

SIAM CEMENT BIOMASS PROJECT



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Summary:

- The Siam Cement Project is a combination of five GHG reduction projects located in five different cement manufacturing units including Ta Luang, Khao Wong, Lampang, Thung Song and Kaeng Khoi sites. All the five projects involved partial replacement of fossil fuels by alternative fuel in cement manufacture. This project categorized as large-scale project on sectoral scope No.4 “Manufacturing Industries” with application of ACM0003 version 7.2.
- The verification conducted by Bureau Veritas Certification Holding SAS has been performed for all five cement sites as mentioned above in order to verify GHG emission reduction claimed by project proponents in period of October 2009 to February 2011.
- The criteria according to ACM0003 version 7.2, Tool to calculate baseline, project and/or leakage emission from electricity consumption, Tool to calculate project or leakage CO₂ emission from fossil fuel combustion and underlining principles stipulated in VCS standard version 3.0 have been applied as scope and guidance in completion of this verification process.
- The Bureau Veritas Certification Holding SAS performed as verification body satisfied in all clarifications and corrections responded by project proponent as consequences of CARs and CLs raised in verification process. As detail provided in the report, verification body concluded that project proponents correctly quantified emission reduction during this current verification period at 352,443 tons CO₂e

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1 INTRODUCTION

1.1 Objective

Verification is the periodic independent review and ex-post determination by the verification body of the monitored reductions in GHG emissions during defined verification period

The verification serves as project description verification and its requirement of all VCS projects. The verification is an independent third party assessment of the project design. In particular, the project's baseline, the monitoring plan (MP), and the project's compliance with relevant VCS version 3 and host country criteria are validated in order to confirm that the project description, as documented, is sound and reasonable, and meet the stated requirements and identified criteria. Verification is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation voluntary carbon units (VCUs).

1.2 Scope and Criteria

The verification scope is defined as an independent and objective review of the project design document/ project description document, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against VCS version 3 requirements and associated interpretations. The verification is not meant to provide any consulting towards the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvements of the project monitoring towards reductions in the GHG emissions.

1.3 Level of assurance

The verification report is based on VCS PD, monitoring report, supporting documents made available to the verifier and information collected through performing interviews and during the on-site assessment. The verification opinion is assured to provide the credibility of all above.

1.4 Summary Description of the Project

The project is a combination of five GHG reduction projects located in five different cement manufacturing units of SCG Cement Co.,Ltd, in Thailand. All project activities in this group involve partial replacement of fossil fuels by alternative fuels or less carbon intensive fuels, including biomass, in kiln processing of cement manufacture. In order to implement the project activities a complete system for receiving, storing, and feeding alternative fuels and less carbon intensive fuels needs to be introduced.

The proposed grouped project has been implemented at The Siam Cement (Ta Luang) Co., Ltd. (Ta Luang Cement Plant and Khao Wong Cement Plant), The Siam Cement (Kaeng Khoi) Co., Ltd., The Siam Cement (Thung Song) Co., Ltd., and The Siam Cement (Lampang) Co., Ltd. SCG Cement Co., Ltd. has 100% shareholding in these five companies. Although there are 5 different sites, the primary site appeared in the VCS project database is 'The Siam Cement (Kaeng Khoi) Co., Ltd.' with unique coordinate at 14°36'33.59" N 100°59'46.88" E.

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According to Voluntary Carbon Standard Program Guidelines, clause 5.2 (Group Projects), the central GHG information system and controls associated with the project and its monitoring will response by SCG Cement Co. Ltd. As per VCS program guidelines (18 November 2008), the proposed grouped project is expected to reduce anthropogenic emissions by sources within 5,000 – 1,000,000 tonnes of carbon dioxide equivalent annually. It can be categorised in sectoral scope No.4 “Manufacturing Industries” under UNFCCC guideline.

To implement of the project activities is able to reduce the GHG emission from fossil combustion in kiln processing with amount of VCUs expected over 10 year crediting period: 6,102,304 tCO₂e.

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

2.1 Validation Process

The validation process has been conducted by Bureau Veritas Certification Holding SAS with issued date as of 3 November 2009. This report is publicly available on v-c-s.org website at link

<https://vcsprojectdatabase1.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=403&lat=14%2E609331&lon=100%2E996356&bp=1>

2.2 Validation Findings

2.2.1 Gap Validation

This project applied ACM0003 methodology version 7.2 under UNFCCC Clean Development Mechanism which is currently approved by VCS (<http://www.v-c-s.org/how-it-works/linked-programs>). Therefore, Gap Validation for this project is not applicable.

2.2.2 Methodology Deviations

There was no methodology deviation found during validation process.

2.2.3 New Project Activity Instances

The project is not registered under grouped project activity and there is no inclusion of new project activities in this verification period.

2.3 Validation Conclusion

As stated in validation report, validation team gave opinion that the project correctly applies and meets the relevant VCS requirements and the relevant host country criteria. The validation was based on the information made available to validation team and the engagement conditions detailed in validation process.

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3 VERIFICATION PROCESS

3.1 METHOD AND CRITERIA

The overall verification process, from Contract review to Verification report & Opinion, was conducted using Bureau Veritas Certification Holding SAS's internal procedures.

The verification process consisted of the following steps:

- A desk review of the VCS PD and supporting documents with the use of the requirements of CDM methodology ACM0003 version 07.2 and related tools, in accordance with VCS standard version 3.
- A desk review of monitoring report and supporting documents submitted by the project proponent.
- On-site inspections, review of performance records, interviews with project proponents and on-site operators, collection of measurements, observation of established practices and testing of the accuracy of monitoring equipment
- Review of monitoring results and verification of the correct application of monitoring methodologies
- Follow-up responses to Clarification and Corrective Action Requests
- Verify calculation formula and results and crosscheck data from original sources as appropriate
- Determination of the reductions in GHG emissions

3.2 Document Review

The document review has been conducted based on latest version of these following documents.

#	Title
1.	Siam Cement Biomass Project – Project Description version 2 (24/09/2009)
2.	Siam Cement Biomass Project – Monitoring Report version 3.1 (26/10/2011)
3.	Siam Cement Biomass Project – Validation Report (03/11/2009)
4.	Siam Cement Biomass Project – Verification Report for period of 01/07/2009 to 30/09/2009 (05/06/2010)

3.3 Interviews

The verification team interviewed the following persons as part of verification process.

#	Name	Title	Organization
1.	Dr Kriengkrai Suksankraisorn	Engineer	SCG Head office
2.	Panai Srinual	Engineer	SCG Head office
3.	Suranon Kanokbanpot	Engineer	SCG Ta Luang
4.	Praphat Chaimongkol	Specialist	SCG Ta Luang
5.	Kumpol Meemangkol	Commercial Manager	SCG Khao Wong
6.	Pratuan Siriban	Analyzer Chemical	SCG Khao Wong
7.	Natthakon Veeramritphan	Commerical officer	SCG Khao Wong
8.	Sutin Wong-on	Production	SCG Khao Wong
9.	Woraphun Asavasurareak	Engineer	SCG Khao Wong

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10.	Benjawan Boonchatrasuriya	Engineer	SCG Khao Wong
11.	Adul Tongprasom	Engineer	SCG Lampang
12.	Ponggumpan Chaiyo	Engineer	SCG Lampang
13.	Nakarin Krabaoklang	Production Engineer	SCG Kaeng Khoi
14.	Paripat Pajayakrit	Production Engineer	SCG Kaeng Khoi
15.	Chalit Waewswang	Production Department	SCG Kaeng Khoi
16.	Sutin Thongtaew	Production Department	SCG Kaeng Khoi
17.	Jatuporn Chareonpitakporn	Production Engineer	SCG Thung Song
18.	Nakorn Therajane	Maintenance Engineer	SCG Thung Song
19.	Chawalit Sommaneewat	Production Promotion Engineer	SCG Thung Song
20.	Apai Senglai	X-ray and Chemical Manager	SCG Thung Song
21.	Prayad Sukanan	Biomass Procurement Manager	SCG Thung Song
22.	Pichien Assawarungseekul	Clinker QA Manager	SCG Thung Song
23.	Utai Panbangpra	Fuel Manager	SCG Thung Song
24.	Suksiri leadkua	OP Biomass	SCG Thung Song

3.4 Site Inspections

Site inspections for five SCG locations have been performed according to the following schedule.

#	Date	Site Inspection
1.	19 July 2011	SCG Ta Luang, Saraburi province
2.	22 July 2011	SCG Khao Wong, Saraburi province
3.	3 August 2011	SCG Lampang, Lampang province
4.	5 & 15 August 2011	SCG Kaeng Khoi, Saraburi province
5.	9 August 2011	SCG Thung Song, Nakon Si Thammarat province

The inspection for all five SCG sites has been performed with objective to verify the authentic and credibility of data used in calculation of emission reduction. For inspection in each site, interviewing with key operational staff has been conducted in order to confirm consistency of data received from project proponent and to monitor project implementation particularly in biomass handling system, at which has been detailed in registered VCS Project Description.

3.5 Resolution of Any Material Discrepancy

As per ACM0003 version 7.2, it was requested by methodology that quantity of alternative fuel and fossil fuel consumption have to be cross-checked with annual energy balance that is based on purchased quantities and stock change. However, It was found by verification team that there are material discrepancies of quantity of

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alternative fuel and fossil fuel consumption for data used in Voluntary Emission Reduction (VER) calculation spreadsheet and stock checking report among 5 SCG sites. As indicated in CAR05, CAR06, CAR08, CAR09 in verification protocol (annex 1), that inconsistency larger than 5% for amount of fuel oil consumption between VER calculation and stock checking report were found. In response to these CARs, project proponent revised fuel oil data at Ta Luang, Khao Wong, Kaeng Khoi and Thung Song sites to be in line with stock checking report in order to keep ER calculation conservative. Therefore these CARs are closed.

As stated in CAR10, CAR 11, CAR13, CAR14, CAR15 in verification protocol (annex 1), discrepancy for amount of biomass consumption between data used in VER calculation and stock checking report were found during verification process. In response to these CARs, project proponent revised this data in ER calculation in the way that contribute less benefit to proponent at which stock checking balance was typically used. This resulting in the CARs mentioned earlier closed.

In term of solid fossil fuel (i.e., lignite, coal, etc.), verification team raised 5 CLs, as stated in CL03 to CL07 in verification protocol (annex 1), for project proponents to further clarify on what is the basis of weight (wet or dry) shown in stock checking report. Based on project proponents' responses, it was found that there are inconsistency of consumption data between what were used in VER calculation spreadsheet and stock checking report. To keep Emission Reduction (ER) calculation in line with conservative principle, project proponents decided to revise ER calculation by using consumption data from stock checking report which is contributed less benefit to project proponents, then, these CLs were closed.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

As result of verification process, combined with evidence submitted and site inspection finding, verification body able to confirm that implementation of biomass handling system has been operated as described in registered VCS Project Description. Fossil fuel, which is common fuel in cement manufacture, has been partially replaced by biomass such as, wood chip, bark, rice husk, etc., which are locally available around the site. In term of equipment calibration, project proponents are properly responsible for periodic calibration for almost equipment associated with monitoring of fuel consumption and heating value analysis. Availability of data since from October 2009 to February 2011 (17 months) are available at verification process without missing data gap while good corporation from key operational staff and project proponents have been constantly provided throughout verification process. However, verification discovered some discrepancy and error in calculation of emission reduction in stage of desk review and site inspection. These have been described in following detail.

On top of the above, verification team found that fluidized bed gasifier has been installed in Lampang site since 2009. The implementation of this new system leads to difficulties in consideration of baseline and emission reduction from this new system. Refer to CL05 in verification protocol (annex 1), project proponents decided to neglect any amount of emission reduction possibly generated from Lampang site during this current verification period (October 2009 – February 2011) in order to preserve principle

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of conservativeness. Then, the revision of emission reduction calculation as per clarification in CL05 is satisfied and closed.

As per stated in monitoring plan in registered VCS project description that heating value of fuel oil subjected to be analysed by SCG laboratory in case of value provided by fuel supplier is not available. With finding from onsite visit, it was confirmed by SCG officer that SCG laboratory able to conduct heating value for fuel oil. This finding caused verification team to raise CAR17, CAR19 and CL01 as indicated in verification protocol (annex 1) requesting project proponents to further correct and provide more clarification. In response to this, project proponents amended emission reduction calculation and also submitted official heating value results from SCG laboratory. In addition, more clarification on activities deviated from monitoring plan have been described on section 2.2 of monitoring report version 3.0 dated on 19 October 2011. Verification team verified its justification and confirmed that these deviations are in accordance with ACM0003 version 7.2 and monitoring plan in registered VCS project description. Therefore, CAR17, CAR19 and CL01 are closed.

There is one remaining FAR from previous verification provided that completion of monitoring data on year 2009 and inconsistency of data for this year are suggested to be re-checked. Verification team conducted re-checking procedure and gone through data for all months in year 2009 and able to confirm its consistency and completion of data collection in 2009. Thus, FAR01 from previous verification period is closed.

Version 3**4.2 Accuracy of GHG Emission Reduction or Removal Calculations****a) Baseline Emission**

In accordance with ACM003 version 7.2, verification verified accuracy of data used in estimation of Baseline Emission in year y , which is result of summation between Baseline emission from fossil fuel displaced by alternative fuel or less carbon intensive fuel ($BE_{FF,y}$) and Baseline methane emission avoided ($BE_{CH_4,biomass,y}$). As indicated in equation (8) to (17) of ACM0003 version 7.2, these following parameters are stipulated in monitoring plan in registered VCS project description and needed for calculation of baseline emission. Verification team verified completion of data collection and its required QA/QC procedures to justify its accuracy as detail below;

I. Quantity of fossil fuel type i fired in the project plan in year y (tons), $FC_{PJ,i,y}$

Verification team raised 5CLs (i.e., CL03, CL04, CL05, CL06, and CL07 – see detail in annex 1) for project proponent to further clarify on why inconsistency of fossil fuel consumption data occurred in five SCG sites between data used in VER calculation and stock checking report. In response to these CLs, project proponent has clarified its basis of weight presented in stock checking report. In case of some inconsistency that larger than 5%, project proponent revised emission reduction calculation in the way that contribute less benefit to project proponent. In other words, emission reduction was calculated from larger amount of fossil fuel consumption whether in data used in VER calculation or stock checking report which can be defined as conservative calculation. Therefore, these five CLs were closed.

II. Quantity of alternative fuel or less carbon intensive fuel type k used in the project plant in year y (tons), $FC_{PJ,k,y}$

Given definition of alternative fuels have been clearly defined by ACM0003 version 7.2, CL08 (detail in annex 1) is issued based on curiosity on why project proponents included paper bag, filter bag, amimo drymix at Ta Luang site into baseline calculation. In response to this, project proponents excluded paper bag, filter and amimo drymix from baseline calculation, therefore, CL08 is closed.

As brief detail provided earlier in section 3.5, reasons for raising CAR10, CAR 11, CAR13, CAR14, CAR15 (detail in verification protocol – annex 1) are based on the finding that discrepancy of biomass consumption larger than 5% found between data used in VER calculation and stock checking report. In response to these, project proponents revised emission reduction calculation in the way that contribute less benefit or being in conservative principle. The revision in emission reduction calculation is satisfied and these CARs were closed.

Version 3III. Net calorific value of fossil fuel type l in year y (GJ/ton), $NCV_{l,y}$

The clarification on CL01, as indicated in verification protocol annex 1, was raised based on why some SCG sites is able to carry on using fuel oil heating analysis report from supplier but some sites are using fuel oil NCV value taken from Department of Alternative Energy Development and Efficiency (DEDE) report. This CL01 is also raised based on the finding on how project proponents convert heating value of fuel oil from DEDE report which was originally quoted at '39.77 MJ/litre' to '39.77 GJ/ton' in VER calculation spreadsheet. Likewise, CAR17, CAR19, CAR20, CL10 and CL11 were raised because some inconsistencies were found between two data sources as well as its application of fuel oil heating value from DEDE report in some SCG sites is not in line with monitoring plan at which heating value of fuel oil shall be taken from either SCG internal laboratory or fuel oil supplier. This is not agreed with finding that SCG internal laboratory is able to conduct fuel oil's heating value in each delivery batch.

In response to these CARs and CLs, project proponents revised emission reduction calculation by using value taken from SCG internal laboratory while errors in calculation have been corrected. Verification did verify this latest revision and later submitted supporting evidences, its correctness and credibility were confirmed. Therefore, these CARs and CLs mention above were closed.

IV. Net calorific value of the alternative or less carbon intensive fuel type k in year y (GJ/ton), $NCV_{k,y}$

The consistency between data log sheet and daily report (used in VER calculation) has been cross-checked during site inspection. There was no discrepancy larger than 5% found between these two sources of data.

V. Production of clinker in year y, $P_{clinker,y}$

It was raised as of CL12 (detail provided in annex 1) for more clarification on why the total clinker calculation in Lampang site was not following work instruction and how difference between total clinker calculated following work instruction and fixed clinker factor. Based on responses from project proponents, it was clarified that clinker factor was originally calculated from loss on ignition (LOI) and % dust loss as per indicated in work instruction. This number is normally stable and almost fixed value but this value is recently fluctuated because of implementation of waste heat power generation. With reference from 'LP_clinker factor.xls', new clinker factor is set at 4% approximately. Verification team verified this calculation and found that explanation for this calculation is satisfied and accepted. Then, CL12 was closed.

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VI. Baseline methane emission avoided during the year y from preventing disposal or uncontrolled burning of biomass residues (tCO₂e)

According to CAR22 in verification protocol annex 1, verification requested project proponents to revise incorrect calculation formulae in sheet 'BE_step3' of VER calculation spreadsheet which is not following equation (17) of ACM0003 version 7.2. The project proponents made appropriate response and corrected the calculation accordingly. Then CAR22 was closed.

b) Project Emission

As per equation (1) to equation (6) in ACM0003 version 7.2, the accuracy of project emission data from all five SCG sites have been verified against monitoring plan and methodology. The verification finding has been detailed as below.

I. Project emission from the use of alternative fuels and/or less carbon intensive fossil fuel

As indicated in CAR03 in verification protocol annex 1, this corrective action request is raised base on the finding from five SCG sites that some of alternative fuel originating from fossil sources did not take into account of project emission in VER calculation spreadsheet. In response to CAR03, project proponents revised VER calculation spreadsheet by taking account of crude wax, plastic, tire, rubber, waste oil, epoxy into project emission to be in line with definition alternative fuel. This made estimation of emission reduction to be more conservative. Therefore, this CAR is closed.

II. Project emission from additional electricity and/or fossil fuel consumption as a result of project activity

Verification team issued CAR04 (see detail in verification protocol – annex 1) for incorrect cell linkage found in VER calculation spreadsheet in term of electricity consumption at Ta Luang site on year 2010 and there is inconsistency of electricity consumption data found between data log sheet and VER calculation spreadsheet for Khao Wong site. Moreover, power meter used to monitor electricity consumption is lack of periodic calibration. In response to this, project proponents revised cell linkage and corrected data in VER calculation spreadsheet to be in accordance with original data log sheet which was later submitted to verification body. Specification of power meter showing maximum error was found in this document at which the maximum error at 0.5% has been later applied to electricity consumption data in the way that give less benefit to project proponents. Verification verified consistency and credibility of the documents and able to confirm its authentic and reliability. Therefore, CAR04 was closed.

III. Project emission from combustion of fossil fuel for transportation of alternative fuels to the project plant

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As of desk review, verification team verified its correctness and conservativeness of parameters (i.e., TL_y and AVD_y) used in calculation and found that these two parameters were taken from reliable sources and correctly applied in calculation.

c) Leakage

As per CAR02 in verification protocol (annex 1) issued during desk review, it was found by verification team that no demonstration of leakage and its related parameters required by ACM0003 version 7.2 were demonstrated in monitoring report version 00. In response to this CAR, project proponents identified available biomass quantity and provided in section 4.3 in latest monitoring report version 3.1. The data used in rule out leakage has been cross-checked with claimed reference and its correctness is confirmed. Therefore, CAR02 was closed.

d) Emission Reduction

According to CAR22 in verification protocol annex 1, verification requested project proponents to revise incorrect calculation formulae in sheet 'BE_step3' of VER calculation spreadsheet which is not following equation (17) of ACM0003 version 7.2. The project proponents made appropriate response and corrected the calculation accordingly. This correction has been verified and its correctness was confirmed. Then CAR22 was closed.

In addition to the finding above, verification team raised 4 FARs for next verification period. These are forward actions given for next verification body to ensure that fossil fuel consumption used in biomass handling system and necessary equipment's (i.e., Pfister and fuel oils' flow meter) would be calibrated properly and be traceable back to national/international standard. The FAR04 is also raised to ensure that biomass consumption would be properly measured in next verification period. See more detail in annex 1.

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

In term of quality of evidence, verification team did verify reliability and credibility of evidences submitted for verification such as, certificate of analysis (COA) of fuel oil from supplier and heating value analysis report from internal SCG laboratory. As per indicated in CL10 and CL11 in verification protocol annex 1, project proponents are requested to submit more evidences to verify fuel oil heating value used in VER calculation spreadsheet. To close these CLs, project proponents provided result of heating value from internal SCG laboratory, then verification team verified its reliability this data by cross-checking with document submitted during onsite visit and able to confirm its reliability. As consequence of these evidences, the CL10 and CL11 were closed.

During verification process, operational staff and project management were interviewed. Based on their responses during interview process, verification team verified their claims with physical onsite inspection as per stated in section 3.4 above, their credibility and reliability in term of quality of evidence and consistency of data can be confirmed.

4.4 Management and Operational System

Verification team interviewed key operation staff and project management at 5 SCG sites including Ta Luang, Khao Wong, Lampang, Thung Song and Kaeng Khoi. Verification team found that cell head is key personal responsible for data collection from data control room with closed corporation with operation staff in each SCG site. To be qualified to perform duty in data control room, cell head and operational staff subjected to obtain successful training activities with adequate probation working hour under supervision of supervisor or assigned cell head. Combined with interview with key staff and auditing program during onsite visit, verification team concluded that cell head and operational staff were qualified to perform data collection for verification process.

In regard to biomass handling system and fossil fuel consumption activities, relevant data from data control room were transferred to daily report file and continuously recorded in data log sheet for future verification process. To ensure consistency between data log sheet and daily report, verification team performed cross-checking between these two sources of data in period of October 2009 to February 2011. As shown in CAR18 in verification protocol annex 1, this CAR was raised based on inconsistency of fossil fuel's heating value at Kaeng Khoi site between daily report and data log sheet. Project proponents rechecked these data and made revision in VER calculation to be in line with heating value from SCG laboratory. This revision was satisfied and accepted and CAR18 was closed.

In approach of management system, verification team found that role and responsibility in key staff who was assigned to response any queries from verification team during sit inspection was differ from site to site. With respect to variety in function/responsibility of key staff which is understandable in each SCG site, clear responsibility and unity in response of key staff could possibly assist verification body in next monitoring period.

5 VERIFICATION CONCLUSION

Conclusion of verification process for period of October 2009 to February 2011 is based on verification finding from desk review and onsite inspection process including interviewing with key operational staff from five SCG sites during period of 19 July 2011 to 9 August 2011. Verification team confirms that calculation of greenhouse gas emission reduction is in accordance with registered VCS project description and principle of VCS version 3.0. The emission reduction as stated below was correctly calculated in accordance with ACM0003 version 7.2 and related tools. The emission reduction generated from five SCG sites during October 2009 - February 2011 and conclusion of net GHG emission reduction are exhibited in following tables.

Site/Year	2009	2010	2011	Total
Ta Luang	1,396	6,809	2,424	10,629
Khao Wong	25,879	30,428	12,121	68,428
Kaeng Khoi	10,768	11,421	18,610	40,799
Thung Song	38,003	184,959	9,625	232,587

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Lampang	0	0	0	0
Total	76,046	233,617	42,780	352,443

GHG Emission Reductions or Removals	tCO ₂ e
Baseline Emissions	403,751
Project Emissions	51,308
Leakage	0
Net GHG emission reductions or removals	352,443