



PMI | Africa IRS (AIRS) Project

Indoor Residual Spraying (IRS 2) Task Order Four

2012 ZIMBABWE END-OF-SPRAY REPORT

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2012 ZIMBABWE END-OF-SPRAY REPORT

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ACRONYMS

AIRS	Africa Indoor Residual Spraying
BMP	Best Management Practices
CDC	Centers for Disease Control
COP	Chief of Party
DEHO	District Environmental Health Officer
DDT	dichlorodiphenyltrichloroethane
ECO	Environmental Compliance Officer
ECM	Environmental Compliance Manager
EMA	Environmental Management Agency
EMMP	Environmental Mitigation and Monitoring Plan
F&A	Finance and Administration
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Nets
M&E	Monitoring and Evaluation
MEP	Monitoring and Evaluation Plan
MOHCW	Ministry of Health and Child Welfare
MRCZ	Medical Research Council of Zimbabwe
NatPharm	The National Pharmaceutical Company of Zimbabwe
NIHR	National Institutes of Health Research
NMCP	National Malaria Control Programme
PEHO	Provincial Environmental Health Officer
PMI	President's Malaria Initiative
PPE	Personal Protective Equipment
PSI	Population Services International
SEA	Supplemental Environmental Assessment
STTA	Short Term Technical Assistance
UMP	Uzumba-Marama-Pfungwe
USAID	United States Agency for International Development
WHOPEs	World Health Organization Pesticide Evaluation Scheme

EXECUTIVE SUMMARY

Under its Task Order Four contract with the United States Agency for International Development (USAID), Abt Associates has assumed the role of lead implementing partner for the President’s Malaria Initiative (PMI)’s Africa Indoor Residual Spraying (AIRS) project in Zimbabwe and 13 other sub-Saharan countries. In May, 2012, Abt Associates began its implementation of the AIRS project in Zimbabwe, by establishing an office in Harare, and hiring project staff.

In most project countries, AIRS plans, implements, and manages all aspects of IRS campaigns. However, in Zimbabwe, the National Malaria Control Programme (NMCP) has over 50 years’ experience implementing IRS. Therefore, the AIRS Zimbabwe works to fill gaps, and provide technical assistance to improve the capacity of the NMCP to implement IRS. The key technical area where AIRS Zimbabwe has aimed to improve the technical capacity of the NMCP includes: environmental compliance during spraying, liquid and solid waste disposal, and entomological surveillance.

From May, 2012 through May, 2013, PMI (via the AIRS Zimbabwe project) provided support to the IRS campaigns in 17 districts in Manicaland, Mashonaland East, and Mashonaland West Provinces. Thereby, AIRS Zimbabwe worked to establish soak pits (for the safe disposal of liquid wastes) at operation bases/camp-sites for the IRS campaign. Other accomplishments of AIRS Zimbabwe in support of the 2012 IRS campaign, included: providing food support and printing training documents for spray operator trainings at the district-level, training district-level environmental health staff on solid waste disposal, assessing the capacity of provincial-level incinerators to dispose of IRS campaign solid wastes and working with the NMCP and provincial health offices to plan for the safe incineration of solid wastes, completing entomological surveillance, procuring personal protective equipment (PPE) and insecticide for the NMCP to use in its IRS programming, and monitoring the implementation of IRS in Manicaland, Mashonaland East, and Mashonaland West Provinces.

Table I below, provides a brief summary of the 2012 IRS Campaign.

TABLE I: 2012 IRS CAMPAIGN AT A GLANCE

Dates of IRS Campaign	October 1, 2012- February 4, 2013
Number of districts supported by PMI and AIRS Zimbabwe:	17 districts Manicaland: Makoni, Buhera, Chipinge, Mutare, Mutasa, Nyanga, and Chimanimani Mashonaland West: Hurungwe, Chegutu, Kadoma, Zvimba, Makonde, and Kariba Mashonaland East: Murehwa, Mutoko, Mudzi, and Uzumba-Maramba-Pfungwe (UMP)
Insecticide-Used	Pyrethroid: Makoni, Buhera, Mutare, Mutasa, Nyanga, Chimanimani, Hurungwe, Chegutu, Kadoma, Zvimba, Makonde, Murehwa, and Mutoko DDT: Mudzi and UMP DDT and Pyrethroid: Chipinge and Kariba
Number of structures sprayed in the 17 districts	501,613

Dates of IRS Campaign	October 1, 2012- February 4, 2013
Number of structures targeted in the 17 districts	581,165
2012 IRS campaign spray coverage	86%
Population protected by 2012 IRS campaign	1,164,586

I. INTRODUCTION

Under its Task Order Four contract with USAID, Abt Associates has assumed the role of lead implementing partner for PMI's Africa Indoor Residual Spraying project in Zimbabwe and 13 other sub-Saharan countries. In May, 2012, Abt Associates established its project office in Harare and began the implementation of its project to support the IRS program completed by Zimbabwe's NMCP. Following discussions between PMI and the NMCP, AIRS Zimbabwe was directed to support IRS programming in 17 districts in Manicaland, Mashonaland East, and Mashonaland West provinces. Outside of working with the NMCP, AIRS Zimbabwe also worked closely with the provincial and district health offices in Mashonaland East, Mashonaland West, and Manicaland, to support their implementation of the 2012 IRS campaigns.

This report provides a description of the activities that AIRS Zimbabwe completed to support the 2012 IRS campaign, key observations that AIRS Zimbabwe noted during and after the IRS campaign, and recommendations to help improve the future work of the AIRS Zimbabwe project. The report also provides the results of the 2012 IRS campaign in the 17 districts supported by PMI/AIRS, and data on the key IRS indicators that AIRS is required to report to PMI.

2. COUNTRY AND PROJECT BACKGROUND

2.1 BACKGROUND OF IRS IN ZIMBABWE

IRS has been implemented in Zimbabwe since the 1940s, with initial IRS programming through the 1970s, focusing on spraying “barrier” areas, or lower altitude areas that surround the agricultural intensive highlands (where malaria transmission is relatively low), and preventing malaria epidemics in the major population areas.¹ In the 1980s, IRS programming shifted to a larger national program with coverage extending to most of the country, in order to reduce morbidity and mortality nationally.² This continues to be the overarching policy of the IRS program in Zimbabwe. The NMCP’s National Strategic Plan for 2008-2013, aims to provide nearly universal access to malaria prevention and protection programming, including IRS, with 90% of the at-risk populations covered by IRS and Insecticide Treated Nets (ITNs) by 2013.³ Malaria prevention in Zimbabwe is noted for the high acceptance of IRS.

In the 1990s, the NMCP switched the insecticide primarily used in IRS (dichlorodiphenyltrichloroethane or DDT) to pyrethroids. However, a noted increase in malaria cases during the 1990s led the NMCP to switch to using a mix of pyrethroids and DDT in its IRS activities. Presently, the NMCP continues to use a mix of DDT and pyrethroids for its IRS campaigns throughout Zimbabwe. PMI currently only supports IRS in areas that use pyrethroids.

2.2 BACKGROUND OF PMI AND AIRS ZIMBABWE SUPPORT FOR IRS IN ZIMBABWE

In 2011, Zimbabwe was selected as a PMI project country. Although USAID funds, have supported IRS programming in Zimbabwe since 2009, the funds received under FY 2011, were the first PMI funds that were designated to specifically bolster IRS capability. Since the Zimbabwean NMCP has several decades’ experience in organizing and implementing IRS campaigns throughout the country, PMI decided to focus its support to providing technical assistance to the NMCP, and helping the NMCP improve its capacity to complete IRS, particularly with regards to environmental compliance/safety, entomological surveillance, and other key aspects of IRS campaign management.

After establishing its project office in Harare, AIRS Zimbabwe initially hired three staff members, Finance and Administration (F&A) Manager, an Environmental Compliance Officer (ECO), and a Technical Director/Entomologist. The Technical Director/Entomologist also served as the project’s initial Chief of Party (COP). The Technical Director/Entomologist stepped down as COP in February, 2013 to focus on the entomology aspects of the project, and the AIRS Zimbabwe project hired a new COP to assure the overall management of the project, and act as a primary liaison with the NMCP and PMI-Zimbabwe.

¹ Musawenkosi L. Mabaso H. Sharp B. Lengeler C. “Historical review of malarial control in southern African with emphasis on the use of indoor residual house-spraying.” *Tropical Medicine and International Health*. August 2004. Vol. 9. No. 8. pgs. 846–856.

² Musawenkosi L et al. 2004.

³ Ministry of Health and Child Welfare (MOHCW) Zimbabwe. National Malaria Control Programme Strategy 2008-2013. pg. 24.

AIRS Zimbabwe’s approved 12 month work plan (January 1, 2012 to December 31, 2012) outlined AIRS Zimbabwe’s support for the 2012 IRS campaign. A supplemental work plan (January 1, 2013-April 30, 2013), outlined AIRS Zimbabwe’s work following the end of the 2012 IRS campaign.

2.2.1 HIRING OF LOCAL CONSULTANTS

AIRS Zimbabwe also hired four local consultants in 2012 to help complete IRS environmental compliance monitoring, and noting if spraying met the guidelines listed in PMI’s Best Management Practices (BMP). Additionally, the consultants helped the AIRS Zimbabwe team to collect data on the number of rooms that comprise a sprayed structure in the spray districts. This data helped AIRS Zimbabwe devise an algorithm for determining the number of rooms that comprise a structure, for data reporting to PMI (see section 6.1, “Conversion of “Rooms” to Structures” for more details).

The four consultants that AIRS Zimbabwe hired had previous experience working on IRS in Zimbabwe, either via work with the NMCP, Ministry of Child Health and Welfare (MOHCW), or provincial health offices.

Using their expertise and contacts at the provincial level, the consultants also played a key role in helping to organize and supervise the construction of soak pits in Manicaland, Mashonaland East, and Mashonaland West. The consultants also contributed to helping to build covers for the soak pits after the IRS campaign finished.

AIRS Zimbabwe staff, completed a two-day training for the consultants in early October, 2012 covering PMI’s BMP standards with regards to environmental compliance and the implementation of IRS campaigns; the design and rationale for constructing soak pits; entomological surveillance activities; and the data entry forms that the consultants were expected to complete while observing the IRS campaign.

2.3 BACKGROUND OF THE 2012 IRS CAMPAIGN

The 2012 IRS campaign was completed in Mashonaland East, Mashonaland West, and Manicaland provinces between October 1, 2012 and February 4, 2013. It should be noted that five districts in Mashonaland East Province were not covered by the IRS campaign, as these districts are located at higher elevations, and are not malaria-endemic areas.

Table 2, below, denotes the population of the 17 districts where PMI and AIRS Zimbabwe supported the 2012 IRS campaign.

TABLE 2: MANICALAND, MASHONALAND EAST, AND MASHONALAND WEST’S ESTIMATED POPULATION

Province	District	Population
Manicaland	Nyanga	125,688
	Mutasa	169,756
	Makoni	273,289
	Mutare	260,567
	Buhera	246,462
	Chimanimani	133,810
	Chipinge	300,792

Province	District	Population
Mashonaland East	Mudzi	132,617
	UMP	112,150
	Murewa	195,085
	Mutoko	145,676
Mashonaland West	Kariba	41,420
	Hurungwe	324,675
	Makonde	148,819
	Zvimba	245,489
	Chegutu	149,025
	Kadoma	90,109
Total		3,095,429

2.3.1 INSECTICIDE SELECTION FOR THE 2012 IRS CAMPAIGN

For the 2012 IRS Campaign, the NMCP had already selected that it would use a combination of pyrethroids and DDT in Manicaland, Mashonaland East and Mashonaland West. The selection of insecticides was based on the following criteria developed by the National Vector Control Subcommittee:

- 1) Districts with high endemicity for malaria, and long malaria-transmission seasons are sprayed with DDT;
- 2) Districts with moderate malaria endemicity and shorter malaria transmission seasons are sprayed with pyrethroids. Additionally, pyrethroids are sprayed in areas with high cultivation of tobacco;

Please see table I, to review the insecticides that were selected by the National Vector Control Subcommittee and NMCP for the IRS campaigns in Manicaland, Mashonaland East, and Mashonaland West.

2.3.2 USE OF DDT IN PMI-SUPPORTED DISTRICTS

The Supplemental Environmental Assessment (SEA) that AIRS developed in 2012 did not include DDT. Therefore it was decided that AIRS could not provide support to districts that use DDT for their IRS campaigns in 2012. Please see section 4.1, "Supplemental Environmental Assessment" for more details.

However, it was noted that DDT was used for spraying in four districts supported by PMI/AIRS Zimbabwe (Chipinge district in Manicaland, Mudzi and UMP districts in Mashonaland East, and Kariba district in Mashonaland West), during a STTA trip taken by an AIRS Core team staff member in October, 2012, to observe the spray campaign, and soak pit construction. During this trip, the AIRS Core staff member noted boxes of DDT in a storage room at a spray camp site in UMP district, and after further follow-up by the AIRS staff, it was confirmed by several DEHOs that DDT was being used in the above-listed districts.

AIRS staff informed PMI about the use of DDT in the four districts, immediately after confirming the use of DDT by the DEHOs, chiefly during the AIRS Core staff member's debriefing meeting with PMI-Zimbabwe. A memo describing the use of DDT in Chipinge, Kariba, Mudzi, and UMP districts was sent to PMI on October, 31, 2012. Noting this information and the lack of a SEA to support IRS campaigns

that spray DDT, PMI and AIRS stopped providing project support for IRS programming in UMP and Mudzi districts completely, while providing partial support to Kariba and Chipinge districts, but only in areas that completed IRS with pyrethroids.

Regrettably, the AIRS Core staff learned during further discussions with the AIRS Zimbabwe staff in late October/early November that the AIRS Zimbabwe Technical Director/Entomologist had prior knowledge of the use of DDT in the four districts before the 2012 IRS campaign started. The Technical Director/Entomologist learned of the use of DDT during the levels 1 and 2 trainings (for national, provincial, and district health staff) in August/September, and did not disclose this information to AIRS Core staff or PMI. AIRS Core staff did take probationary human resource measures against this staff member.

Additionally, AIRS did ask the DEHOs and Environmental Health Technicians in Chipinge, Kariba, Mudzi, and UMP how the DDT would be disposed. Unfortunately the DEHOs and Environmental Health Technicians in the four districts did not provide a clear answer, noting that DDT would be rinsed from the spray tanks at the spray camp sites, and waste water (if it cannot be re-used) would be dumped into a nearby field. AIRS did not observe any dumping of DDT waste water in nearby fields, but they did observe progressive rinsing in Mudzi, where it was noted that spray operators were attempting to follow the progressive rinsing method. AIRS staff noted that seven barrels were set-up, with alternating empty and full barrels. However, spray operators were using one of the full barrels and eventually the empty barrels (which were now filled with DDT waste water) individually. Additionally spray operators were not wearing full PPE (particularly gloves) during the rinsing process.

AIRS staff worked with the Environmental Health Technician for Mudzi to stop the rinsing process, and re-train the spray operators to follow the correct progressive rinsing procedure, and to assure that all spray operators used their PPE. It was unclear where the waste water in all of the barrels would be dumped (as Mudzi did not have an evaporation tank), although the Environmental Health Technician noted that the waste water would likely be re-used if it was not too dirty, due to water shortages in the area. See figure 1 below, showing the initial rinsing process completed by the spray operators using DDT in Mudzi.

FIGURE 1: PROGRESSIVE RINSING IN MUDZI DISTRICT



In UMP, AIRS staff was not able to observe how DDT was being disposed, yet the team did talk to the Environmental Health Technician, and were able to view the rinsing area, which consisted of two large white plastic containers, one filled with water, and one filled with presumably dirty/used spray tank water. It was noted that both containers were used for rinsing, and due to the shortage of water in the area, the used spray tank water would be re-used until it was too “dirty” and then it would be dumped. The rinsing area was also located right next to a hospital ward. Figure 2, below denotes the rinsing area in UMP.

FIGURE 2: RINSING AREA IN UMP DISTRICT



3. AIRS ZIMBABWE SUPPORT FOR PRE-IRS CAMPAIGN ACTIVITIES

3.1 SIGNING OF OUTLINE OF AGREED ACTIVITIES TO SUPPORT THE IRS CAMPAIGN, AND HAND-OVER OF PPE AND INSECTICIDE

An Outline of Agreed Activities was established between AIRS Zimbabwe and the NMCP, to establish the terms for AIRS Zimbabwe to complete its work to support the 2012 IRS campaign, and establish the terms for the NMCP's use of the PPE and insecticide that AIRS Zimbabwe procured for the 2012 IRS campaign. Additionally the Outline of Agreed Activities established the liability/responsibility of the NMCP to secure, store, and safely use the insecticide and PPE provided by AIRS Zimbabwe. The final version of the Outline of Agreed Activities was signed by AIRS Zimbabwe and the Permanent Secretary for the MOHCW in October, 2012. A copy of the Outline of Agreed Activities is found in the annex of this report.

3.2 PROCUREMENT OF PYRETHROIDS FOR USE DURING THE 2012 IRS CAMPAIGN

Due to a shortage in funds the NMCP was unable to procure enough insecticide for the 2012 IRS campaign. Therefore, in June, 2012, the NMCP asked PMI-Zimbabwe to procure 80,000 sachets of pyrethroids.

After receiving all of USAID's approval signatures for the Zimbabwe SEA in July 2012, AIRS procured the 80,000 sachets of pyrethroids (K-Otherine), which arrived in Zimbabwe on October 3, 2012. Following their clearance from customs, the NMCP promptly received the 80,000 pyrethroids sachets, and moved them to storage at the National Pharmaceutical Company of Zimbabwe (NatPharm)'s regional warehouses outside of Harare.

The NMCP has been unable to provide AIRS Zimbabwe with any information on where the pyrethroids were sent, or if they were used during the 2012 IRS campaign in the PMI and AIRS Zimbabwe supported spray districts

3.3 PROCUREMENT AND HAND-OVER OF PERSONAL PROTECTION EQUIPMENT

AIRS Zimbabwe also procured coveralls, gloves, face shields, torches, and other PPE to supply 640 spray operators and 259 spray team supervisors in Manicaland, Mashonaland East, and Mashonaland West for the 2012 IRS campaign. A list of the PPE procured by AIRS Zimbabwe, and its distribution to the three provinces is found below in Table 3.

TABLE 3: DISTRIBUTION OF PROCURED PPE BY PROVINCE

Item	Total Quantity Procured	Quantity Provided to Manicaland	Quantity Provided to Mashonaland East	Quantity Provided to Mashonaland West
Spray Gear				
Face shield	943	443	300	200
Haversack	943	463	270	210
Apron	899	399	300	200
Coveralls	1,887	898	499	490
Rubber Gloves	943	433	300	210
PPE – Consumables				
Mouth/nose masks (box of 50)	543	250	165	128
Socks, cotton (pair)	1 798	838	540	420
Reusable Store Items to Support IRS Campaigns				
Nylon rope (30 M)	100	50	30	20
Barrel (200-litre)	119	49	28	42
Barrel (100-litre)	50	25	13	12
Basin (20-litre)	300	138	58	104
Basin (40-litre)	85	35	20	30
Barrel (60-litre) / Bucket (80-litre)	170	78	52	40
Metal Drums (200-litre for D fuel)	34	8	12	14
Jug (2-litre)	85	35	15	35
Clear bag	425	210	115	100
Polythene sheet (3 meters)	683	333	200	150
Calculator	102	48	30	24
Tool kit	259	119	80	60
Oil dispenser	34	16	10	8
Bucket	51	25	14	12
Shovel	51	24	15	12

AIRS Zimbabwe arranged for a hand-over of the PPE materials on October 5. However, the NMCP failed to show-up for the hand-over, citing that they did not have enough funds to hire trucks, to send the PPE to the field. Instead, the NMCP asked AIRS Zimbabwe to hire trucks and send all PPE and IRS commodities to the Provincial Health Offices in Mashonaland East, Mashonaland West, and Manicaland. AIRS Zimbabwe agreed to do so, with the PPE delivered to the Provincial Health Offices in Mashonaland East, Mashonaland West, and Manicaland on October 8, 2012.

3.4 SUPPORT FOR LEVELS 1, 2, AND 3 TRAININGS

The NMCP has established three levels of trainings for the IRS campaign in Zimbabwe. Level 1 trainings focus on the roles of national-level health staff regarding the IRS campaign, and developing plans to organize and implement IRS. Level 2 trainings focus on the role of provincial and district-level health staff regarding the IRS campaign, specifically how the staff at the provincial and district level will manage and implement the IRS campaign. Finally, level 3 trainings focus on the work of the spray operators to complete IRS, and to clean and take care of their equipment.

It's important to note that since the recipients of the level 3 trainings are individuals from nearby communities, and not government staff, AIRS Zimbabwe was allowed to provide direct resource support to the level three trainings. Therefore, AIRS Zimbabwe provided food for all level-three training participants in Manicaland, Mashonaland East, and Mashonaland West, and printed and provided hand-outs to the level three participants on progressive rinsing, soak pit construction, and correct use of PPE.

For the levels 1 and 2 trainings, the AIRS Zimbabwe ECO and Technical Director/Entomologist attended the trainings and completed presentations on environmental compliance issues (specifically, environmental compliance legislation concerning IRS, the importance and correct way of completing progressive rinsing for spray pumps, the importance of soak pits for disposing of liquid wastes, and the importance and proper use of PPE), toxicology regarding the insecticides used during IRS, and a brief overview of the methodology for completing entomological surveillance.

Table 4, below provides a break down of the number of people who attended the levels 1, 2, and 3 trainings⁴.

TABLE 4: NUMBER OF PEOPLE TRAINED DURING IRS CAMPAIGN TRAININGS

Training	Date of Training	Number of People Trained	Number of Men Trained	Number of Women Trained
Level 1 Training	July 29-August 4	50	N/A	N/A
Level 2 Training- Manicaland	September 2-September 7	55	N/A	N/A
Level 2 Training- Mashonaland East	September 13-September 17	54	N/A	N/A
Level 2 Training- Mashonaland West	September 2- September 7	55	N/A	N/A

⁴ Only attendees for level 3 trainings are included in the tally of the Monitoring and Evaluation Plan (MEP)'s indicator 2.2.4 because AIRS logistically supported these trainings. Levels 1 and 2 trainings were not supported by AIRS and are excluded from the calculations of the MEP training indicators.

Training	Date of Training	Number of People Trained	Number of Men Trained	Number of Women Trained
Level 3 Training- Manicaland	Started around September 24 in Mutare District and the last training session was completed in Chipinge district in mid-October	336	315	21
Level 3 Training- Mashonaland East	October 10-15	196	176	20
Level 3 Training - Mashonaland West	September 26-October 16	222	197	25
Totals		968	688	66

4. ENVIRONMENTAL COMPLIANCE ACTIVITIES

4.1 SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

In order to prepare for the support of Zimbabwe's IRS activities, AIRS, following USG regulations, completed a Supplemental Environmental Assessment to establish an EMMP. The SEA also proved information on the current infrastructure used for IRS in Zimbabwe, Zimbabwe's malaria burden, the environmental risks and considerations of completing IRS in Zimbabwe, and notes about the insecticides used for IRS in Zimbabwe and their risks. AIRS hired a consultant to complete the SEA, who traveled to Zimbabwe in February/March, 2012. The consultant presented his initial findings to PMI-Zimbabwe and NMCP during a debrief meeting in early March, 2012. An initial draft of the SEA was submitted to PMI in May, 2012, with PMI and USAID approving a final version of the SEA in July, 2012.

4.2 PRE-SPRAY ENVIRONMENTAL INSPECTION

In order to understand the environmental compliance issues where AIRS Zimbabwe could provide support, the AIRS Zimbabwe ECO and the AIRS project's Environmental Compliance Manager (who was in Zimbabwe for a short-term technical assistance (STTA) trip) completed a brief pre-spray environmental inspection in late September, 2012.

The pre-spray environmental inspection visited 8 provincial-level store rooms and 17 district-level store rooms, and several health centers that would host spray campaign camp sites, in order to note the preparation and infrastructure in place to support the 2012 IRS campaign. Please find listed below the key findings from the pre-spray environmental inspection:

- It was noted that 20 of the store rooms at the proposed spray campaign camp sites were inadequate for storing insecticide. The store rooms did not have separate rooms for storing insecticide, nor were there any pallets or shelving to store the insecticide off the ground. For most store rooms the insecticide was mixed in with other IRS and non-IRS commodities. This was particularly evident at the Chinhoyi (Mashonaland West) provincial store room.
- None of the store rooms visited displayed warning signs regarding toxicity of the insecticides within the store rooms.
- Most store rooms located at the health centers were attached or right next to hospital wards. This could pose a risk given the flammability and toxicity of insecticides.
- The store room holding insecticides in Murehwa was situated near a hospital kitchen. Not only was this a potential issue for the food being prepared at the health center, but rodents were also found in the store room.
- The provincial store room in Marondera (Mashonaland West) was poorly ventilated with few windows.
- None of the store rooms visited had thermometers for measuring the temperature in the store room.
- None of the store rooms visited possessed fire extinguishers or spill kits.

- There were no soak pits found at any of the spray campaign camp sites, or the provincial or district-level store rooms visited.

4.3 BUILDING OF SOAK PITS

Noting that soak pits had not been built to safely dispose of liquid wastes at the spray camp sites, AIRS Zimbabwe engaged the NMCP and the Provincial/District Health Offices to build soak pits at each spray campaign camp site.

During previous IRS campaigns soak pits were not used in Manicaland, Mashonaland East, and Mashonaland West. Liquid wastes were often re-used, as the left-over liquid remaining in the spray pumps was simply re-used for spraying the next day. In some areas a drainage ditch or hole was dug for dumping the liquid wastes, but the hole did not include charcoal, sand, or other sediments necessary for developing a soak pit, and properly filtering and safely degrading the chemicals within the insecticide. Finally, in some cases left over liquid waste was dumped into nearby fields and in ventilated improved pit latrines

Noting these issues, AIRS Zimbabwe pushed forward with establishing 65 soak pits in all spray areas, as soon as possible. The soak pits were built from a basic design developed by the AIRS Core teams' ECM based on specification's noted in PMI's BMP (see section 10.1, "Design of Soak Pits Constructed in Manicaland, Mashonaland East, and Mashonaland West" for more details). The soak pits that AIRS Zimbabwe helped construct also offered a slightly sloped cement slab to serve as a wash area, or as the area to support barrels for progressive rinsing, and buckets for washing PPE. Thereby, run-off and waste water from the progressive rinse and washing of PPE would flow into the soak pit for safe disposal and degrading of the insecticide chemicals.

Demonstrations were completed by the ECM and ECO for the DEHOs and environmental health technicians throughout Manicaland, Mashonaland East, and Mashonaland West province in late September, 2012. The demonstrations covered the concept of the soak pit and why they are important, how to correctly construct a soak pit, and the correct way to layer the rocks, sand, sawdust, and charcoal in each soak pit hole to assure the safe degradation of the insecticide chemicals. Additionally, a short document noting the design of the soak pits was distributed to all of the DEHOs and environmental health technicians.

AIRS Zimbabwe procured all of the necessary equipment for building the soak pits and hired trucks to move the materials to the provincial health offices. Initially the provincial health offices agreed to move the materials to each spray campaign camp site. However, all three provincial health offices noted that they did not have the budget and/or transport to move the materials. Therefore AIRS Zimbabwe hired local transport to move the materials to each spray campaign camp site, as soon as possible. The delays in coordination about whom would transport the soak pit materials to the spray campaign camp sites, did lead to IRS campaigns starting in Chitakatira (Mutare District), Gadzema (Chegutu District), Obva (Makonde District), St. Ruperts (Mutasa District), and Deve (Hurungwe District), before the soak pits in these areas were fully built.

Construction of soak pits started in early October, with the ECO and the four local consultants traveling throughout Manicaland, Mashonaland East, and Mashonaland West, visiting spray camp sites, and helping the DEHO decide where to place the soak pit. Thereafter, the ECO and the consultants engaged local builders (suggested by the DEHO) to build the soak pits. Figure 3 below shows a wash area/soak pit being built in Mutoko District.

FIGURE 3: CONSTRUCTING A SOAK PIT IN MUTOKO DISTRICT



Figure 4 notes a finished soak pit in Makonde district.

FIGURE 4: FINISHED WASH AREA AND SOAK PIT IN MAKONDE DISTRICT



Additionally 12 soak pits were built in Mudzi, Kariba, UMP, and Chipinge districts before the AIRS Core team staff member noted the use of DDT in these districts in mid-October. Given that DDT needs to be disposed in evaporation pits/tanks and not a soak pit, AIRS Zimbabwe spoke with the NMCP, and provincial and district officials and directed them to not use the soak pits in these districts. Instead the soak pits were covered and locked, with fencing built around the soak pit to prevent access. The soak

pits will remain in these areas and are usable, should the NMCP decide to spray these districts with pyrethroids in the future.

In total, AIRS Zimbabwe constructed 64 soak pits in Manicaland, Mashonaland East, and Mashonaland West during the 2012 IRS campaign. Table 5 notes the location of each soak pit that AIRS Zimbabwe built.

TABLE 5: SOAK PITS BUILT BY AIRS ZIMBABWE IN 2012

Province	District	Spray Campaign Camp Site
Mashonaland East	Mudzi	Dendera
		Shinga
		Suswe
		Makaha
	Mutoko	Kawere
		Kapondoro
		Chindenga
		Chidye
		Jani
	Murewa	Mudamombe
		Chitowa 2
		Jekwa
		Virginia
UMP	Maramba	
	Chitsungo	
	Manyika	
Mashonaland West	Hurungwe	Kasimure
		Chivende
		Chidamwoyo
		Deve
		Nyamakati
		Masanga
		Chundu
		Kazangarare
	Chegutu	Gadzema Primary School
	Kadoma	Nyaonde
		Chakari Mine
		Geja
		Donini
	Zvimba	Rafingora
		Zowa
	Makonde	St. Ruperts
		Kadzamba/Obva
		Doma
		Runene

Province	District	Spray Campaign Camp Site
	Kariba	Makande
		Msampakaruma
		Kasvisva
Manicaland	Makoni	Chiendambuya
		Chinenga
		St. Michaels
	Buhera	Birchenough
		Zangama
		Muzokomba
	Chipinge	Mutandahwe
		Manzvire
		Mutema
		Junction Gate
	Mutare	Marange
		Bezel Bridge
		Chitakatira
		Nyagundi
	Mutasa	Chisuko
		Mupotedzi
		Sherukuru
		Manica Bridge
	Nyanga	Nyatate
		Elime
		Nyamaropa
		Tombo
	Chimanimani	Chakowa
		Biriwiri
Rusitu		
Nyanyadzi		

4.4 INCINERATION AND SOLID WASTE DISPOSAL

4.4.1 INCINERATOR EVALUATION

Following the 2012 IRS campaign, from March 4-March 8, the ECO visited the three provincial-level incinerators in Manicaland, Mashonaland East, and Mashonaland West that are designated for disposing IRS campaign solid wastes. The ECO completed a brief evaluation/analysis of the incinerators with the PEHOs, District Public Works Department Officials, and staff from the Environmental Management Agency (EMA). Key results from the review of incinerators are found below in table 6.

TABLE 6: SUMMARY OF INCINERATOR ASSESSMENT

Province	Incinerator	Type of Incinerator	Maximum Temperature the Incinerator can Reach	Other Issues
Manicaland	Mutare Provincial Hospital	Coal-Fired	Unknown, not measured recently	<ul style="list-style-type: none"> • Currently in-use for incinerating bio-medical waste • Stack (chimney) is not fitted with air-scrubbers • Incinerator Workers' PPE is in poor shape and needs to be replaced • There is no regular collection of waste residues from this facility
Mashonaland East	Mutoko District Hospital	Coal-Fired	400C	<ul style="list-style-type: none"> • Incinerator needs repairs to cracked kiln • Cracked kiln is known by Public Works Department • Even with a repaired kiln the incinerator needs further work to reach above 1,100 Celsius , the recommended temperature to incinerate pyrethroids • Stack (chimney) height is less than 10 meters, risking air pollution to the surrounding community • No equipment to measure emissions at the incinerator
Mashonaland West	Chinhoyi Provincial Hospital Incinerator	Diesel-Fired	600C	<ul style="list-style-type: none"> • Currently going through refurbishments, with regards to kiln surface, and placing air-scrubbers in the stack • Could possibly reach high enough temperature to incinerate pyrethroid wastes after refurbishments, pending tests • Stack is over 30m high, very good for this type of incinerator • PPE for incinerator workers in poor condition, need to be replaced • No regular collection of waste residue

Overall AIRS Zimbabwe and the government staff who conducted the incinerator review noted that none of the incinerators were able to reach appropriate temperatures to incinerate pyrethroid wastes from the IRS campaign. Additionally, PPE for most incinerator workers (individuals that operate the incinerator and handle the solid waste, and for individuals that transport the solid waste) was in poor condition and offered limited protection.

It was also noted that incineration had already started in Manicaland, with IRS campaign solid waste being incinerated at district hospital incinerators that may not have met specifications for properly incinerating IRS wastes. Noting this information, and since the provincial health offices did not have the funds to refurbish their incinerators to reach appropriate temperatures, AIRS Zimbabwe worked with the NMCP and PMI to halt incineration in Manicaland, Mashonaland East, and Mashonaland West, and pay for the incineration of the IRS campaign solid wastes for all three provinces at the Bromar and Bytes International Plant in Harare (which has an incinerator that is able to reach correct temperatures for disposing of IRS campaign solid wastes). The incineration of the solid wastes is described below in section 4.4.2, “Incineration of Solid Wastes”, and in a report that AIRS Zimbabwe provided to PMI-Zimbabwe and the NMCP in July, 2013.

Additionally, AIRS Zimbabwe agreed to procure new PPE for the staff that are involved in incineration and/or transporting solid wastes in each of the three provinces. AIRS Zimbabwe also proposed in its 2013-2014 work plan to refurbish the incinerators in Mashonaland East, Mashonaland West, and Manicaland, and assure they are able to handle IRS campaign solid wastes following the 2013 IRS campaign.

4.4.2 INCINERATION OF SOLID WASTE

Following the incinerator evaluation and noting the issues with the provincial incinerators, AIRS Zimbabwe worked with the NMCP and provincial health offices to organize the incineration of the remaining solid wastes from the 2012 IRS campaign at an incinerator that could reach high enough temperatures to properly dispose of the solid wastes.

All of the solid wastes were transported via Ministry of Health and Child Welfare (MOHCW) vehicles to the Bromar and Bytes International Plant’s Incinerator in Harare. Each truck carrying the solid wastes were accompanied by an IRS supervisor from each of the DEHOs. AIRS Zimbabwe provided fuel for the MOHCW vehicles, along with personal protection equipment (including, overalls, helmets, gumshoes, nose/mouth masks, and face shields) for the drivers and IRS coordinators.

AIRS Zimbabwe made the arrangements and paid for the incineration of the remaining solid wastes at the Bromar and Bytes International Plant’s incinerator. This incinerator is the only one in Zimbabwe that has been licensed by EMA to incinerate hazardous substances, and the incinerator has been used by the University of Zimbabwe, National Blood Transfusion Services, Avenues Clinic, Harare City Health Department, and various donor-funded projects for incinerating medical and hazardous solid wastes.

AIRS Zimbabwe originally expected to assist with the solid waste disposal for 15 districts in Mashonaland East, Mashonaland West, and Manicaland that sprayed with pyrethroids (this includes Kariba and Chipinge districts that completed part of their IRS campaigns with pyrethroids), however, AIRS Zimbabwe was only able to assist with the incineration of solid wastes from Kadoma, Chegutu, Makonde, Zvimba, Kariba, Hurungwe, Murewa, Mutoko, and Mutasa districts. The solid wastes from Chimanimani, Nyanga, Buhera, Makoni and Mutare districts in Manicaland Province were incinerated on a monthly basis during the 2012 IRS campaign at the Mutare Provincial Hospital during the 2012 IRS campaign. Please note that it is currently acceptable to incinerate pyrethroids solid wastes at any local incinerator during the IRS campaign. This is partially due to budgetary challenges, as the district and provincial health offices noted difficulties with affording the transport of the solid wastes from spray areas to provincial incinerators.

Additionally, AIRS Zimbabwe approached district officials several times between March and July, 2013 to receive, transport, and dispose the pyrethroid IRS campaign solid wastes in Chipinge district. However, district health officials refused the assistance of AIRS Zimbabwe, and noted that they would prefer to hold on to their solid wastes (according to district officials, the solid waste in Chipinge district is around 7kg), until the end of the 2013 IRS campaign, and dispose the 2012 solid wastes with the 2013 solid wastes.

AIRS Zimbabwe spoke with district officials in Chipinge, UMP, Mudzi and Kariba who stated that UNDP (the Global Fund's principle recipient in Zimbabwe) completed incineration of DDT solid wastes in March, 2013. The solid wastes were collected and sent to the Hwange Colliery for disposal. were incinerated by the NMCP at the medical waste incinerator in Hwange, with support from UNDP in March, 2013.

The incineration of IRS solid waste was done in three batches on April 25, April 30, and July 2, 2013 due to the volume of the solid wastes to be disposed, and the availability of the incinerator at the Bytes and Bromar International plant (the incinerator can only run for a certain number of hours per day, to ensure the maintenance of the incinerator). All of the solid wastes were transported via MOHCW vehicles. Each truck was accompanied by an IRS supervisor from each of the district's environmental health office. AIRS Zimbabwe provided fuel for the MOHCW vehicles, along with PPE (including, coveralls, helmets, gumshoes, nose/mouth masks, and face shields) for the drivers and IRS coordinators.

All incineration of solid wastes was witnessed by the NMCP's Vector Control Officer, the AIRS Zimbabwe ECO, AIRS Zimbabwe F&A Manager, and the IRS Supervisors from each district that accompanied the solid wastes to Harare.

After the incineration, each district was issued a certificate of incineration which noted the quantity of waste incinerated, and the temperature the incinerator reached to dispose of the solid wastes.

Table 7 below denotes the total quantity of solid waste that was incinerated.

TABLE 7: TOTAL QUANTITY OF SOLID WASTE INCINERATED

Province	District	Quantity of waste incinerated in kg	Notes
Mashonaland West	Kadoma/Chegutu	39	Kadoma and Chegutu districts collected and submitted their solid wastes together
	Makonde/Zvimba	70	Makonde and Zvimba districts collected and submitted their solid wastes together
	Kariba	28	Pyrethroid wastes only
	Hurungwe	61	Pyrethroid wastes only
Mashonaland East	Murewa	102	Murewa district had not completed any disposal of its solid wastes during the IRS campaign, and had considerable wastes left-over from the IRS campaign.
	Mutoko	7	Mutoko had already began incinerating its solid waste during the IRS campaign, and had a small quantity left-over for the incineration.
Manicaland	Mutasa	33	
	Total amount of waste incinerated	340	

4.4.3 SOLID WASTE DISPOSAL TRAINING

AIRS Zimbabwe conducted a training (March 14-March 15) regarding solid waste disposal for the DEHOs, Environmental Health Technicians, and drivers in Manicaland, Mashonaland East, and Mashonaland West. Overall, 37 participants, including 33 DEHOs and Environmental Health Technicians, and four drivers, attended the training in Macheke, Mashonaland East.

The training was facilitated by the AIRS Zimbabwe ECO and Technical Director/Entomologist, along with EMA provincial officers, from Manicaland and Mashonaland East, the PEHOs from Mashonaland East and Manicaland, and one of the local consultants that AIRS Zimbabwe used for environmental monitoring during the 2012 IRS campaign (who has significant experience in the safe transport of insecticide). The EMA provincial officers presented on legislation governing disposal and transportation of hazardous substances and waste in Zimbabwe, and the requirements for safe disposal of hazardous wastes. The Mashonaland East PEHO presented on the toxicology of the insecticides used during IRS, while the PEHO from Manicaland presented on how to manage illness or injury caused from insecticide exposure. Each DEHO also presented on the state of solid waste disposal in their respective districts.

- Other subjects covered during the training included:
- The correct use of PPE for handling of IRS solid waste;
- Correct methods for storing insecticide;
- Plan of action for collection and incineration of solid wastes;
- Safety precautions for transporting insecticide and solid wastes;
 - Response to road accidents involving vehicles carrying insecticides and solid wastes;
 - Processes for decontaminating vehicles after transport of insecticides and solid wastes;
- Disposal of insecticide containers (empty pyrethroids sachets); and
- Approaches for closing and covering soak pits.

5. OBSERVATIONS OF 2012 IRS CAMPAIGN

5.1 ORGANIZATION OF THE 2012 IRS CAMPAIGN

The 2012 IRS campaign was implemented from October 1, 2012 through February 4, 2013, with spray teams deployed to work continuously for 21 days during three sessions (roughly one month). Between each session the spray operators were provided a one week break. The spray operators were community members that came from the spray area, and were familiar with the villages and structures to be sprayed. The spray operators were divided into 36 spray teams of fifteen spray operators. Each team was supervised by a team leader, usually the Environmental Health Technicians for the district). The team leader was responsible for his/her team's performance and organization. The number of spray teams per district was determined by the geographical area to be sprayed in the district, with larger districts/provinces receiving more spray teams.

The spray teams were deployed directly from the level 3 trainings in each district to IRS campaign camp sites, with the camp sites acting as the operation base for the spray campaign. Where possible the camp site was located at a district health center to ensure safe storage of IRS commodities. However camp sites were also found near schools, fields outside of towns, and on municipal building property. The location of the camp sites was established by the provincial/district officials based on access/proximity to various amenities, most notably water and health centers.

The camp sites were also the location of the wash areas for rinsing of spray pumps and washing of PPE, and also for the newly developed soak pits. Large trucks with enclosed flatbeds were used to transport the spray operators from the camp site to the spray areas each day. Figure 5, below shows a typical IRS campaign camp site.

FIGURE 5: IRS CAMPAIGN CAMP SITE



A breakdown of the distribution of spray teams during the 2012 IRS campaign is found below in Table 8.

TABLE 8: DISTRIBUTION OF SPRAY TEAMS BY DISTRICT

Province	District	Number of Spray Teams
Manicaland	Nyanga	2
	Chipinge	3
	Mutasa	3
	Mutare	3
	Chimanimani	2
	Buhera	2
	Makoni	2
Mashonaland East	UMP	3
	Mudzi	3
	Mutoko	2
	Murewa	2
Mashonaland West	Kariba	2
	Hurungwe	2
	Makonde	1
	Zvimba	1
	Chegutu	1
	Kadoma	1
	TOTAL	36

5.2 OVERVIEW OF AIRS ZIMBABWE’S MONITORING OF THE 2012 IRS CAMPAIGN

As noted in section 2.2.1., “Hiring of Local Consultants” AIRS Zimbabwe hired and trained four local consultants to help the AIRS Zimbabwe ECO observe the IRS Campaign, and note any operations or spray campaign implementation issues, specifically with regards to environmental compliance. These observations are meant to help the NMCP note areas where the spray operators are succeeding and/or needs improvement in using PPE, and also identify areas where spray operators need further supervision and training. AIRS Zimbabwe also valued the opportunity to monitor the IRS campaign and understand any issues that may need further assistance in the future. AIRS Zimbabwe presented on its IRS campaign monitoring findings listed in this section, during the provincial IRS review meetings that took place in May and June, 2013.

Two consultants were sent to Manicaland to observe the IRS campaign (since the IRS campaign covered the most districts, and would spray the most structures), and one consultant each monitored the IRS campaign in Mashonaland East and Mashonaland West. Where possible the AIRS Zimbabwe ECO and Technical Director/Entomologist also went to the spray districts to observe the IRS campaign. The consultants were in the field observing the IRS campaign from mid-October through the end of December.

The consultants were able to “embed” themselves with the spray teams, as the AIRS Zimbabwe provided each consultant with a full-set of PPE (coveralls, gloves, face masks, gum boots, etc), a torch, a tent, and a sleeping bag. This allowed the consultants to stay with the spray operators at their camp sites/operation bases. In turn, the consultants were able to follow several spray operators each day from

the time they received their PPE and IRS commodities in the morning, through their actual spraying of structures, and after the spray operators returned to the camp sites to wash their PPE and rinse their spray tanks.

The consultants recorded their observations on a checklist developed by the AIRS Zimbabwe team based on the BMP. The checklist is found in section 10.4, “Environmental Compliance and IRS Supervision Checklist.”

Overall, the consultants monitored 27 of the 36 spray teams in the provinces, and observed the work of 200 spray operators. The results of the data recorded on the checklists noted the high competency of the spray operators in the 17 spray districts. Spray operators closely followed the policies and best practices set forth in the BMP. However, in some areas where the consultants (or AIRS Zimbabwe staff) noted non-compliance with the BMP or poor spray practices, the consultants, ECO, Technical Director/Entomologist worked with the spray operator and the environmental health technician supervising the spray operators to correct the issue.

The data collected on the IRS campaign monitoring checklist were entered into an excel spreadsheet for further analysis, which also notes the date, location, and the specific spray operator that was observed. AIRS Zimbabwe shared this data with the NMCP, PEHO, and DEHO, during the IRS Campaign review meetings that were completed in Manicaland, Mashonaland East, and Mashonaland West, in May and June, 2013. The excel spreadsheet can be provided to the NMCP for their analysis and records, if needed.

5.3 KEY OBSERVATIONS OF THE 2012 IRS CAMPAIGN

All data displayed in this section is compiled and compared via province. Where possible, AIRS Zimbabwe has highlighted significant outliers in red, and noted beneath the data tables explanations regarding some of the more interesting results. The data listed in this section was compiled over the three months (October through December, 2012) during the IRS campaign monitoring work completed by AIRS Zimbabwe ECO and the four consultants.

5.3.1 USE OF PPE

TABLE 9: OBSERVED USE OF PPE

Issue	Number of Spray Operators Observed	Percent of Spray Operator		
		Manicaland	Mashonaland East	Mashonaland West
Wearing Coveralls	200	100%	100%	100%
Wearing Face Masks	197	100%	100%	100%
Wearing Face Shields	198	90%	9%	0%
Wearing Gum Boots	191	80%	100%	100%
Wearing Gloves	200	99%	98%	100%
Wearing Helmets	187	4%	0%	0%
Wearing Aprons	119	97%	16%	100%

- Outside of Manicaland, gum boots were widely worn. In Manicaland spray operators complained of discomfort from wearing the gum boots, with several spray teams allowing spray operators to wear “safety shoes,” “boots”, and “sneakers/trainers.”
- Helmets were rarely worn except sparingly in Manicaland. After speaking with the NMCP about this issue, AIRS Zimbabwe learned that helmets were not procured for most spray teams in Manicaland, Mashonaland East, and Mashonaland West. Helmets proved to be too costly, and the NMCP decided to procure floppy/sun hats for most spray operators to wear instead. Spray operators also stated their preference for wearing the floppy hats over helmets, as helmets were seen as being too hot and uncomfortable. Since the floppy/sun hats are made of cloth, they do not protect one’s head adequately, and tend to absorb insecticide residue.
 - Although it was possible to attach a face shield to the floppy hat (via a bracket and plastic cord), spray operators noted it was difficult.
- The variance in face shield use between Manicaland, and Mashonaland East and Mashonaland West was surprising. Overall, it was noted that the enforcement of wearing face shields was higher in Manicaland, than the other two provinces. Additionally, it was noted that most sprayers in Mashonaland West and Mashonaland East preferred to use goggles over face shields
 - The spray operators also felt the face shields, cracked, tore, or broke fairly easy. AIRS was surprised by this finding, since AIRS had procured the same type of face shields for the IRS campaigns in Manicaland, Mashonaland East, and Mashonaland West, as was procured for multiple AIRS countries’ IRS campaigns in 2012. No other country noted the fragility of the face shields. In fact most countries were planning on using the same face shields procured in 2012, for several more IRS campaign rounds. AIRS did receive a picture of a cracked/torn face shield used in Mashonaland East (which is noted below in figure 6).

FIGURE 6: DAMAGE TO FACE SHIELD



5.3.2 SPRAY OPERATORS PREPARATION OF STRUCTURES BEFORE SPRAYING

TABLE 10: OBSERVED RESULTS OF SPRAY OPERATORS PREPARING STRUCTURES FOR SPRAYING

Issue	Number of Spray Operators Observed	Percent of Spray Operator		
		Manicaland	Mashonaland East	Mashonaland West
Inform Occupants About IRS, before Spraying	195	97%	100%	100%
Ensure Food and Furniture was Removed from Structure	196	94%	100%	100%
Ensure Occupants are Outside of Structure during Spraying	198	100%	100%	100%
Spray Operator Communicates for Occupants to Stay Outside of Sprayed Structure for 2-3 hours after spraying	191	100%	100%	100%
Ensures Domestic Animals are not in the vicinity of the sprayed structure	194	76%	100%	100%

- Overall compliance for these issues was high, except for spray operators in Manicaland that were less compliant with ensuring animals, particularly chickens, were out of the vicinity of sprayed structures.

5.3.3 SPRAYING OF STRUCTURES

TABLE II: OBSERVED BEST PRACTICES WHILE SPRAYING STRUCTURES

Issue	Number of Spray Operators Observed	Percent of Spray Operator		
		Manicaland	Mashonaland East	Mashonaland West
Spray Operators agitates spray pumps periodically during spraying	191	78%	99%	100%
Holds lance of spray pump 45cm from the wall being sprayed	195	90%	99%	100%
Ensure occupants maintain correct overlap between swaths	193	93%	99%	98%
Maintains right speed during spraying	195	94%	100%	100%
Checks the Spray Pump pressure gage regularly	184	90%	99%	100%
Release the Spray Pump Pressure Trigger, When Pump is Not in Use	177	82%	100%	93%
Spray Operator Completes Spraying of Roof	196	64%	100%	100%
Sprays behind doors	193	98%	100%	100%
Sprays behind immovable furniture	175	81%	96%	100%
Eating and Drinking during Spraying	197	5%	0%	2%
Smoking during Spraying	197	3%	0%	2%
Mobile phone use during spraying	192	3%	0%	3%

- Spray training in Manicaland should review the correct way to spray, given that spray operators in Manicaland were less likely to agitate spray pumps and spray structure walls at the correct distance noted in the BMP. Spray operators were noted as spraying walls from 60cm away, versus the best practice of spraying 45cm from a wall. Manicaland spray operators were noted as spraying too fast, not checking spray pump pressure regularly, less likely to spray behind immovable furniture, and not releasing the spray pump pressure trigger when not spraying (which can lead to unintended spraying and insecticide leakage).
- It was noted that spray operators in Manicaland were less likely to spray roofs, as compared to their counterparts in Mashonaland East and Mashonaland West. During the Manicaland Province IRS review meeting, participants remarked that the spray operators in Manicaland lacked spray pump lance extensions, which made it more difficult for Manicaland spray operators to cover roofs.

5.3.4 POST-SPRAYING ACTIVITIES

TABLE 12: OBSERVED ADHERENCE TO POST-SPRAYING BEST PRACTICES

Issue	Number of Spray Operators Observed	Percent of Spray Operator		
		Manicaland	Mashonaland East	Mashonaland West
Returned Empty and Unused Sachets	171	100%	100%	100%
Clean Spray Pumps Using Progressive Rinse	159	70%	63%	100%
Clean Spray Pumps on Wash Slab, and empty liquid waste into the soak pit	159	70%	75%	100%
Wash PPE After Spraying	165	94%	88%	100%
Bath before handling food	159	100%	100%	100%

- It was noted that due to water shortages in Mashonaland East and Mashonaland West, some spray camp sites did not have enough water to allow for progressive rinsing of spray pumps each day. It was also noted by the consultants that spray operators were more likely to clean their spray pumps daily, if a soak pit was present.
- Similar to the progressive rinse issue, AIRS Zimbabwe learned that due to water shortages PPE was not washed daily at all spray campsites in Mashonaland East and Mashonaland West.

5.3.5 INSECTICIDE USAGE RATES AND OTHER KEY IRS OPERATIONS DATA

TABLE 13: INSECTICIDE USAGE RATE AND OTHER KEY DATA COLLECTED BY SPRAY OPERATORS

Issue	Manicaland	Mashonaland East	Mashonaland West
Average Number of Rooms Sprayed by Spray Operators Daily	26.3	35.5	37.3
Average Number of Structures Sprayed by Spray Operators Daily	13.7	21.4	23.9
(Calculated via conversion listed in section 6.1., “Conversion of “Rooms” to Structures”)	(26.3 rooms/1.92 rooms per structure)	(35.5 rooms/1.66 rooms per structure)	(37.3 rooms/1.56 rooms per structure)
Average Number of Sachets Used by Spray Operators Daily	6.6	8.7	9.5
Average Number of Sachets Used per Room	0.28	0.24	0.26
Average Number of Sachets Used per Structure	0.15	0.14	0.17
(Calculated via conversion listed in section 6.1., “Conversion of “Rooms” to Structures”)	(0.28 sachets per room/1.92 rooms per structure)	(0.24 sachets per room/1.66 rooms per structure)	(0.26 sachets per room/1.56 rooms per structure)
Average Number of Rooms Targeted by Spray Team Per Day	493.9	610	1065.4
Average Number of Structures Targeted by Spray Teams Daily	257.2	367.5	682.9
(Calculated via conversion listed in section 6.1., “Conversion of “Rooms” to Structures”)	(493.9 rooms/1.92 rooms per structure)	(610 rooms/1.66 rooms per structure)	(1065.4 rooms/1.56 rooms per structure)

5.3.6 OTHER FINDINGS NOTED DURING THE MONITORING OF THE IRS CAMPAIGN

- In camp sites not located near a health center, insecticide was often stored in a tent. The consultants and ECO noted that this was a significant security risk, and were weary that spray operators slept in the tents where the insecticide was stored.
- In camp sites with store rooms, the consultants and ECO continually noticed the insecticides were often mixed in (often on the same shelf) with other health commodities (non IRS commodities) in the store rooms.
- AIRS Zimbabwe had procured nearly 1,900 coveralls for the spray campaign in Manicaland, Mashonaland East, and Mashonaland West, as the NMCP noted that some of coveralls that they had in their possession were in poor condition. However, AIRS Zimbabwe staff noticed that some of the spray operators wore the coveralls that the NMCP had procured in previous years. The older coveralls worn by the spray operators were in good shape, and did not need to be replaced. The PEHO and DEHO in the affected areas had commented that the coveralls that AIRS Zimbabwe had procured would be used in future years

5.4 POST-SPRAY CAMPAIGN INSPECTION

The AIRS Zimbabwe ECO and the four local consultants carried out post-spray inspections between mid-February and mid-March, 2013. Where possible, the NMCP's Vector Control Officer and the PEHOs and DEHOs participated in the inspections. Similar to the monitoring of the IRS campaign, a brief checklist was devised and used during the post-spray environmental inspection (please see 10.6., "Post-Spray Environmental Inspection Checklist" for an example of the checklist). The inspection looked into the condition of the soak pits, and assured that all soak pits received a cover that was locked in place. The inspection also looked into whether solid waste from the IRS campaign had been collected and sent to the provincial store rooms, and the ECO and the consultants completed a brief inventory of the remaining PPE in the store rooms visited, and noted the condition of the store rooms at the provincial-level and at various district health centers that were holding insecticide or IRS equipment. Listed below are the brief findings from the inspections.

5.4.1 INSPECTION OF SOAK PITS AND PROVISION OF SOAK PIT COVERS

The soak pits built by AIRS Zimbabwe were found to be in good condition and needed limited refurbishment. In some cases the fences and gates surrounding the soak pits were in need of limited repair. After completing the inspection, a soak pit cover, made from concrete and reinforced wire mesh was built, and fitted and locked on to the soak pit. The locked soak pit cover prohibited access to the soak pit during the "off-season", and allow for the insecticide in the soak pit to safely degrade. Figure 7 below shows a covered soak pit.

FIGURE 7: EXAMPLE OF A COVERED AND LOCKED SOAK PIT



5.4.2 STORAGE OF INSECTICIDES AND IRS EQUIPMENT

The inspection noted that insecticide was found at the 17 district health store rooms visited. Insecticide was found in intact boxes, although the boxes were not on pallets or shelves, nor was it separated into a different room. Insecticide was often mixed together with other IRS PPE and equipment (spray pumps, tents, progressive rinsing drums, washing buckets, rubber gloves, face masks, and aprons). In many cases the PPE and equipment were haphazardly stored, mixing damaged and working PPE. Other key findings from the inspection of the store rooms include:

- Store rooms in Kariba and Chegutu were found to be in poor condition. The store rooms in both districts did not have any functioning locks on the store room doors, and are readily accessible. Additionally, the store room in Chegutu was situated inside the environmental health offices, which could pose a risk considering staff, were in close proximity to insecticides.
- The inspection team did note that the store room in Chimanimani is very well managed, and included good organization of IRS equipment on shelves and hooks. Insecticide was also separated and stored in another room.
- AIRS Zimbabwe is now aware that the NMCP allows the spray operators to keep their gum boots at the end of the IRS campaign. Unfortunately AIRS Zimbabwe is also not aware if the gum boots were properly and thoroughly washed before they were given to the spray operators.

Table 14 provides a brief summary of the inventory and store room findings per province. More detailed tables are found in section 10.7., “Results of Post-IRS Spray Campaign Inspections.”

TABLE 14: SUMMARY OF STORE ROOM INSPECTIONS

Issue	Manicaland	Mashonaland East	Mashonaland West
Used Insecticide Sachets	Remaining sachets that have not been incinerated have been moved to the provincial store	Stored at provincial level store room in plastic bags	Stored at provincial level store room in plastic bags
Progressive Rinsing Barrels	42 counted, should be adequate for IRS campaign in 2013	28 counted, should be adequate for IRS campaign in 2013	42 counted, should be adequate for IRS campaign in 2013
Spray Pumps	202 Spray pumps were found, although many of them need repairs. 87 other pumps are too damaged to be re-used, and need to be replaced.	123 spray pumps were in working order. 48 other pumps need extensive repair or to be replaced.	149 spray pumps were in working order. 53 other pumps need extensive repair or to be replaced.
Stretcher Beds	About 66 are usable, 322 other beds should be replaced	Only 33 are usable, around 206 need to be replaced	Only 78 are usable, around 129 needs to be replaced.
Tents	21 are in usable condition, 64 other tents need to be replaced	42 are in usable condition, 22 tents need to be replaced	36 are in usable condition, 26 tents need to be replaced
Rubber Gloves	120 pairs in stock, need 322 more gloves for the 2013 IRS campaign	73 pairs in stock, need significantly more gloves for the 2013 IRS campaign	78 pairs in stock, need significantly more gloves for the 2013 IRS campaign
Coveralls	0 found in stock, need to replace about 704 pairs	Only 115 found in stock, need to replace about 330 pairs	Only 89 found in stock, need to replace about 229 pairs

Issue	Manicaland	Mashonaland East	Mashonaland West
Store Rooms Locked and Secured	8 store rooms were secure with good locks	5 store rooms were secure with good locks	Store rooms in Kariba and Chegutu did not have functioning locks
Store Room Stock Cards Filled-Out Properly	All stock cards were complete and were accurate	All stock cards were complete and were accurate	All stock cards were complete and were accurate
First Aid Kits at Store Rooms	Not found at any store rooms	Not found at any store rooms	Not found at any store rooms
Spill Kits found at Store Rooms	No spill kits were found. Ideally, there should be 32 spill kits in Manicaland, one for each store room, and to assure a spill kit for each vehicle that transports spray operator.	Only 4 spill kits were found. Ideally there should be at least 20 spill kits, to assure one spill kit per store room, and a spill kit for each vehicle that transports spray operators.	20 spill kits were found. Ideally there should be at least 24 spill kits, to assure one spill kit per store room, and a spill kit for each vehicle that transports spray operators
Fire Extinguishers found at Store Rooms	None of the store rooms had a fire extinguisher	None of the store rooms had a fire extinguisher	None of the store rooms had a fire extinguisher

6. DATA RESULTS OF 2012 IRS CAMPAIGN

6.1 CONVERSION OF “ROOMS” TO STRUCTURES

Since the NMCP and the IRS program in Zimbabwe collect data on the number of rooms found and sprayed, AIRS Zimbabwe was asked by PMI to develop an algorithm for converting the number of rooms (found and) sprayed to the number of eligible structures (found and) sprayed. Given that all participating AIRS countries report to PMI the number of structures found and sprayed, it was necessary for AIRS Zimbabwe to adhere to the same reporting standards for comparison of program progress across all AIRS project countries, and to help PMI understand its own contribution to the IRS program in Zimbabwe.

During October, November, and December, AIRS Zimbabwe used its local consultants (and AIRS Zimbabwe staff when they traveled to the field to observe the IRS campaign) to record the number of rooms the spray operators found in each “living” structure to help determine an average number of rooms per (living) structure found. The NMCP considers “living” structures a collection of rooms used for human habitation (i.e. bedrooms, kitchens, living rooms, etc.); versus “other” structures (also recorded on the spray operator cards) that may also be sprayed but usually consist of toilets, granaries, chicken coops, goat pens, kraals, etc. This information was recorded on a special form (resembling the spray operator cards used during the IRS campaign), that was completed by the ECO and consultants while they also filled in the Environmental Compliance and IRS Supervision Checklists. An example of the form can be found in section 10.5., “Data Collection Form for Rooms to Structure Calculation.”

In total 276 data collection forms were completed. Each form noted a different household that was visited and/or sprayed. AIRS Zimbabwe staff compiled the forms and sent them to the AIRS Home Office Monitoring and Evaluation (M&E) team in late December for analysis. The M&E team entered and cleaned the data in an Excel spreadsheet, and calculated an average number of rooms per structure to determine spray coverage and report campaign results, at the structure level.

6.1.1 ROOM-TO-STRUCTURE CONVERSION FACTOR

The room-to-structure conversion factor was calculated using the number of rooms found, rather than the number of rooms sprayed for “living” structures only. Because spray teams typically find more structures than they spray, due to various reasons such as no one present, locked houses, sick person-inside, etc., AIRS used the number of structures found for our calculation to increase our sample size and improve the validity and reliability of our data. Using the data gained from the data collection forms, AIRS summed the total number of rooms found and calculated an average number of rooms per structure for each province. This was important, as AIRS Zimbabwe had advised that the structures found and sprayed in Manicaland tend to be a different in size than the structures found and sprayed in Mashonaland East and Mashonaland West. Table 15 notes the results of this calculation.

TABLE 15: DATA COLLECTED FOR ROOM-TO-STRUCTURE CONVERSION

Province	No. Rooms Found	No. Living Structures Found	Average No. Rooms per Structure
Manicaland	324	169	1.92
Mashonaland East	697	420	1.66
Mashonaland West	309	198	1.56
Total	1,330	787	1.69

6.2 RESULTS OF 2012 IRS CAMPAIGN

Using the AIRS room-to-structure conversion factor, AIRS Zimbabwe converted the final IRS campaign coverage data provided by the NMCP, to convert the number of rooms sprayed to the number of structures sprayed during the 2012 IRS campaign in Zimbabwe. Overall, it was noted that 501,613 structures were sprayed in Manicaland, Mashonaland East, and Mashonaland West provinces, protecting 1,164,586 people. The overall spray coverage rate was 86% percent of structures visited by the spray operators were sprayed. A breakdown of the 2012 IRS campaign results by province and district are noted in Table 16.

TABLE 16: SUMMARY OF SPRAY COVERAGE DURING THE 2012 IRS CAMPAIGN

Province	Districts ⁵	Target Rooms	Rooms sprayed	Target Structures	Sprayed Structures	Spray Coverage, %	Target Population	Population protected	Pop Protected, %
Manicaland	Chimanimani	59,791	54,440	31,187	28,396	91.1	70,895	66,487	93.8
	Chipinge	94,922	83,622	49,512	43,618	88.1	153,111	141,378	92.3
	Makoni	47,198	38,694	24,619	20,183	82.0	54,158	45,940	84.8
	Mutare	105,276	88,820	54,912	46,329	84.4	121,328	112,947	93.1
	Mutasa	75,281	63,214	39,267	32,973	84.0	92,800	74,356	80.1
	Nyanga	80,677	64,164	42,082	33,468	79.5	84,119	77,709	92.4
	Subtotal	463,145	392,954	241,579	204,967	84.8	576,411	518,817	90.0
Mashonaland East	Mudzi	86,088	76,907	51,875	46,343	89.3	127,761	105,408	82.5
	UMP	88,085	60,499	53,078	36,456	68.7	115,236	85,629	74.3
	Murewa	65,058	62,386	39,203	37,593	95.9	75,909	70,303	92.6
	Mutoko	100,513	74,499	60,567	44,892	74.1	130,691	91,384	69.9
	Subtotal	339,744	274,291	204,724	165,283	80.7	449,597	352,724	78.5
Mashonaland West	Kariba	21,113	20,697	13,529	13,262	98.0	36,230	35,768	98.7
	Chegutu	22,194	21,277	14,221	13,634	95.9	28,105	27,665	98.4
	Hurungwe	63,431	60,932	40,645	39,044	96.1	92,792	87,304	94.1
	Kadoma	38,115	37,006	24,423	23,713	97.1	55,234	55,022	99.6
	Zvimba	22,784	21,902	14,599	14,034	96.1	29,204	28,099	96.2
	Makonde	45,952	43,193	29,445	27,677	94.0	62,499	59,187	94.7
	Subtotal	213,589	205,007	136,863	131,364	96.0	304,064	293,045	96.4
Total		1,016,478	872,252	583,165	501,613	86.0	1,330,072	1,164,586	87.6

⁵ A provincial average number of rooms per structure factor was also applied at the district level to present spray coverage and campaign results across the 17 districts. It is important to note that the average number of rooms per structure may vary between districts; thus, using the provincial average may not truly reflect the reality in each district. These are merely estimates.

6.3 POSSIBLE REASONS STRUCTURES WERE NOT SPRAYED

Although the IRS campaign sprayed more 86% of the structures found, the data received from the NMCP reported that 81,552 structures were not sprayed in 2012. The NMCP did not provide an official breakdown of the reasons why structures were not covered, but anecdotal reports indicate that structures were commonly not sprayed because of the following situations:

- No one at-home or present at the structure;
- Structure locked;
- Infant/baby sleeping in room that was supposed to be sprayed;
- Water shortage -- Residents refused IRS when spray operators asked for water from their well or water tap to mix the insecticide. Apparently due to a drought in some areas, residents did not want to provide their own water to the spray operators.

7. ENTOMOLOGY

Entomological surveillance for the 2012 IRS campaign began in November, 2012 and was completed in April, 2013. Listed below are a summary of the entomological surveillance work completed for the 2012 IRS campaign. AIRS Zimbabwe has presented on most of its entomological surveillance findings during the IRS provincial review meetings that took place in May and June, 2013. A final entomological report was submitted to PMI Zimbabwe in July, 2013, which provides more details about the entomological surveillance findings during the 2012 IRS campaign.

It should be noted that AIRS Zimbabwe is currently waiting for the National Institutes of Health Research (NIHR) to perform identification at the sibling species level by molecular techniques. The NIHR staff received training in molecular techniques during a PMI/CDC-led entomological training in June, 2013. It is expected that the NIHR can complete this work in September, 2013.

7.1 SENTINEL SITES USED FOR ENTOMOLOGICAL SURVEILLANCE

For the entomological surveillance activities completed by AIRS Zimbabwe, the following sentinel sites were used.

- Mashonaland East
 - **Murara (Mutoko District):** Murara was initially used as a sentinel site, given its proximity to the Murara Dam and nearby mosquito breeding areas. Entomological surveillance was performed at Murara in November, 2012 just after the area was covered by the IRS campaign, and in April, 2013. The area around Murara was sprayed with lambda-cyhalothrin. Unfortunately, the sentinel site became inaccessible once the rainy season began, and had to be abandoned. However the roads became passable in April, which allowed for further entomological surveillance at this sentinel site.
 - **Kawere (Mutoko District):** Entomological surveillance for Mashonaland East was moved to Kawere in February, since the sentinel site at Murara was unavailable, and Kawere and Murara are located in the same district and geographic area. Kawere was also sprayed with lambda-cyhalothrin in early December.
- Mashonaland West
 - **Kasimure (Hurungwe District):** Kasimure has been used three times for entomological surveillance between December, 2012 and April, 2013. The area around Kasimure was sprayed with Deltamethrin in mid-December.
- Manicaland
 - **Burma Valley (Mutare District):** Entomological surveillance was performed at Burma Valley in December, 2012. Due to difficult relations with the Manicaland Provincial Health Office, AIRS Zimbabwe was unable to revisit the sentinel site for further entomological surveillance work. The area around Burma Valley was sprayed with lambda-cyhalothrin in October.

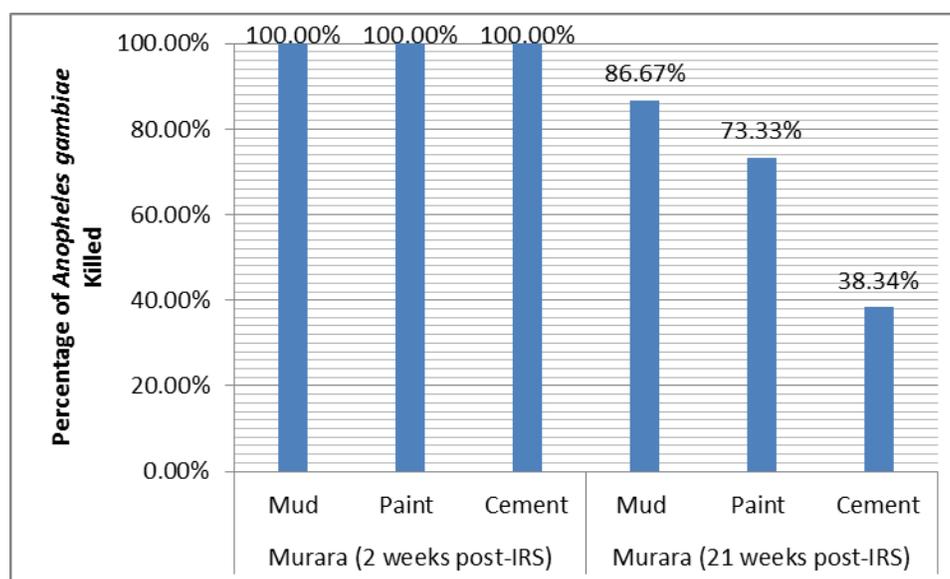
- Control Sites
 - **Rusike (Goromonzi District, Mashonaland East):** Goromonzi district was not covered by the IRS campaign in 2012 as it is considered a non-malarious area. Rusike was originally selected as a control site due to its proximity to mosquito breeding areas, and was used for some CDC light trap and vector density testing in December, 2012. Unfortunately due to rains, the site became inaccessible, and district health staff in January, advised AIRS Zimbabwe to select another nearby area as a control-sentinel site.
 - **Strathlone Farm (Goromonzi District, Mashonaland East):** Entomological surveillance was performed at Strathlone Farm in February and March, 2013, as a replacement control site for Rusike. Unfortunately, Strathlone Farm was sprayed on March 28 in response to a malaria outbreak in the area. Since the malaria outbreak was unforeseen, the District Health Executive did not have time to communicate plans to spray the Strathlone Farm to AIRS Zimbabwe. Since this control site was sprayed, it was not possible to complete further entomological monitoring.

7.2 RESIDUAL EFFICACY

7.2.1 MASHONALAND EAST

The first bioassays were completed in November, 2 weeks after the IRS campaign was completed in the area. The bioassays showed 100% mosquito mortalities on three types of sprayed surfaces, mud, paint and cement. In April, 21 weeks post-IRS, mosquito mortalities showed a decline below 90% on different surfaces types, ranging from 86.67% on mud, to 73.33% on paint, and 38.34% on cement surfaces (see Figure 8 for more details). The higher residual efficacy on mud walls is likely to be due to the more absorptive properties of mud as compared to painted or cemented walls.

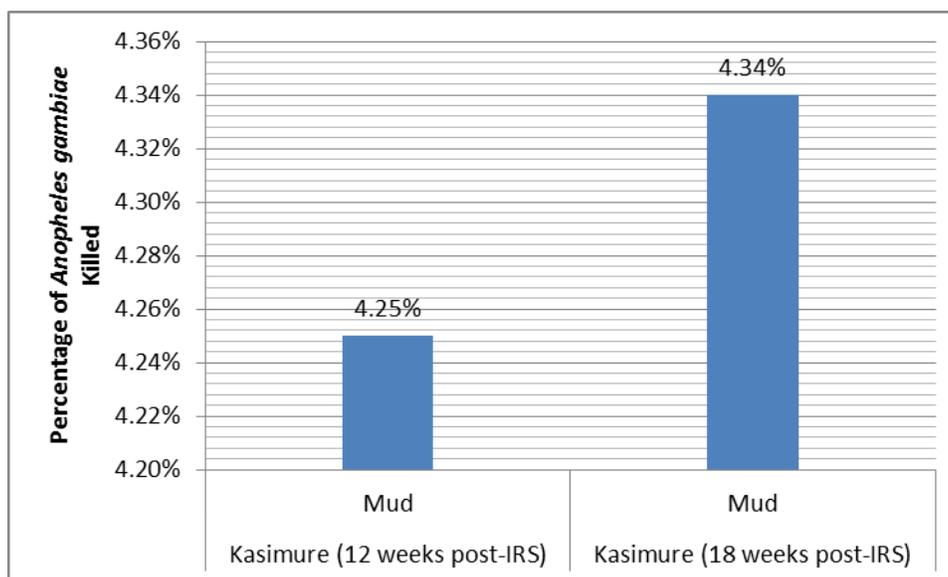
FIGURE 8: MORTALITY RATES OF FIELD-COLLECTED ANOPHELES GAMBIAE S.L. AFTER EXPOSURE TO INSECTICIDE SPRAYED SURFACES AT MURARA SENTINEL SITE



7.2.2 MASHONALAND WEST

Mortalities were noted as 4.25% in March, 2013 (12 weeks post-IRS) and 4.34% at in April, 2013 (18 weeks post-IRS) at Kasimure. The low mortalities rates could be due to low residual life of the insecticide, as at this point the insecticide was sprayed more than three months before. Additionally, given that the weather conditions were noted as cool (between 18oC and 21oC) and it was rainy, variations in temperature and relative humidity may have affected the bio-efficacy and possibly bio-availability of the insecticide. More investigation will be needed through more regular bioassays during the 2013 IRS campaign.

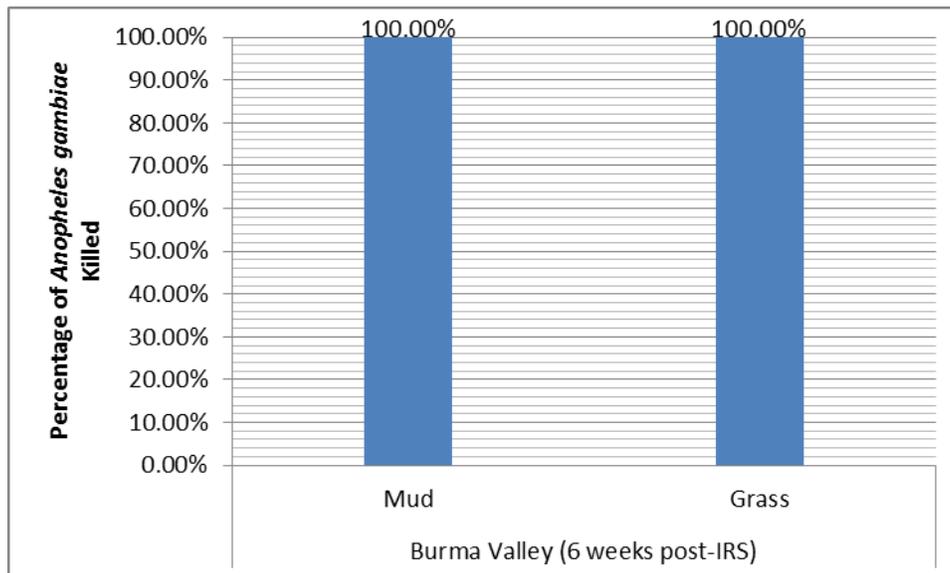
FIGURE 9: MORTALITY RATES OF FIELD-COLLECTED ANOPHELES GAMBIAE S.L. AFTER EXPOSURE TO INSECTICIDE SPRAYED SURFACES AT KASIMURE SENTINEL SITE



7.2.3 MANICALAND

Bioassay tests done in December, 2012 (6 weeks after spraying) at a sprayed house and a control, unfortunately there were not enough mosquitoes to complete testing in other houses) showed high residual efficacy on mud and grass surfaces at the Burma Valley sentinel site. Mortalities were 100%, six weeks after spraying.

FIGURE 10: MORTALITY RATES OF FIELD-COLLECTED ANOPHELES GAMBAIE S.L. AFTER EXPOSURE TO INSECTICIDE SPRAYED SURFACES AT BURMA VALLEY SENTINEL SITE



7.3 INSECTICIDE SUSCEPTIBILITY

Insecticide susceptibility tests were done on *Anopheles gambiae s.l.* collected from the areas surrounding Kawere (Mashonaland East) and Kasimure (Mashonaland West) sentinel sites in March, 2013. No mortalities were encountered during the two susceptibility tests completed at Strathlone Farm, the control-site; hence correction by Abbott’s formula was not necessary.

At Kawere, *Anopheles gambiae s.l.* was susceptible to Deltamethrin, Bendiocarb, DDT and Pirimiphosmethyl. However, susceptibility was reduced for Lambda-cyhalothrin (90.83%) for the same mosquito population. Maximum and minimum temperatures were noted as 27oC and 25oC, respectively, and the relative humidity was 71% during the susceptibility tests in Kawere. Please see table 17 for more details.

TABLE 17: MORTALITY RATES OF ANOPHELES GAMBAIE S.L. FIELD POPULATIONS AT KAWERE (MASHONALAND EAST PROVINCE) DURING INSECTICIDE SUSCEPTIBILITY TESTING

Insecticide	Kawere (Mashonaland East)			
	Total tested (replicates)	KD after 30 min (%)	KD after 60 min (%)	% mortality 24-hour
Lambda-cyhalothrin (0.05%)	35 (2)	17.14%	91.43%	90.83%
Deltamethrin (0.05%)	30 (2)	36.67%	100%	100%
Bendiocarb (0.1%)	30 (2)	63.33%	100%	100%
DDT (4%)	18 (1)	61.11%	100%	100%
Pirimiphos-methyl (1.0%)	15 (1)	0%	80%	100%
Silicone Oil (Pyrethroid control)	20 (1)	0%	0%	0%
Olive Oil (OP/carbamate control)	15 (1)	0%	0%	0%
Risella Oil (OC control)	15 (1)	0%	0%	0%

At Kasimure, there was reduced susceptibility to Lambda-cyhalothrin (90%) and Deltamethrin (93.75%). Susceptibility tests noted full susceptibility to Bendiocarb, DDT, and Pirimiphos-methyl. The relative humidity was 61.1%; and maximum and minimum temperatures were 21oC and 18oC, respectively during susceptibility tests carried-out at Kasimure. Please see table 18 for more details.

TABLE 18: MORTALITY RATES OF ANOPHELES GAMBIAE S.L FIELD POPULATIONS AT KASIMURE (MASHONALAND WEST PROVINCE) DURING INSECTICIDE SUSCEPTIBILITY TESTING

Insecticide	Kasimure (Mashonaland West)			
	Total tested (replicates)	KD after 30 min (%)	KD after 60 min (%)	% mortality 24-hour
Lambda-cyhalothrin (0.05%)	31 (2)	12.9%	67.74%	90%
Deltamethrin (0.05%)	29 (2)	93.10%	93.10%	93.75%
Bendiocarb (0.1%)	42 (2)	88.09%	88.09%	100%
DDT (4%)	24 (1)	95.83%	95.83%	100%
Pirimiphos-methyl (1.0%)	21 (1)	85.71%	85.71%	100%
Silicone Oil (Pyrethroid control)	15 (1)	0%	0%	0%
Olive Oil (OP/carbamate control)	15 (1)	0%	0%	0%
Risella Oil (OC control)	15 (1)	0%	0%	0%

7.4 MOSQUITO COLLECTION

7.4.1 PYRETHRUM SPRAY COLLECTION

Pyrethrum spray collections were done at Murara, Kasimure, Burma Valley, and Kawere sentinel sites, and the control sites at Rusike and Strathlone Farm, to note the indoor resting patterns of mosquitoes. Significantly more mosquitoes were collected at the control sites, where IRS was not performed, except for Burma Valley. At Burma Valley, which had been sprayed several weeks before, 27 fed *Anopheles gambiae* female mosquitoes were collected. This was far higher than the next highest sentinel site in a spray area, Kasimure, where 1 fed *Anopheles gambiae* female mosquito was collected. The total number of mosquitoes and their gonothrophic stages are summarized below in Table 19.

7.4.2 MOSQUITO COLLECTED FROM CDC LIGHT TRAPS

CDC light traps were used for mosquito collections at Murara, Kasimure, Burma Valley, and Kawere sentinel sites, and the control sites at Rusike and Strathlone Farm, to gain further data on the outdoor and indoor density of mosquitoes. Overall considerably more mosquitoes were trapped outside than inside in the IRS campaign areas. At the control site, Strathlone Farm, over 143 *Anopheles gambiae* mosquitoes were trapped inside, significantly higher than the next highest number of *Anopheles gambiae* mosquitoes trapped, 24, trapped outside at Kawere. Nuisance mosquitoes trapped, included *Culex* and *Aedes* species, all of which were unfed.

Ideally light traps should have been set simultaneously indoors and outdoors, as it was done in Murara and Kawere. However, AIRS Zimbabwe was informed by community members that the light traps were not safe if left unguarded outdoors. There was a strong possibility that the batteries would be stolen. For this reason AIRS Zimbabwe were unable to set light traps for collecting mosquitoes outdoor at Kasimure and Strathlone Farm sentinel sites.

TABLE 19: INDOOR RESTING MOSQUITOES FROM PYRETHRUM SPRAY COLLECTIONS

Female <i>An. gambiae</i> complex											
Study site	Date of collection	Spray status	No. of rooms	Unfed	Fed	Half gravid	Gravid	Total	Male Anopheles	Culex	An. funestus
Murara	Nov 2012	Sprayed	7	0	0	0	0	0	0	1FF	0
		'not sprayed'	2	0	0	0	0	0	0	0	0
	April 2013	Sprayed	7	0	0	0	0	0	0	0	0
		'not sprayed'	2	0	0	0	0	0	0	0	0
Kawere	Feb 2013	Sprayed	12	1	0	0	0	1	0	35FF	0
Kasimure	Nov 2012	not sprayed*	11	1	0	0	0	1	0	3FF	0
	March 2013	Sprayed	12	0	0	0	0	0	0	3UF, 10FF, 4HG, 3G	0
	April 2013	Sprayed	10	0	1	0	0	1	0	1HG	0
	April 2013	'not sprayed'	2	0	0	0	0	0	0	0	0
Burma Valley	Dec 2012	Sprayed	11	2	27	6	28	63	7	11FF	0
Rusike "Control"	Jan 2013	N/A		0	0	0	0	0	0	0	0
Strathlone Farm	Mar 2013	Not under IRS	13	2	22	8	0	32	11	0	(fed)

TABLE 20: MOSQUITOES COLLECTED FROM CDC LIGHT TRAPS

Study site	Date of collection	Position	No. of traps	Female <i>An. gambiae</i> complex					<i>An. pretoriensis</i>	<i>An. funestus</i>	<i>An. rufipes</i>	Male <i>Anopheles</i>	Culicines
				Unfed	Fed	Half gravid	Gravid	Total	Female	Female	female		
Murara	Nov 2012	Indoor		0	0	0	0	0	0	0	0	0	0
	Nov 2012	Outdoor		1	0	0	0	1	0	0	0	0	0
	April 2013	Indoor ⁵		0	0	0	0	0	3	0	0	0	0
		Outdoor ⁴		9	0	0	0	0	127	0	0	0	0
Kawere	Feb 2013	Indoor ⁴		9	0	0	0	9	0	0	0	4	46 Culex; 28 Aedes
		Outdoor ⁵		24	0	0	0	24	53	0	2	5	33 Culex; 10 Aedes
Kasimure	Nov 2012	Outdoor ⁶		1	0	0	0	1	10	0	0	0	3UF
	Mar 2013	Indoor ⁶	12	4	0	0	0	4	0	0	0	0	0
	April 2013	Indoor ²	12	2	0	0	0	2	0	0	0	0	23UF, 2F, 1HG, 1G
Burma Valley	Dec 2012	Outdoor		8	0	0	0	8	0	0	0	0	0
Rusike "Control"	Jan 2013	Indoor ⁹		0	0	0	0	0	0	0	0	0	9UF
		Outdoor		0	0	0	0	0	0	0	0	0	29UF
Strathlone Farm "Control"	Mar 2013	indoor* ⁶ ⁶	12	143	0	0	0	143	0	3 (UF)	0	6	11UF

7.5 CONSTRAINTS FOR ENTOMOLOGICAL SURVEILLANCE WORK

Unfortunately several issues impacted AIRS Zimbabwe and their efforts to complete entomological surveillance before, during, and after the 2012 IRS campaign. These issues include:

- Human landing collections were not used since ethical clearance was not given by the relevant authority, the Medical Research Council of Zimbabwe (MRCZ). After contacting the MRCZ about the use of human landing collections, and providing answers to an MRCZ email with questions about the use of human landing collections, the MRCZ noted that in their decision that human landing collections are unethical, and AIRS Zimbabwe should use an alternative method for mosquito collection. In place of the human landing collections, AIRS Zimbabwe used CDC light traps.
- During entomological surveillance, the Technical Director/Entomologist, insectary managers, and the entomological technicians struggled to find enough larvae to gain enough mosquitoes for surveillance activities. This occurred at Burma Valley, Kawere, and Kasimure sentinel sites in particular. AIRS Zimbabwe surmises the lack of larvae was due to a long dry season which led to water shortages and a lack of mosquito breeding areas. Additionally, AIRS Zimbabwe had trouble collecting *Anopheles gambiae s.l.*, as many mosquito breeding areas were populated with the non-vector species *Anopheles pretoriensis*.
- The Technical Director/Entomologist found that the Insectary Managers and entomological technicians at the sentinel sites lacked capacity, and could not collect larvae and rear mosquitoes adequately before the entomological surveillance activities were supposed to begin. This often meant delays, as the Technical Director/Entomologist had to re-train the insectary managers and entomological technicians, and closely supervise their work.
- AIRS Zimbabwe's difficulties with project planning during the start of project led to the postponement of completing baseline surveillance in September before the IRS campaign began. Unfortunately, AIRS Zimbabwe did not ask for and receive permission to use the NMCP's sentinel sites until September. In September, the NMCP was unclear about the work that AIRS Zimbabwe would complete at the sentinel sites, and also pushed for the inclusion of NMCP staff in order to assure clearance with provincial health offices for the use of the sentinel sites, and help set-up the work to be completed at the sentinel sites. After further discussions between PMI, AIRS and the NMCP, clearance was provided to start entomological work in November (several weeks after the initial IRS campaigns had started). The late clearance meant that AIRS Zimbabwe only collected baseline data in Kasimure (Mashonaland West), since the area around Kasimure had not been sprayed yet.
- AIRS Zimbabwe was disallowed from further entomological monitoring work in Burma Valley, after December, following difficulties concerning spray operator payments in Manicaland.
- Entomological monitoring was disrupted in from mid-January through early-February due to an impasse over per diems. The AIRS Zimbabwe staff did not have clearance to access sentinel sites for completing entomological surveillance during this time period, and entomological surveillance activities were postponed until February when the MOHCW was able to provide a clearance letter.
- The NIHR could not provide a susceptible colony of mosquitoes for use in the cone bioassay tests and other entomological monitoring activities. This led the AIRS Zimbabwe Entomologist to work with the resident Insectary Managers at each sentinel site and district staff to raise adult *An. gambiae s.l.* from larvae and pupae collected from the field. This process took several days and led to delays in completing entomological surveillance activities.

8. POST-SPRAY REVIEW MEETINGS

Due to a shortage of funds from its Global Fund budget, the NMCP could not support a national end-of-spray campaign review conference. PMI agreed to have AIRS Zimbabwe provide funds to support provincial-level IRS review meetings in Manicaland, Mashonaland East, and Mashonaland West. The provincial level IRS review meetings were held in all three provinces in May/June, 2013. AIRS Zimbabwe produced a summary report of the provincial IRS review meetings that was provided to PMI-Zimbabwe and the NMCP in August, 2013.

Overall, 145 persons attended the provincial IRS review meetings representing numerous stakeholders in malaria control, including:

- PEHO and PEDCOs for Manicaland, Mashonaland East and Mashonaland West
- DEHOs for the districts supported by PMI/AIRS Zimbabwe
- Insectary managers at the sentinel sites in the districts supported by PMI/AIRS Zimbabwe
- Seasonal staff during the IRS campaign including: Data Managers, IRS Coordinators, and Accountants
- Health Services Administrators
- District Nursing Officers
- AIRS Zimbabwe
- USAID/PMI
- NMCP
- Population Services International (PSI)
- NIHR

At all three provincial level IRS review meetings the NMCP, NIHR, and provincial and district staff presented on the results of the 2012 IRS campaigns. AIRS Zimbabwe also presented on their findings from monitoring the IRS campaigns, entomological surveillance work, incinerator evaluations, and other environmental compliance observations.

The provincial IRS review meetings also provided an opportunity for the various malaria stakeholders to present on the challenges and successes of the 2012 IRS campaign, and to begin planning for the 2013 IRS campaign. As noted in the provincial level IRS review meeting summary report, the malaria stakeholders developed 14 overall recommendations for improving the 2013 IRS campaign, which are listed below:

1. There is a need for comprehensive support in the servicing of motorcycles and motor vehicles used for transport and monitoring/supervision during the IRS campaign.
2. Logistical support is needed to allow provincial health staff to become more involved in entomological surveillance before, during, and after the IRS campaigns.
3. The provinces need more logistical and resource support to conduct IRS mobilization campaigns before the IRS campaigns officially begin.

4. There is a need for environmental health managers and sentinel site managers to be trained in bioassays, in order to better contribute to the vector surveillance activities.
5. The provinces should identify new buildings that can be converted into insectaries and other structures for use as sentinel sites.
6. Distribution/procurement of IRS commodities should be provided to the provinces/districts as far in advance as possible, in order to avoid delays in the implementation of the IRS programme in all the three provinces.
7. Inter district exchange visits should be conducted in the three provinces, in order to promote the sharing and transmission of ideas, and share best practices between provincial and district staff involved in IRS campaigns.
8. All IRS camps in pyrethroids districts in the three provinces should be provided with soak pits for progressive rinsing.
9. The provinces should identify one incinerator that should be upgraded in order to meet the environmental compliance requirements for IRS solid waste incineration and disposal.
10. The guidelines on IRS waste handling and disposal should be developed with support from the NMCP.
11. A proposal needs to be developed for further training in larviciding for health staff in Mashonaland East and Mashonaland West Provinces.
12. Service vehicles should be made available for use during the spray programme in the three provinces.
13. The IRS programme should be provided with cellphone airtime to improve communication.
14. There is a need for new health workers to be trained in Integrated Disease Surveillance and Response for epidemic detection and management.

9. LESSONS LEARNED, CHALLENGES AND RECOMMENDATIONS

Listed below are the lessons learned and challenges that AIRS Zimbabwe noted from its project implementation in 2012. Additionally, AIRS Zimbabwe has listed several recommended actions to improve its program implementation to support the 2013 IRS campaign.

9.1 LESSONS LEARNED

- **Need to Establish Better Relationship with NMCP and Provincial/District Health Offices**

From the start of the AIRS Zimbabwe project, the objectives and goals of the project were not clearly conveyed to the NMCP. Consequently, NMCP made some incorrect assumptions that AIRS Zimbabwe support would be more comprehensive regarding the implementation of IRS in the three designated provinces. In addition, NMCP was unsure how AIRS Zimbabwe would support their work, and the value of the technical assistance that AIRS Zimbabwe would provide.

Overall this was mostly due to ineffective communication between AIRS Zimbabwe and the NMCP. AIRS Zimbabwe needs to take a greater role in continually meeting with, and updating the NMCP on its work, and sharing ideas for support and technical assistance to the NMCP.

AIRS Zimbabwe is moving forward with being more open and communicating more often with the NMCP. This has been noted via the extensive meetings held by AIRS Zimbabwe to develop project activities for the 2013-2014 work plan. Finally, AIRS Zimbabwe is moving forward with developing a new Outline of Agreed Activities with the NMCP for 2013. The document will clearly convey the activities that AIRS Zimbabwe will complete in 2013, and establish the guidelines for the project's relationship with the NMCP, especially with regards to seconding a staff person to the NMCP, and providing PPE to the NMCP.

- **Improved Communications with PMI and Other Malaria Control Organizations**

During the beginning of the project, AIRS Zimbabwe struggled with its communication with PMI-Zimbabwe. Some of this may have related to staff having limited experience working directly with a donor agency. In addition, the PMI-Zimbabwe team was not fully on the ground and operating until July/August 2012. The lack of communication did lead to the project failing to initially warn PMI about the use of DDT in the PMI-supported spray areas in August, 2012.

AIRS Zimbabwe has improved its relationship with PMI-Zimbabwe in the past few months, and worked to develop a more open line of communication, via regular meetings. The hiring of a Chief of Party who has extensive experience working with various donor agencies and the MOHCW has also improved communications.

Another area of improvement in 2013 should be AIRS Zimbabwe's outreach to other malaria control organizations. The project carried-out limited outreach to other organizations in the past year. Given the limited resources of AIRS Zimbabwe, better coordination and communication could have allowed AIRS Zimbabwe to share resources with other organizations, and further expand the activities that AIRS Zimbabwe was able to complete. Additionally more outreach may have helped AIRS Zimbabwe understand how to better collaborate with the NMCP and work around difficult issues.

- **Planning Activities**

The overall completion of some project activities was at times limited or delayed by a lack of effective planning. The AIRS Zimbabwe team has improved greatly, but in the beginning of the project, the team did not always account for the amount of time needed to get approvals from the NMCP and provinces to complete activities in the field.

- **Insecticide Liability Issues**

Although AIRS was able to procure 80,000 sachets of pyrethroids to support the 2012 IRS campaign, it was unclear to PMI and AIRS where the procured insecticide was used during the 2012 IRS campaign. PMI and AIRS also noted that the use of the insecticides by the NMCP could not be properly supervised, and therefore neither organization could guarantee that all BMP guidelines for storage, transport, and spraying of pyrethroids were followed. As a result, PMI has directed AIRS to not procure insecticides for the 2013 IRS campaign.

- **Environmental Compliance**

AIRS Zimbabwe has noted the strong interest in improving IRS environmental compliance/safety among the NMCP and provincial/district health offices. This was noted as both the NMCP and Provincial Health Offices supported the building of over 60 soak pits in Manicaland, Mashonaland East, and Mashonaland West, and the good attendance at a solid waste management/ disposal training in February, 2013. The NMCP is fully cognizant that environmental safety is an issue where the IRS program can improve, and has continued to seek the support of PMI and AIRS regarding this issue. EMA has also expressed strong interest in working with AIRS Zimbabwe to improve IRS environmental safety.

- **Developing Trainings for Environmental Compliance and Entomological Surveillance**

AIRS Zimbabwe noted that the main opportunities to present on environmental and entomological issues, at the levels 1 and 2 trainings are valuable since the trainings are attended by a high number of NMCP and provincial/district health officials. However the levels 1 and 2 trainings are very busy and any presentations to be completed by AIRS must be brief, and there is not enough time to go into key details and information. For this reason, AIRS Zimbabwe will explore completing its own trainings on environmental and entomological issues in the future.

9.2 CHALLENGES

- AIRS Zimbabwe was unable to buy its own project vehicle in 2012, due to budget constraints. As a result the project team had to rely on hiring/renting vehicles for its own transport. Unfortunately the cost of hiring/renting vehicles proved to be costly, as vehicle rentals and taxi hires proved to be just as costly as purchasing a vehicle for the project.
- AIRS has noted that there were significant problems regarding NMCP's request of AIRS Zimbabwe to provide payments for spray operators in Buhera District, Manicaland. AIRS Zimbabwe's miscommunication and long response time to this request, and subsequent turning down of this request right before the spray campaign started, created a difficult working relationship with Manicaland Province, and forced the provincial health office and NMCP to scramble and find other funds to pay the spray operators. Overall AIRS Zimbabwe did not communicate effectively and led the province to believe that the project would pay for the spray operators.

However, extensive discussion regarding the payment of spray operators, were held at all levels throughout Abt Associates. Abt Associates' staff reached the conclusion that AIRS Zimbabwe cannot pay spray operators in Zimbabwe, at any time. This decision was made due to the recognition of significant liability issues, particularly since the spray campaign in Zimbabwe is implemented and managed by the NMCP and provincial health officials, and therefore AIRS Zimbabwe cannot assure the work completed by the spray operators that AIRS Zimbabwe would pay. Additionally, Abt Associates

was concerned about the health and liability of any spray operator it pays (and by definition is thereby a contractual employee of the company), since they are exposed to the insecticides during the IRS campaigns. Unfortunately, AIRS Zimbabwe could not assure the safety and health of spray operators in Zimbabwe; given the spray operators are trained and supervised by the NMCP.

Regrettably, AIRS Zimbabwe and Abt Associates should have had quicker discussions regarding the ability to pay spray operators in Zimbabwe, and provided an answer to the NMCP and the Manicaland provincial health office much farther in advance of the IRS campaign in Buhera district. At present AIRS Zimbabwe is still working to improve its relationship with Manicaland Province.

9.3 RECOMMENDATIONS

1. AIRS Zimbabwe should begin working on detailed plans for how all activities to support the 2013 IRS campaign will be implemented, as soon as the 2013-2014 work plan is approved. The plans should ensure a good timeline is established, that provides lead time to assure approvals and per diem issues are resolved, before an activity will begin.
2. For future IRS campaigns, AIRS Zimbabwe would like to work with the NMCP and other IRS partners to determine if the project can provide more support financially and logistically to assure there are regular Vector Control subcommittee meetings. The meetings provide an excellent forum for sharing information about the IRS program, and more frequent meetings may help assure more dialogue between IRS stakeholders, and in-depth discussions about key areas where IRS can improve. Additionally, AIRS Zimbabwe would like assure that key IRS campaign issues, most notably environmental compliance is discussed more often and gains greater visibility during the Vector Control subcommittee meetings.
3. Given that the AIRS project implements IRS and/or provides technical assistance on various IRS components such as entomological surveillance in several other countries, the AIRS Core team should facilitate more dialogue between AIRS Zimbabwe staff and their counterparts in other AIRS country offices. The dialogue should work to foster a robust exchange about lessons learned and recommendations for improving IRS campaign efficiency, and share innovative ideas to improve the efficiency and effectiveness of IRS.
 - a. The AIRS project, along with Abt's PMI-supported Uganda IRS project, has developed numerous tools for managing and monitoring IRS, including: operations management checklists, environmental monitoring tools, soak pit guidelines, Monitoring and Evaluation (M&E) supervisory checklists, M&E databases to organize IRS campaign data, communications messaging on a numerous IRS issues, and supply chain management quantification and forecasting tools. AIRS Zimbabwe should work to share these tools with the NMCP and provincial/district health offices and see if there is interest in adopting these tools to improve the Zimbabwe IRS program.
 - b. Additionally, AIRS Zimbabwe used several checklists to complete its IRS campaign monitoring and during and after the 2012 IRS campaign. For the 2013 IRS campaign, AIRS Zimbabwe should review these checklists with the NMCP, and gain their feedback and approval before using the checklists. If agreed to AIRS Zimbabwe should also go ahead and train the NMCP/MOHCW staff on how to use the checklists, in order to provide them with another tool for monitoring the 2013 IRS campaign.

4. AIRS Zimbabwe should also meet with Plan International and the Global Fund throughout 2013, as both organizations are involved in IRS support, and may have key lessons learned to share. This would also be an excellent opportunity to coordinate on a variety of issues, from PPE procurement for the IRS program, to discussing observations of key technical areas where the IRS program could improve. Additionally, AIRS Zimbabwe should also seek out and work with other PMI projects to discuss their lessons learned regarding their support to the NMCP.
5. AIRS is pleased to note that AIRS Zimbabwe and PMI are moving forward with presenting the initial draft of the 2013-2014 work plan to the NMCP. This will be an excellent opportunity to gain feedback on the proposed future work of the project, and ensure the NMCP is better informed about AIRS Zimbabwe's objectives and ideas to improve the IRS program in Zimbabwe. AIRS Zimbabwe may also want to develop a quarterly meeting with the NMCP, to briefly go over its work, and future timelines for completing other project activities. This will help to develop a better and more open communication between the NMCP and the project, and greater understanding of how AIRS Zimbabwe fits into the IRS program.
6. Given the sparse IRS campaign data that the NMCP's M&E staff was able to provide to AIRS Zimbabwe, and the funding issues from 2012 that led to a more limited roll-out of the NMCP's M&E system, AIRS Zimbabwe would like to conduct an analysis of the M&E system to understand how it works. By better understanding the M&E system, AIRS Zimbabwe can work on directing technical assistance to improve the M&E system for future IRS campaigns.
7. With regards to solid waste disposal, AIRS Zimbabwe should go ahead with an analysis of the other provincial incinerators in 2013, and note if they need any refurbishments before the end of the IRS campaign. This may help the NMCP and provincial health offices re-schedule where and when solid waste disposal should occur. Overall, AIRS Zimbabwe is interested in offering to develop standards and specifications for IRS waste disposal and incineration in collaboration with EMA and the Environmental Health Unit of MOHCW, and ensuring solid waste disposal meets PMI's BMP and World Health Organization standards.
8. Noting the issues with the various district/provincial store rooms, AIRS Zimbabwe would like to complete a further analysis of the store rooms, and possibly develop a short report with recommendations to improve the security and storage of IRS commodities, particularly insecticide. AIRS Zimbabwe notes that some simple refurbishments of store rooms (such as replacing locks, ensuring insecticide is stored separately from other health commodities and on pallets) could be completed for minimal costs.
9. AIRS Zimbabwe will aim to improve its entomological surveillance activities for the 2013 IRS campaign, particularly the timeliness of entomological surveillance at each sentinel site. AIRS Zimbabwe will aim to plan its activities more carefully and complete baseline work before the 2013 IRS campaign starts in October. Thereafter, each sentinel site will be visited on a monthly basis to complete various entomological surveillance activities, particularly to monitor the residual life of the pyrethroids sprayed, and determine if they remain effective in killing mosquitoes during the peak transmission season of malaria. AIRS Zimbabwe should also aim to complete entomological surveillance activities right after structures are initially sprayed to determine if the quality of spraying was satisfactory.

In order to complete this work, AIRS Zimbabwe will aim to hire an entomological assistant to complete work at several sentinel sites, while the Technical Director/Entomologist is covering other sentinel sites, and assure the workload for completing entomological surveillance at all sentinel sites on a monthly-basis is feasible. Also, AIRS Zimbabwe will work to include staff from the NMCP, the PEHOs, and DEHOs while completing entomological surveillance. This will help improve their capacity, and let the chief IRS stakeholders gain first-hand knowledge about the effectiveness of the IRS campaign.

Lastly, AIRS Zimbabwe should aim to present its entomological findings on a bi-monthly basis to the NMCP, PEHOs, DEHOs, and Vector sub-committee via a brief report. The report should provide the initial findings during all entomological surveillance. A more detailed presentation about entomological surveillance data should be provided to the NMCP right after the IRS campaign, in order for the NMCP to consider its insecticide selection for future IRS campaigns.

10. ANNEX

10.1 Design of Soak Pits Constructed in Manicaland, Mashonaland East, and Mashonaland West

FIGURE 11: DESIGN OF STANDARD IRS CAMPAIGN SOAK PIT

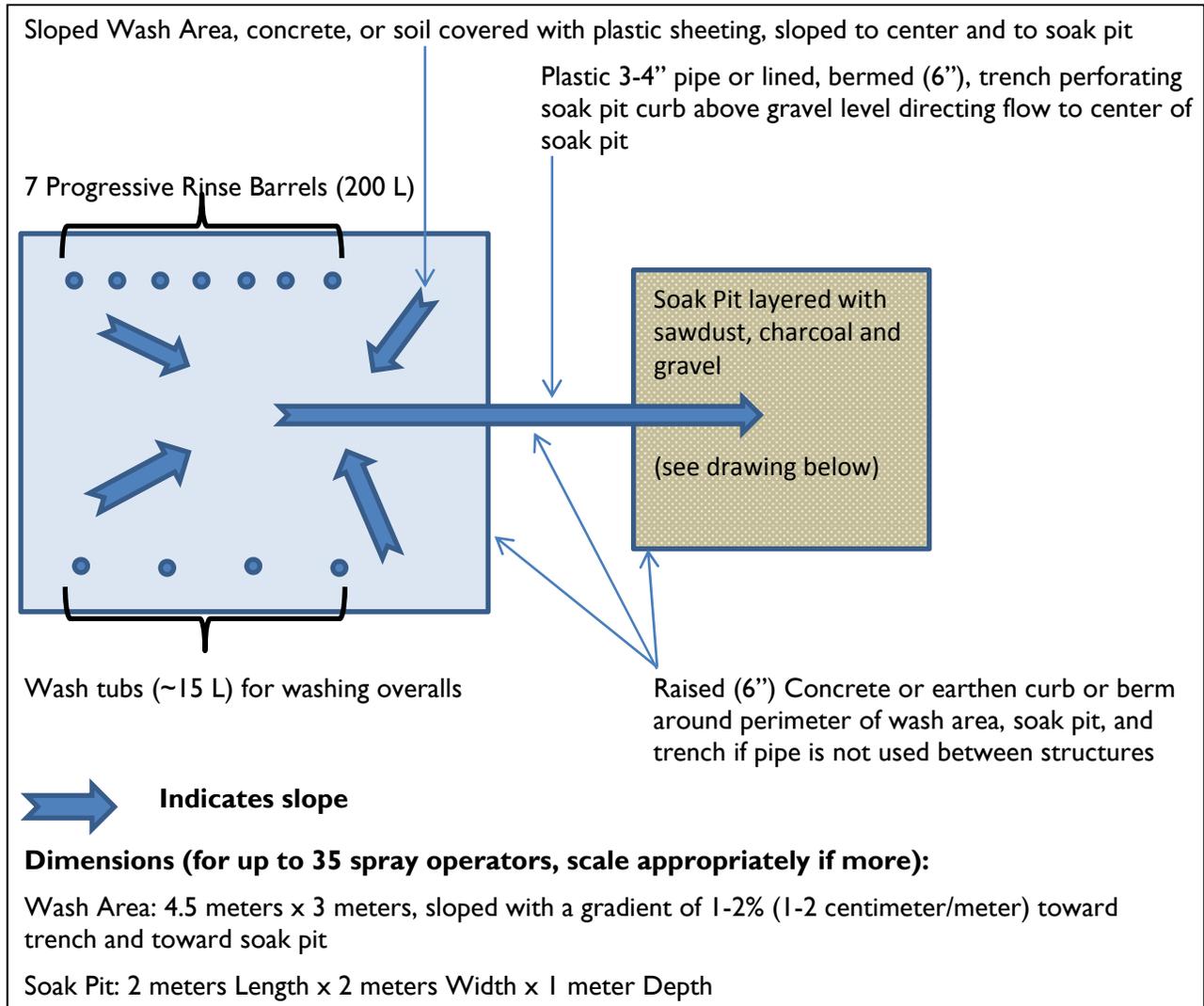
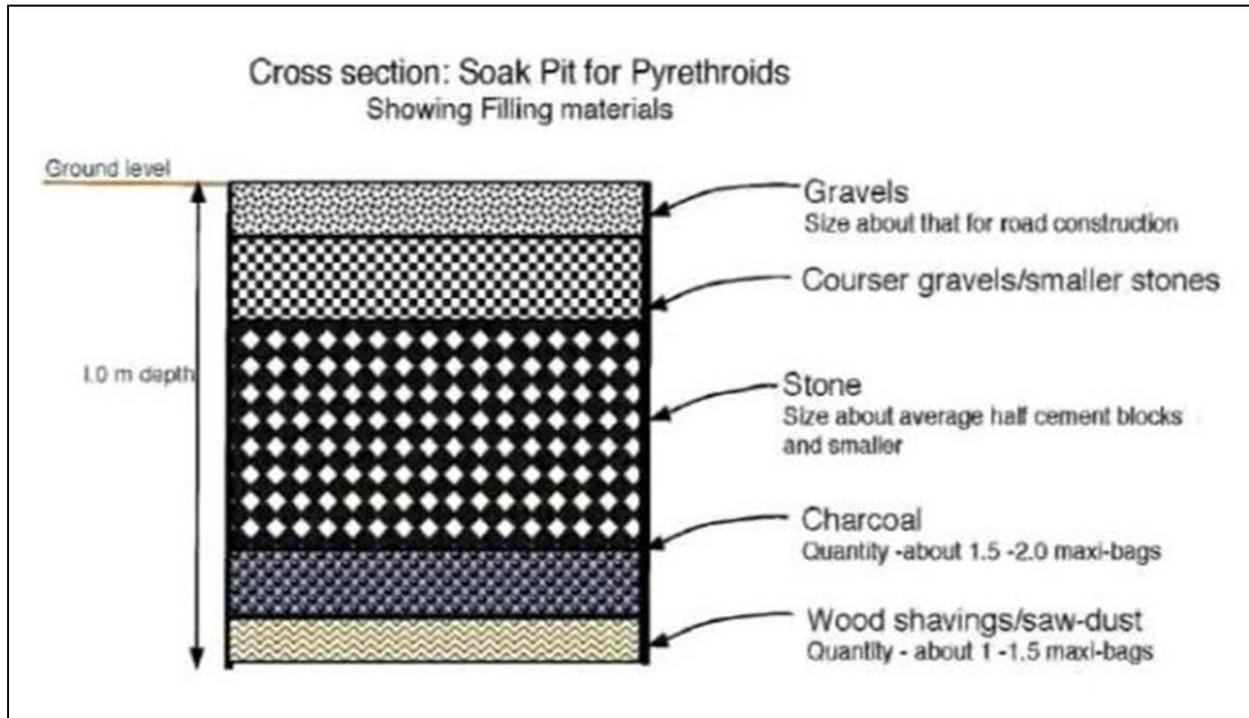


FIGURE 12: CROSS SECTION OF SOAK PIT



Comments on the cross sectional layers of the soakpit

- Wood shavings layer 20cm
- Charcoal layer 25 cm
- Big stones 30 cm
- Courser gravel 15cm
- Gravel 15 cm

10.2 OUTLINE OF AGREED ACTIVITIES

~~COVENANT OF AGREEMENT~~ MINISTRY OF HEALTH AND CHILD WELFARE'S NATIONAL MALARIA CONTROL PROGRAMME (NMCP) TO SUPPORT THE 2012 INDOOR RESIDUAL SPRAYING (IRS) CAMPAIGN

This document is meant to clarify several key activities that the Ministry of Health and Child Welfare (MOHCW) through the National Malaria Control Program (NMCP) and Abt Associates (under their project name, the Africa Indoor Residual Spray (AIRS) Zimbabwe project) will undertake to assure collaboration and support for the 2012 Indoor Residual Spraying (IRS) campaign.

The agreed activities are supported by the United State Agency for International Development (USAID)'s President's Malaria Initiative (PMI), and their malaria control program, who are the sole funding agent for AIRS.

1) ACTIVITIES OF AIRS TO SUPPORT THE 2012 IRS CAMPAIGN

The activities of AIRS to support the 2012 IRS campaign shall be to:

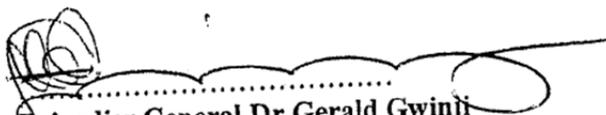
- a. provide technical and operations support to the NMCP, as requested with regards to Indoor Residual Spraying activities.
- b. procure agreed upon IRS commodities that are needed by the NMCP for the IRS campaign, and can include insecticides, compressions sprayers and PPE, depending on its annual budget and the approval of PMI.
 - i. AIRS shall procure personnel protective clothing and equipment as needed by the spray operators and supervisors in the spray districts, and as permitted by PMI and the annual budget. The equipment and clothing shall be handed over to NMCP and shall remain useable for the duration of the project life.
 - ii. AIRS together with NMCP shall monitor the use of the mentioned PPE and insecticide by IRS workers and document any actions of non-compliance for remedial action.
 - iii. co-label IRS commodities with the PMI and MOHCW logos.
- c. recognize that following the procurement of the IRS commodities by AIRS, and their distribution to the NMCP storage facilities, the NMCP will gain possession of these commodities, and will be responsible for their use, inventory record-keeping, storage, and disposal.
- d. assist with the supervision of the IRS campaign, and monitor and observe environmental compliance of spray programming, and report any issues to PMI, the NMCP, and MOHCW.
- e. inspect storage facilities checking on environmental compliance, security, maintenance, and repair of IRS equipment (The basis of these inspections will help both partners decide on future commodity needs).
- f. Abt shall provide technical assistance to NMCP in insecticide resistance monitoring through completing entomological monitoring before, during, and after the IRS campaign, via the completion of bioassays, vector density measurements, and other activities.
- g. work with NMCP to plan and conduct annual IRS Planning and Review Meetings.
- h. Produce monthly reports to PMI and the NMCP regarding supervision, environmental and entomological surveillance activities. The reports will provide information on best practices, and areas that need improvement, and possible recommendations for developing more efficient and cost-effective IRS campaigns in the future.

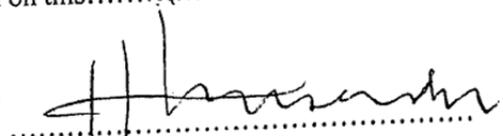
**2) ACTIVITIES OF THE NMCP TO SUPPORT AIRS' ACTIVITIES IN SUPPORT OF
THE 2012 IRS CAMPAIGN**

The activities of the NMCP to support AIRS' activities in support of the IRS campaign shall be to:

- a. become the primary owner of IRS commodities (including insecticides) procured and handed-over to the NMCP by AIRS, for use in IRS campaigns, and thereby be responsible for the appropriate use, storage, disposal, and inventory-control of these commodities.
 - i. ensure that people participating in insecticide storage and handling are knowledgeable of safe handling of insecticides and that they are adequately protected.
 - ii. co-label IRS commodities with the PMI and MOHCW logos
- b. work with Provincial and District health officials to ensure that soak pits are developed for the safe disposal of liquid wastes.
- c. provide end of spray report to AIRS.
- d. provide updates on spray campaign activities and facilitate access to data on IRS coverage to AIRS on a regular basis, or as agreed upon by AIRS Zimbabwe and the NMCP. The data gained from this update will be used to update PMI on the performance of the Spray Campaign.
 - i. The data provided to Abt will include:
 1. Number of people trained with PMI funds to deliver IRS
 - a. Disaggregated by gender and cadre
 2. IRS Coverage:
 - a. Total number of eligible rooms that were found in the target area
 - b. Total number of eligible rooms that were sprayed in the target area
 3. Population Protected:
 - a. Total number of people sleeping/spending the night in sprayed structures, as reported by the head of household or other adult respondent.
 - b. Disaggregated by the number of people under 5 years and over 5 years
 - e. liaise with relevant provincial and district health departments in order to ensure safe and expeditious movement in relation to programme related travel of AIRS staff and consultants in order to support IRS campaign activities, including supervision, and implementing entomological surveillance activities

These activities are recognized by the NMCP and AIRS, and thereby will be upheld to the best of both parties abilities. This is agreed upon on this.....17th.....day of.....October 2012


Brigadier General Dr Gerald Gwinji
For the MOHCW


Dr Masendu
AIRS

10.3 PRE-SPRAY ENVIRONMENTAL INSPECTION CHECKLIST

IRS Environmental Inspection Report Form

GPS
Coordinates

Lat
Long

Date of Inspection : ____/____/____

Country: _____

District _____

Province: _____

Village: _____

Inspectors : _____



BMP Requirement	<u>Y</u>	<u>N</u>	<u>Comments/Recommended Actions</u>	<u>Completion Date if Applicable</u>
Storage Facility				
Storage facility located an adequate distance from schools, homes, and water bodies/flood plains			Distance to nearest sensitive receptor _____ m	
Double locks on pesticide storage				
Facility guarded 24 hrs/day				
Windows barred and screened				
Adequate lighting				
Danger signs with skull and crossbones				
Guards have boots, whistles, and flashlights, phones				
Pesticides properly labeled				

Health and Safety Sheet laminated and posted				
Extra Health and Safety sheets for transport vehicles				
Adequate PPE in inventory for the number of operators expected (Helmets, neck shield, face shield, dust mask, coveralls, gloves, socks, boots)			Number of operators to work out of this operations center: _____	
			Number of full sets of PPE available: _____	
1. First aid kits for storeroom and transport vehicles fully stocked (bandaids, gauze, antibiotic cream, eye wash, hydrocortisone cream/calamine, and aspirin). 2. Spill kits for storeroom and for vehicles (Sand bucket, long handle brush with stiff bristle, shovel, fire extinguisher)			Number of transport vehicles expected to be used _____	
			Number of fully stocked first aid kits _____	
			Number of spill kits in inventory: _____	
Adequate PPE in inventory for the number of operators expected			Number of operators to work out of this operations center: _____	
			Number of full sets of PPE available: _____	
Emergency response procedure posted in stockroom (with phone numbers)				
Spill response procedure posted				
Insecticides past their expiration date			Expiration date of pesticides in inventory: _____/_____/_____	
Containers for waste available and clearly marked				

Items in the storeroom stocked on pallets and according their type				
Maximum storage height (2 m) exceeded and/or aisles blocked?				
Recording thermometer in storeroom				
Fire extinguisher inside and outside storeroom				
Fire extinguisher inside and outside storeroom				
Recording thermometer in storeroom				
Leak-proof floor in storeroom				
Leak-free floor and roof				
Soap and water available				
Antidotes to pesticides available nearby`			Distance to nearest health facility _____	
Storeroom supervisors know signs of poisoning and location of nearest treatment facility				
Prepared to administer pregnancy tests				
Soak Pit				
Is a soak pit located near IRS storage Facility?				
Is the soak pit located away from water bodies, steep slope or flood prone area?				
Is the soak pit correctly fenced, gated, locked & strongly built to hang pumps?				
Is there an adequate water supply for clothes washing and triple rinse of pumps?				
Are soak pit and surroundings cleared of vegetation and cleaned?				
Are the washing areas properly sloped to drain to the soak pit, with no leaks or cracks?				

Is the sawdust, charcoal, and gravel adequate & well placed and prepared to act as a filter?				
Are the lines to dry the clothes present and strong enough to carry the load.				
Are there skull and crossbones hazard signs on the fence?				
Are showers and toilets with adequate privacy and drainage present at site? (1 /gender)				

Additional Comments

10.4 ENVIRONMENTAL COMPLIANCE AND IRS SUPERVISION CHECKLIST

Environmental Compliance and IRS Supervision Checklist

Province _____ District _____ Date _____

Village/Town _____

Consultant _____

Spray Operator Team _____

Number of Spray Operators on Team _____

Spray Operator issued with PPE:

Overalls: _____ Face Mask _____ Face shield _____ Aprons _____

Gumshoes: _____ Gloves _____ Helmet _____

Check whether Spray Operators did the following;

Item	Tick appropriate		Comments
	Yes	No	
Spray operator using PPE consistently	Yes	No	
Inform occupants about spraying	Yes	No	
Ensure that food items, water, cooking utensils are covered and/or taken outside	Yes	No	
Ensure that the house occupants are outside during spraying	Yes	No	
Communicate the need for occupants to remain outside for 2-3 hrs. after spraying	Yes	No	
Ensure domestic animals are not in the vicinity during spraying	Yes	No	
Agitate the sprayer periodically during spraying	Yes	No	
Hold lance at 45cm from sprayed surface	Yes	No	
Maintain correct overlap between swaths	Yes	No	
Maintain the right spray speed and consistency	Yes	No	
Check the operational pressure regularly	Yes	No	
Release the pressure trigger when the sprayer is not in use	Yes	No	
Complete spraying of wall	Yes	No	
Complete spraying of roof	Yes	No	
Spray behind doors	Yes	No	
Spray behind immovable furniture	Yes	No	
Avoid environmental pollution	Yes	No	
Eat and drink during spraying	Yes	No	
Smoke during spraying	Yes	No	
Use mobile phone during spraying	Yes	No	
Properly fill the Spray Operator's Notebook	Yes	No	

Post Spraying Environmental compliance Activities to be checked

Handover of empty insecticides sachets	Yes	No	
Cleaning of the sprayers using progressive rinsing approach	Yes	No	
Cleaning of the sprayers at the washing slab draining liquid waste in the soakpit	Yes	No	
Washing of Protective clothing and Equipment	Yes	No	
Bathing by spray operator before handling food	Yes	No	

No. of rooms targeted by Spray Operator Team _____

No. of rooms sprayed by Spray Operator _____

No. of sachets used by Spray Operators _____

Additional comments:

10.6 POST-SPRAY ENVIRONMENTAL INSPECTION CHECKLIST

VECTOR CONTROL - IRS COMMODITIES AND EQUIPMENT INVENTORY CHECKLIST

COUNTRY: -----

PROVINCE-----DISTRICT-----

DATE OF VISIT-----

Item	Quantity	Remarks
I.BACKGROUND INFORMATION		
No of administrative wards in the district		
No of administrative wards targeted for IRS		
Households targeted for IRS		
Rooms targeted for IRS		
District population at risk		
No of IRS camp sites in the district		
No of camp sites with soakpits		
2.TRANSPORT		
No of lorries for IRS available		
No of IRS supervisory trucks available		
No of IRS lorries with removal benches		
No of motor cycles available for IRS		
No of motorcycles functional		
Are there any other vehicle and motor cycles maintenance needs for the IRS campaign (such as tires)?		
3.INSECTICIDES		
Insecticide type (pyrethroids/other)		
Insecticide requirements (sachets)		
Insecticide (sachets) in stock		
No of waste sachets in stock		
How are the waste sachets stored?		
4. IRS COMMODITIES STOREROOMS (Please take a picture of the store room), and submit with report		
Separate Insecticides storeroom in place at District Level	Yes or No	
State the condition of the existing storerooms	Describe:	
Any other rooms that can be converted in storerooms available	Describe:	
Is water available at the storeroom	Yes or No	
No of IRS camp sites with Field insecticides storage facilities		
Store room roof is in good condition (no leaks or holes)	Yes or No	
Store room has no traces of mice (did you see any mouse faeces), animals (esp. chickens and birds), ants, or other insects	Yes or No	
Are there any windows in the store room? Do they provide enough ventilation	Yes or No (how many windows?)	
Does the store room have a lock?	Yes or No	
If yes, what is the condition of the lock?		
Which staff members hold keys to the lock?		

Item	Quantity	Remarks
Describe how insecticide and PPE are stored (on the ground, on pallets, on shelves)		
Does the store room have any stock cards for the IRS equipment and insecticide		
Are the stock cards accurate?	Yes or No	
Is the store room a separate building or near hospital wards with patients	Yes or No	
Does the store room have a spill-kit?	Yes or No	
Does the store room have a fire extinguisher?	Yes or No	
If yes, has the fire extinguisher expired?	Yes or No	
Does the store room have a first-aid kit	Yes or No	
5.SPRAYING EQUIPMENT		
No of spray pumps available		
No of spray pumps functional		
No of spray pumps not functioning		
No of spray pumps required for the district		
No of tool kits for spray pumps		
Does the district need any spare parts for spray pumps	Yes or No	
If yes, which parts and how many?		
6.CAMPING EQUIPMENT		
No tents required		
No of tents available		
No of tents in useable state		
No of fire extinguishers available (for sprayers and camp sites)		
Have the fire extinguishers expired?	Yes or No	
No of spill kits available		
No of progressive rinsing drums available		
No of First Aid Kits in stock		
No of tool kits in stock for servicing sprayers		
No of shovels available		
No of stretcher beds available		
No of stretcher beds in useable condition		
Ideal number of stretcher beds for the district		
No of Spray operator washing buckets available		

Item	Quantity	Remarks
No of torches available		
7.PROTECTIVE CLOTHING		
No of sprayer operators and supervisors targeted in the district		
No of overalls in good condition that will be re-used in 2013		
No of helmets in good condition that will be re-used in 2013		
No of gumshoes in good condition that will be re-used in 2013		
No of rubber gloves in good condition that will be re-used in 2013		
No of face shields in good condition that will be re-used in 2013		
No of filter masks in good condition that will used in 2013		
No of aprons in good condition that will be re-used in 2013		
No of insecticide carrying bags in good condition that will be re-used in 2013		
No of PVC sheets for covering household goods in stock for use in 2013		
No of mosquito repellents in stock		
General comments on the observations		

Inventory conducted by

1. Name _____ Designation _____ Signature _____
2. Name _____ Designation _____ Signature _____
3. Name _____ Designation _____ Signature _____

10.7 RESULTS OF POST-IRS SPRAY CAMPAIGN INSPECTION

TABLE 21: DISTRICT STORE ROOM ISSUES

Province	Store Room	Store Room has Locks	Store Room has Stock Cards	Are the Stock Cards Accurate	Notes about Stock Cards	Store Room has Pallets and Shelves	First Aid Kits	Spill Kits	Fire Extinguishers
Manicaland	Chipinge	Yes	Yes	Yes	Yes	No	No	No	No
	Makoni	Yes	Yes	Yes	Yes	No	No	No	No
	Buhera	Yes	Yes	Yes	Yes	No	No	No	No
	Chimanimani	Yes	Yes	Yes	Yes	No	No	No	No
	Chegutu	No	Yes	Yes	Yes	No	No	No	No
	Mutare	Yes	Yes	Yes	Yes	No	No	No	No
	Mutasa	Yes	Yes	Yes	Yes	No	No	No	No
	Nyanga	Yes	Yes	Yes	Yes	No	No	No	No
Mashonaland East	UMP	Yes	Yes	Yes	Yes	No	No	No	No
	Murewa	Yes	Yes	Yes	Yes	No	No	No	No
	Mutoko	Yes	Yes	Yes	Yes	No	No	No	No
	Mudzi	Yes	Yes	Yes	Yes	No	No	No	No
Mashonaland West	Kariba	No	Yes	Yes	Yes	No	No	No	No
	Hurungwe	Yes	Yes	Yes	Yes	No	No	No	No
	Makonde	Yes	Yes	Yes	Yes	No	No	No	No

Province	Store Room	Store Room has Locks	Store Room has Stock Cards	Are the Stock Cards Accurate	Notes about Stock Cards	Store Room has Pallets and Shelves	First Aid Kits	Spill Kits	Fire Extinguishers
	Kadoma	Yes	Yes	Yes	Yes	No	No	No	No
	Zvimba	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 22: KEY PPE STOCK COUNTS AT DISTRICT STORE ROOMS

Province	Store Room	# of Spray Pumps	# of Spray Pumps Needed	# of Tents	# of Tents Needed	# of Stretcher Beds	# of Stretcher Beds Needed	# of Face Shields	# of Face Shields Needed
Manicaland	Chipinge	35	13	8	12	0	78	0	78
	Chimanimani	30	8	0	6	16	32	0	48
	Nyanga	15	17	2	11	0	46	0	48
	Buhera	0	32	0	4	0	32	0	32
	Mutare	49	0	9	5	23	47	0	70
	Mutasa	51	10	7	10	27	43	0	70
	Makoni	22	7	4	3	0	46	0	32
	TOTAL	202	87	30	51	66	324	0	378
Mash East	UMP	33	15	11	4	33	28	0	70
	Murehwa	30	12	9	0	0	45	0	45
	Mutoko	30	6	16	16	0	45	0	45
	Mudzi	30	15	6	2	0	68	0	68

Province	Store Room	# of Spray Pumps	# of Spray Pumps Needed	# of Tents	# of Tents Needed	# of Stretcher Beds	# of Stretcher Beds Needed	# of Face Shields	# of Face Shields Needed
	TOTAL	123	48	42	22	33	186	0	228
Mash west	Kariba	31	7	7	9	30	17	0	50
	Hurungwe	48	20	13	2	0	50	0	50
	Kadoma	31	7	7	9	30	12	0	50
	Makonde	30	10	9	3	18	32	0	50
	Zvimba	9	9	0	3	0	18	0	18
	TOTAL	149	53	36	26	78	129	0	218
	Grand TOTALS	474	188	108	99	177	639	0	824

TABLE 23: MORE KEY PPE STOCK AT DISTRICT STORE ROOMS

Province	Store Room	# of Gloves	# of Gloves Needed	# of Overalls	# of Overalls Needed	# of Face Masks	# of Face Masks Needed	# of Helmets	# of Helmets Needed	# of Gum Boots	# of Gum Boots Needed	Progressive Rinse Equipment
Manicaland	Chipinge	50	78	0	156	0	78	0	78	0	78	7
	Chimanimani	0	48	0	96	0	48	0	48	0	48	7
	Nyanga	0	48	0	48	0	48	0	48	0	48	7
	Buhera	0	32	0	32	0	32	0	32	0	32	7
	Mutare	0	70	0	140	0	70	0	70	0	70	7

Province	Store Room	# of Gloves	# of Gloves Needed	# of Overalls	# of Overalls Needed	# of Face Masks	# of Face Masks Needed	# of Helmets	# of Helmets Needed	# of Gum Boots	# of Gum Boots Needed	Progressive Rinse Equipment
	Mutasa	70	0	0	140	0	70	0	70	0	70	7
	Makoni	0	46	0	92	0	46	0	46	0	46	7
	Totals	120	322	0	704	0	392	0	392	0	392	49
Mashonaland East	UMP	0	70	70	70	0	70	0	70	0	70	7
	Murewa	23	22	0	90	0	45	0	45	0	45	7
	Mutoko	50	56	45	45	45	0	0	45	0	45	7
	Mudzi	0	60	0	120	0	60	0	60	0	60	7
	Totals	73	208	115	325	45	175	0	220	0	220	28
Mashonaland West	Kariba	28	22	30	70	0	50	0	50	0	50	7
	Hurungwe	0	50	0	100	0	50	0	50	0	50	7
	Kadoma	28	22	30	70	0	50	0	50	0	50	7
	Makonde	30	20	29	71		50	0	50	0	50	7
	Zvimba	0	18	0	18	0	200	0	18	0	18	7
	Totals	86	132	89	329	0	400	0	218	0	218	35
Grand Totals	279	662	204	1358	55	967	0	830	0	830	112	

10.8 MONITORING AND EVALUATION PLAN INDICATOR MATRIX – 2012 RESULTS

TABLE 24: MONITORING AND EVALUATION PLAN

Performance Indicator ⁶	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	Indicator Type	Annual Targets & Results					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
Component 1: Establish cost-effective supply chain mechanisms including procurement, distribution and storage of IRS-related commodities and execute all aspects of logistical plans for IRS-related activities.											
1.1 Procurement											
1.1.2 Number and percentage of international procurement orders for equipment, including PPE, received at port of entry, 30 days prior to start of spray operations.	[Numerator: Number of international procurements for equipment, including PPE, at port of entry, 30 days prior to start of spray operations] [Denominator: Total number of international procurements for equipment, including PPE.] Calculation: $[\frac{\text{Numerator}}{\text{Denominator}}] \times 100$	Y1, Y2, Y3	Data source: Project records – warehouse inventory books Reporting frequency: Each spray season	By Spray Campaign	AIRS	N.A.; 85%	2; 0%	2; 100%			
1.1.3 Number and percentage of local PPE procurement orders that are delivered to the Abt office in Harare or to government-	[[Numerator: Number of local PPE procurement orders delivered to the main warehouse 14 days before the start of spray operations]	Y1, Y2, Y3	Data source: Project records Reporting frequency: Each spray season	By Spray Campaign	AIRS	N.A.; 80%	13; 0%	11; 100%			

⁶ Not all AIRS project indicators are relevant in Zimbabwe. Thus, we note only those indicators that AIRS Zimbabwe is responsible for measuring, per the approved annual work plan. Please refer to the AIRS Performance Management Plan (PMP) for a full list of the project indicators.

Performance Indicator ⁶	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	Indicator Type	Annual Targets & Results					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
owned district warehouse(s) 14 days before the start of spray operations	[Denominator: Total number of local PPE procurements.] Calculation: [Numerator ÷ Denominator] x 100										
Component 2: Implement safe and high-quality IRS programs and provide operational management support											
2.1 Planning and Design of IRS Programs											
2.1.1 Annual IRS country-specific work plan developed and submitted on time	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records Reporting frequency: Annually		AIRS	Completed	Completed	Completed			
2.2 Support of Safety and Health Best Practices and Compliance with USAID and Host Country Environmental Regulations											
2.2.1 SEA/letter report submitted on time ⁷	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records – submitted SEAs/ letter reports Reporting frequency: Each spray campaign	By Spray Campaign	AIRS	Completed	Completed	Completed			
2.2.3 Number of government environmental and health officers trained	Total number of government environmental and health officers trained in IRS environmental compliance using AIRS	Y1, Y2, Y3	Data source: Project training reports Reporting	By Spray Campaign By Gender	AIRS	38	37; 34 males, 3 females	283; 273 males, 10 females			

⁷ In Year 1, SEAs were due 30 days, and letter reports were to be submitted 14 days, prior to the start of spraying. In Year 2 and Year 3, due dates agreed upon with PMI-Washington will be noted in each country-specific MEP, once known, to assess indicator 2.2.1.

Performance Indicator ⁶	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	Indicator Type	Annual Targets & Results					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
in IRS environmental compliance	Project resources		frequency: Semi-annually								
2.2.4 Number of spray personnel trained in environmental compliance and personal safety standards in IRS implementation	Total number of spray personnel who attended a training in environmental compliance and personal safety standards in IRS implementation using AIRS Project resources. This includes all staff who received environmental compliance training, i.e. spray operators, team leaders, washpersons, storekeepers, etc.	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Each spray season	By Spray Campaign By Gender	AIRS	802	754; 688 males, 66 females	N.A.	N.A.	N.A.	N.A.
2.2.6 Number of adverse reactions to pesticide exposure documented	Total number of incidents of pesticide exposure reported that resulted in a referral for medical care	Y1, Y2, Y3	Data source: Incident report forms Reporting frequency: Each spray season	By Spray Campaign By residential/occupational exposure	AIRS	0	0	0			
2.2.7 Number of Abt-owned vehicular accidents reported	Total number of accidents in Abt-owned vehicles reported	Y1, Y2, Y3	Data source: Vehicular incident report forms Reporting frequency: Each spray season	By Spray Campaign	AIRS	0	0	0			

Performance Indicator ⁶	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	Indicator Type	Annual Targets & Results					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
2.3 Support Entomological Monitoring Activities and Insecticide Resistance Strategies⁸											
2.3.1 Number of sentinel sites supported by the AIRS project	Total number of entomological sentinel sites supported by the AIRS project	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	AIRS	4	4	8			
2.3.2 Number and percentage of entomological monitoring sentinel sites measuring all five primary PMI entomological indicators	[Numerator: Number of entomological monitoring sites measuring all five primary PMI entomological indicators] [Denominator: Number of entomological monitoring sentinel sites] Calculation:[Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	AIRS	3	0; 0%	4; 50%			
2.3.3 Number and percentage of entomological monitoring sites measuring at least one secondary PMI indicator	[Numerator: Number of entomological monitoring sites measuring at least one secondary PMI indicator] [Denominator: Number of entomological monitoring sites] Calculation:[Numerator ÷ Denominator] x 100	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign	AIRS	4; 100%	3; 75%	4; 50%			

⁸ All entomological-related Year 2 targets will be noted after the sentinel site assessment is completed from May 14-24, 2013.

Performance Indicator ⁶	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	Indicator Type	Annual Targets & Results					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
2.3.4 Number and percentage of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control	[Numerator: Number of insecticide resistance testing sites that tested at least one insecticide from each of the four classes of insecticides recommended for malaria vector control.] [Denominator: Number of insecticide resistance testing sites] Calculation:[Numerator ÷ Denominator] × 100	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Annually	By Spray Campaign By Type of Insecticide	AIRS	N.A.	0	8; 100%			
2.3.5 Number of wall bioassays conducted within 2 weeks of spraying to evaluate the quality of IRS	Total number of wall bioassay studies conducted in established sentinel sites to evaluate quality of IRS spraying activities	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	PMI	3	1	3			
2.3.6 Number of wall bioassays conducted after the completion of spraying at monthly intervals to evaluate insecticide decay	Total number of wall bioassay studies conducted at monthly intervals in established sentinel sites to evaluate the rate of insecticide decay on sprayed surfaces	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign	PMI	3	0	3			

Performance Indicator ⁶	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	Indicator Type	Annual Targets & Results					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
2.3.7 Number of vector susceptibility tests for different insecticides conducted in selected sentinel sites	Total number of vector susceptibility tests conducted to gauge the effectiveness of individual insecticides proposed for use in spray operations	Y1, Y2, Y3	Data source: Entomological reports Reporting frequency: Per spray campaign	By Spray Campaign By Type of Insecticide	PMI	N.A.	N.A.	8			
2.4 Conduct Communications Activities and Community Mobilization											
2.4.2 Number of IRS print materials disseminated	Total number of IRS educational materials developed, printed and distributed to community members in target spray districts using AIRS Project resources	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annually	By Spray Campaign By Type of printed material and message(s)	AIRS	N.A.	N.A.	50,000			
Component 3: Provide ongoing monitoring and evaluation and quality control measures											
3.1 Submit Monitoring and Evaluation Plan (MEP) to PMI-Zimbabwe	Milestone: (Completed/Not Completed)	Y1, Y2, Y3	Data source: Project records Reporting frequency: Semi-annual		AIRS	Completed	Completed	Completed			
Component 4: Contribute to Global IRS Policy-Setting and Country-Level Policy Development of Evidence-Based IRS; Disseminate Experiences and Best Practices											
4.1 Number of guidelines/checklists/ tools related to IRS	Total number of implementation guidelines, process checklists and program tools related to	Y1, Y2, Y3	Data source: Project records – Activity reports	By Guideline/ checklist/tool	AIRS	N.A.	29	4			

⁹ An environmental compliance monitoring checklist and a room-to-structure conversion data collection tool.

Performance Indicator ⁶	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	Indicator Type	Annual Targets & Results					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
operations developed or refined with project support	IRS operations developed or refined using the technical and/or financial resources of the AIRS Project		Reporting frequency: Semi-annually								
4.3 Number of best practice presentations given at national/regional/international workshops and conferences	Total number of project-related oral and poster presentations delivered in national, regional and/or international meetings related to IRS.	Y2, Y3	Data source: Project records – Activity reports Reporting frequency: Semi-annually	By IRS Technical Area	AIRS	N.A.	110	3			

Component 5 (Cross-cutting): Capacity Building, Knowledge Transfer, Gender Inclusion

5.1 Capacity Building (Gender Inclusion)

5.1.4 Number of government environmental and/or health officials trained in IRS oversight	Total number of national and sub-national/district government environmental and/or health officials who are trained in oversight of IRS implementation using AIRS Project resources	Y1, Y2, Y3	Data source: Project records – Training reports Reporting frequency: Semi-annually	By Spray Campaign By Gender Percentage of Women Trained Type of government official (e.g. enviro/health)	AIRS	38	37; 34 males, 3 females	283; 273 males, 10 females			
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¹⁰ Environmental compliance monitoring oral presentation.

Performance Indicator ⁶	Indicator Definition	Project Year(s) Reporting	Data Source(s) and Reporting Frequency	Disaggregate	Indicator Type	Annual Targets & Results					
						Year 1		Year 2		Year 3	
						Targets	Results	Targets	Results	Targets	Results
5.1.5 Conduct a capacity assessment	AIRS Zimbabwe program conducted an assessment of IRS capacity among national and sub-national/district government health officials	Y1, Y2	Data source: Project records – Capacity assessment reports Reporting frequency: Semi-annually		AIRS	Completed	In process	Completed			
5.1.6 Number of capacity-building MOUs signed by AIRS, NMCP and partners/institutions	Total number of Memoranda of Understanding (MOU) on provision of local capacity building finalized and signed between AIRS, the National Malaria Control Program, and other local partners and institutions	Y1, Y2, Y3	Data source: Project records – MOUs Reporting frequency: Semi-annually	By Spray Campaign	AIRS	N.A.	1	1			