existing Ranges
		/	//	//	
	/	0	/	0	
Marian C. X. Walter	/sii	NO CST	2 19	the Vil	*/
PISTOL, 9 MM		V	V	./	
TRAINER AT4, 9MM TPT			V	-	
TRAINER SMAW, 9MM TPT		V			
RIFLE, .22 CAL		V		-	
RIFLE, 5.56 MM	V	V	1	1	
RIFLE, 5.56 MM, BLANK	\ \V	V	V	1	
RIFLE, .30 CAL		1			
MACHINE GUN, 7.62 MM	V	V	V	V	
MACHINE GUN, 7.62 MM, BLANK		V	V		
MACHINE GUN, .50 CAL	V	1		1	
MACHINE GUN, .50 CAL, BLANK	1	1		V	
SHOTGUN, 12 GAUGE		V			

- E-3. Tables E-4 E-9 list the ranges and type of weapons utilized to develop the projected small arms noise contours. The projected operating environments are cumulative and therefore include the existing activity and the projected activity as appropriate.
 - a. The Course of Action 1 (COA1) projected operating environment includes:
 - (1) Projected Facilities Northern Fort Stewart:
 - Fiscal Year (FY) 14 Convoy Live Fire (CLFX)
 - FY13 Fire and Movement (FM) Range
 - FY11 Infantry Platoon Battle Course (IPBC)
 - (2) Projected Facilities Central Fort Stewart:
 - FY13 Infantry Squad Battle Course (ISBC)
 - FY11 Modified Record Fire (MRF) Range
 - (3) Projected Facilities Southern Fort Stewart:
 - FY13 25 Meter Zero Range
 - FY13 Known Distance (KD) Range
 - FY13 MRF Range
 - FY11 Multi-Purpose Machine Gun (MPMG) Range
 - FY13 Qualification Training (QTR) Range

TABLE E-4. Fort Stewart – Northern Area Projected Operating Environment Course of Action 1 - Small Caliber Weapons Utilization.

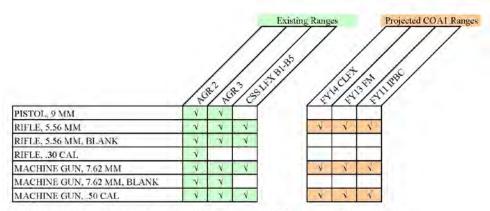


TABLE E-5. Fort Stewart – Central Area Projected Operating Environment Course of Action 1 - Small Caliber Weapons Utilization.

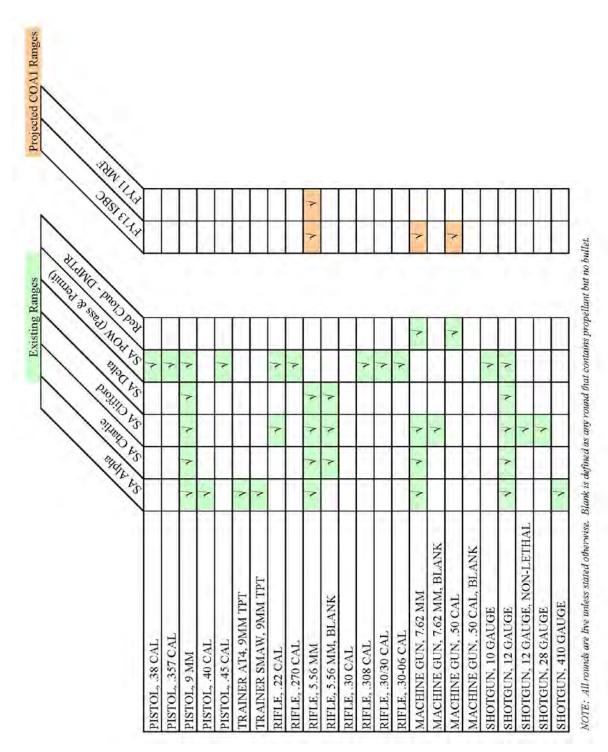
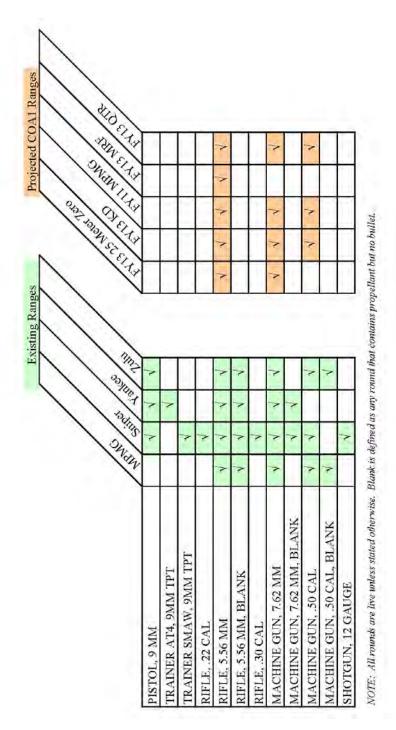


TABLE E-6. Fort Stewart – Southern Area Projected Operating Environment Course of Action 1 - Small Caliber Weapons Utilization.



- b. The Course of Action 2 (COA2) projected operating environment includes:
 - (1) <u>Projected Facilities Northern Fort Stewart:</u>
 - FY14 CLFX
 - FY13 FM Range
 - FY11 IPBC
 - FY13 KD Range
 - (2) Projected Facilities Central Fort Stewart:
 - FY13 ISBC
 - FY11 MRF Range
 - (3) Projected Facilities Southern Fort Stewart:
 - FY13 25 Meter Zero Range
 - FY11 MPMG Range
 - FY13 MRF Range
 - FY13 QTR Range

TABLE E-7. Fort Stewart – Northern Area Projected Operating Environment Course of Action 2 - Small Caliber Weapons Utilization.

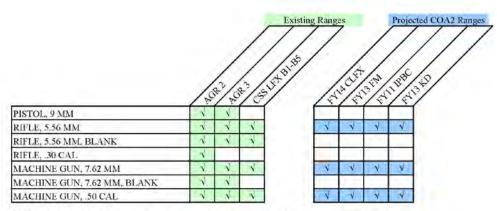


TABLE E-8. Fort Stewart – Central Area Projected Operating Environment Course of Action 2 - Small Caliber Weapons Utilization.

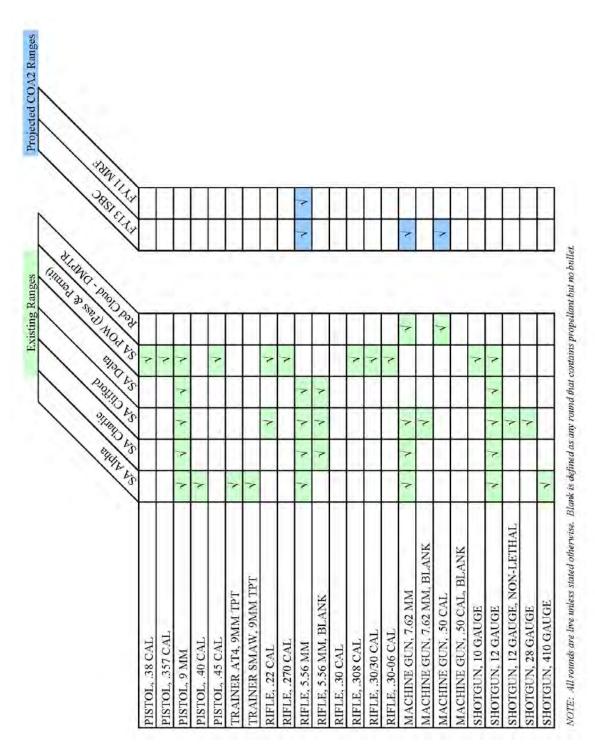


TABLE E-9. Fort Stewart – Southern Area Projected Operating Environment Course of Action 2 - Small Caliber Weapons Utilization.

PISTOL, 9 MM		7	~	~				
TRAINER AT4, 9MM TPT			1					
TRAINER SMAW, 9MM TPT		7						À,
RIFLE, 22 CAL		7						
RIFLE, 5.56 MM	7	7	1	7	7	7	7	>
RIFLE, 5.56 MM, BLANK	7	7	7	7				
RIFLE, 30 CAL		^						
MACHINE GUN, 7.62 MM	1	٨	1	1	7	7		7
MACHINE GUN, 7.62 MM, BLANK		1	1					
MACHINE GUN, 50 CAL	1	1		7		>		N
MACHINE GUN, 50 CAL, BLANK	~			7				
SHOTGUN, 12 GAUGE		N						