ChevronTexaco

SANGEA™ Energy and Emissions Estimating System

10th Annual Natural Gas Star Implementation Workshop

28 October 2003

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SANGEA™ Emissions Estimation and Energy Usage System

- Scope
- Boundaries / Accuracy
- System Description & Operation
- Lessons Learned

Scope

- Gases Included
  - Carbon Dioxide
  - Methane
  - Nitrous Oxide
- Gases Screened
  - HFCs
  - PFCs
  - SF6

Scope *(Continued)*

- **Emission Sources Included:**
  - **Onsite fuel consumption**
  - **Process emissions**
    - **Flashing from tanks**
    - **Glycol dehydrators**
  - **Flaring**
  - **Venting**
    - **Pneumatic devices**
  - **Fugitive Emissions**
  - **Onsite Waste Treatment**

Boundaries for ChevronTexaco Inventory

- All of owned / operated
- Joint Ventures: Completeness/Credibility/Influence
  - 20% threshold
- Contractors: Completeness/Credibility/Influence
  - Major ‘captive’ contractors

Conventional Systems

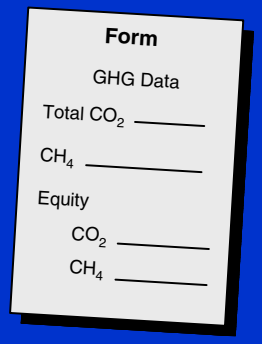
Protocol Document
- **Boundaries**
- **Methodologies**
- **Factors**

Numerous User-Developed Systems to Implement Inventory Protocol

Simple Data Form

Corporate Database

Lotus Notes



ORACLE

Hard Copy Manuals Difficult to Control Revisions

- *Inefficient*
- *Inconsistent to Support*
- *Does Not Encourage/ Facilitate/Standardize Audit Trail Information*

Total and Equity CO_2, CH_4, $CO_2(e)$ for Each Reporting Entity

The SANGEA™ System

SANGEA™ Energy And Greenhouse Gas Inventory System

Database

- *Excel-Based*
- *Control Revisions Electronically (Can't Submit Report if Not Using Latest Version)*
- *Transfer Set-up From Year-to-Year and Version-to-Version*
- *Efficient, Consistent, Central Support is Cost-Effective*
- *Promotes, Facilitates, Standardizes Audit Trail Information*

Total Operated or Equity CO_2, CH_4, N_2O and $CO_2(e)$ Plus Energy Utilization and Criteria Pollutants and Details:

- *Combustion*
- *Flaring*
- *Venting*
- *Fugitives*
- *Indirect*
- *Crude Oil Storage/Loading*
- *Miscellaneous*

Ownership / Responsibilities: Data Input

Reporting Unit Responsibilities

- Monthly Inputs
  - Direct input of data
  - Link SANGEA™ input sheets to data sources (accounting systems, process meters, etc.)
- Quarterly Upload to corporate database
  - Upload parameters specified by Corp
  - Upload process straightforward and user-friendly

Ownership / Responsibilities: Coordination and Certification

- Manager of Operations for Reporting Unit certifies data
- Reporting unit mgmt designates GHG coordinator
  - Analogous to energy coordinator
  - Responsible for completing inventory
  - Coordinate with Operational Excellence efforts and metrics

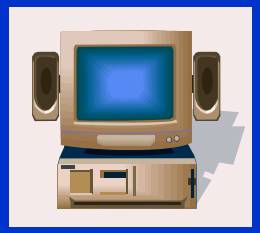
SANGEA™ Software: Operate and Evaluate

- System Rollout: July 10 - 11, 2001
- Data Input: July - October
- First Report Due: October 17, 2001
  - January - September, 2001 data
  - Monthly Data Input October - December
- Year-end 2001 Report Due: January 16, 2002
- January 2002+: Monthly data input, quarterly reporting for Energy and GHG
- January 2003: First full year report for ChevronTexaco

SANGEA™ Energy and Emissions Estimating System

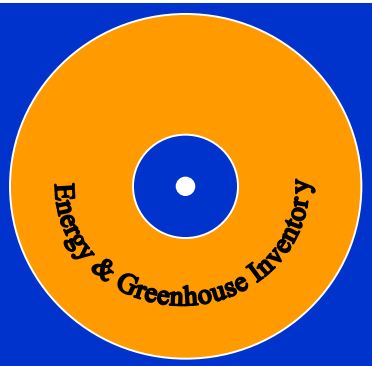
- Enables data collection, computation, compilation and reporting
- Excel-based, compatible with standard Personal Computer (PC)
- Single system and methodology for all business units
  - User customizes for location
- User can choose input and output units (metric, English, mass, volume)
- Flexible level of detail/aggregation
  - Total facility fuel gas use OR by source
- Includes API 2001 methodologies

System Architecture

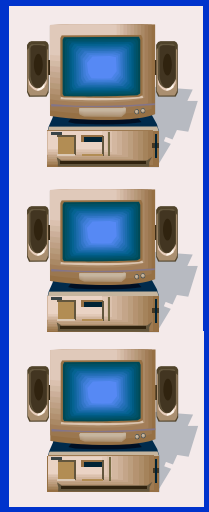


Monthly SBU Data Collection and Analysis

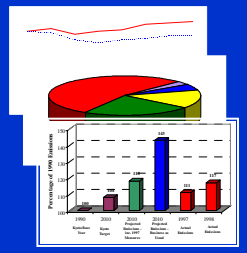
SBU-Configured Inventory Spreadsheet



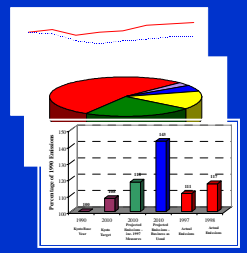
Inventory System CD



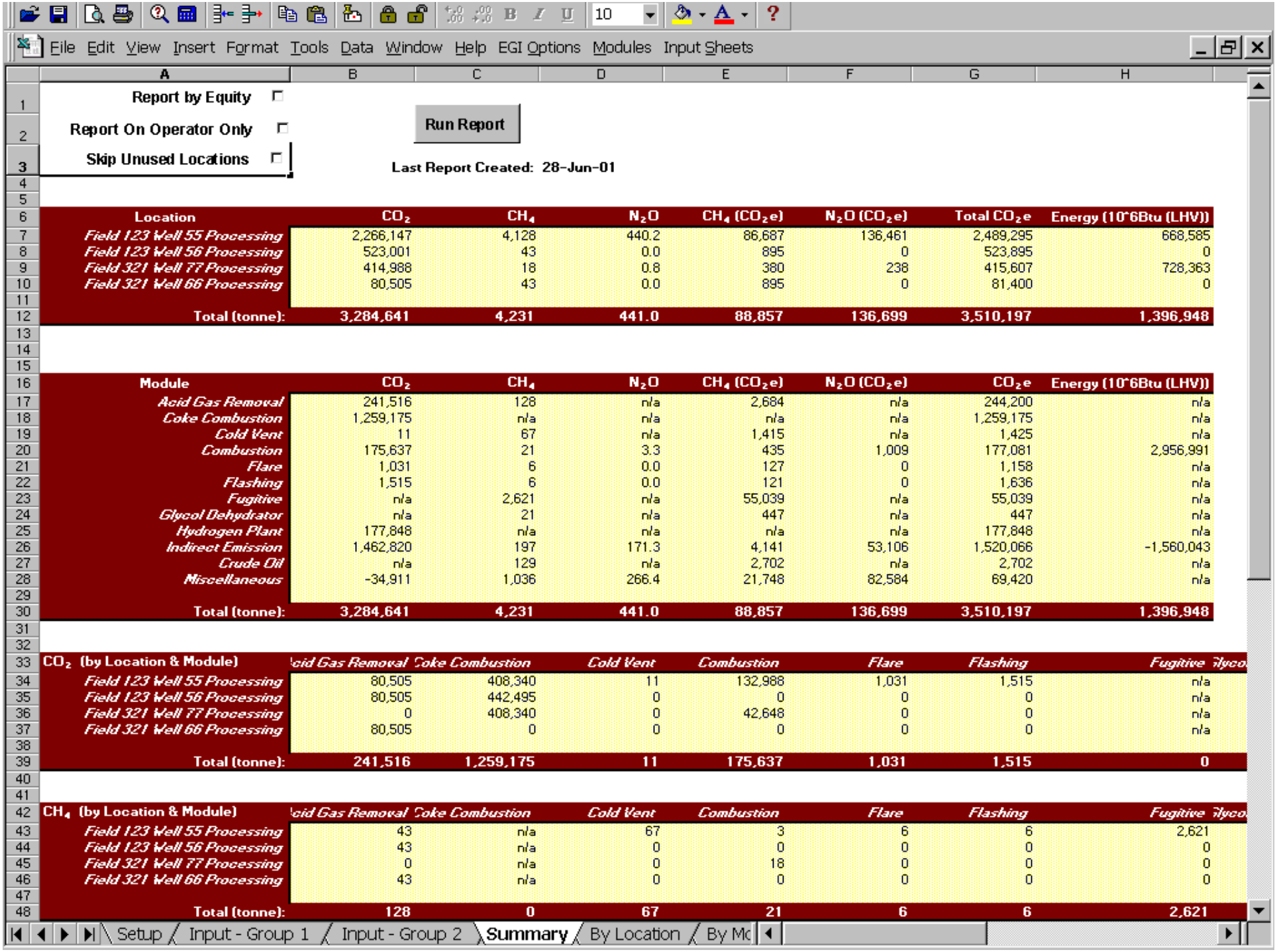
Quarterly SBU Output Reports to Corporate



SBU Analysis, Forecasting Planning



Annual Corporate Aggregation and Reporting



File Edit View Insert Format Tools Data Window Help EGI Options Modules Input Sheets

Report by Equity ☐

Report On Operator Only ☐

Skip Unused Locations ☐

Run Report

Last Report Created: 28-Jun-01

Location	CO_2	CH_4	N_2O	CH_4 (CO_2e)	N_2O (CO_2e)	Total CO_2e	Energy (10^6Btu (LHV))
Field 123 Well 55 Processing	2,266,147	4,128	440.2	86,687	136,461	2,489,295	668,585
Field 123 Well 56 Processing	523,001	43	0.0	895	0	523,895	0
Field 321 Well 77 Processing	414,988	18	0.8	380	238	415,607	728,363
Field 321 Well 66 Processing	80,505	43	0.0	895	0	81,400	0
Total (tonne):	**3,284,641**	**4,231**	**441.0**	**88,857**	**136,699**	**3,510,197**	**1,396,948**

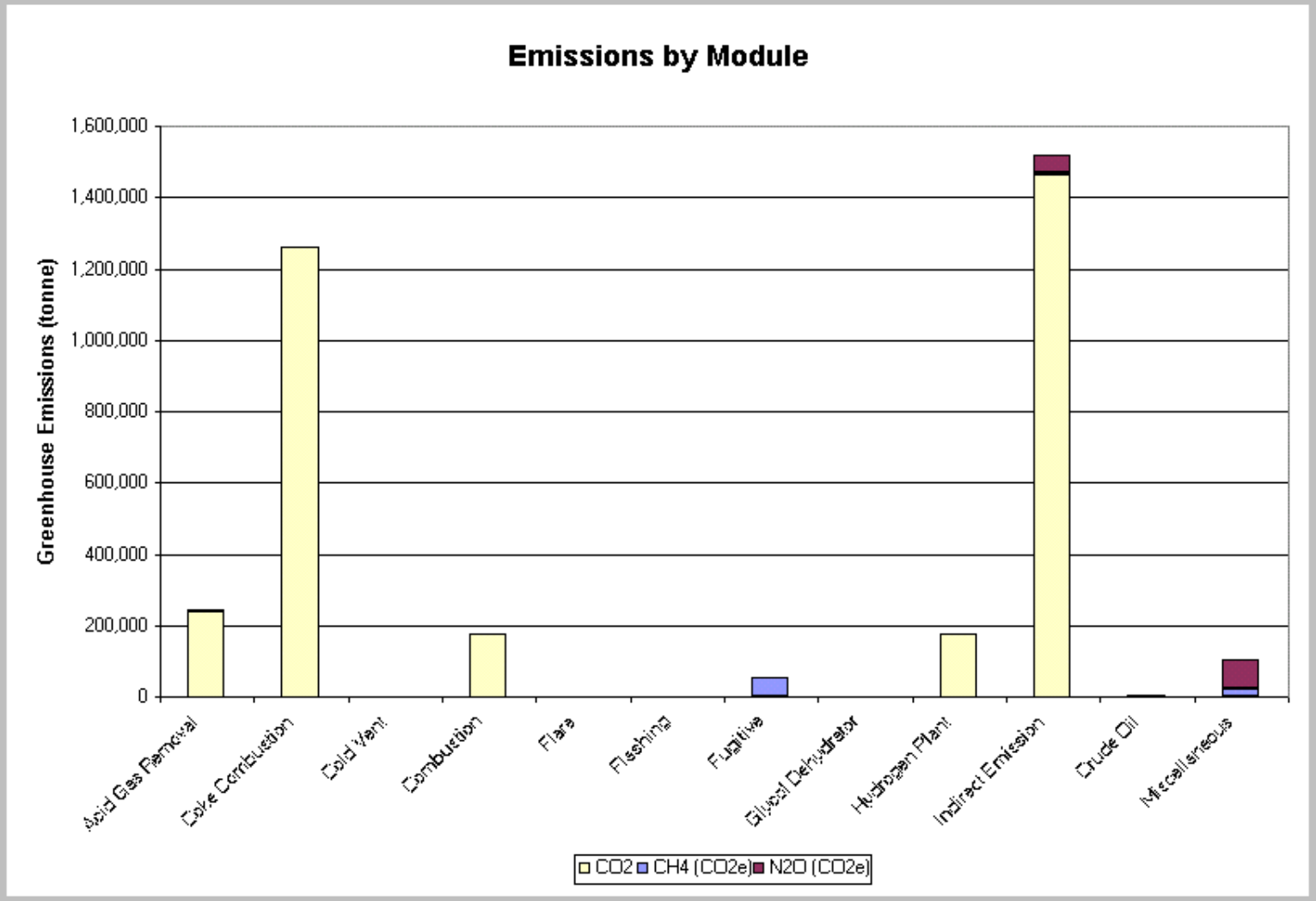
Module	CO_2	CH_4	N_2O	CH_4 (CO_2e)	N_2O (CO_2e)	CO_2e	Energy (10^6Btu (LHV))
Acid Gas Removal	241,516	128	n/a	2,684	n/a	244,200	n/a
Coke Combustion	1,259,175	n/a	n/a	n/a	n/a	1,259,175	n/a
Cold Vent	11	67	n/a	1,415	n/a	1,425	n/a
Combustion	175,637	21	3.3	435	1,009	177,081	2,956,991
Flare	1,031	6	0.0	127	0	1,158	n/a
Flashing	1,515	6	0.0	121	0	1,636	n/a
Fugitive	n/a	2,621	n/a	55,039	n/a	55,039	n/a
Glycol Dehydrator	n/a	21	n/a	447	n/a	447	n/a
Hydrogen Plant	177,848	n/a	n/a	n/a	n/a	177,848	n/a
Indirect Emission	1,462,820	197	171.3	4,141	53,106	1,520,066	-1,560,043
Crude Oil	n/a	129	n/a	2,702	n/a	2,702	n/a
Miscellaneous	-34,911	1,036	266.4	21,748	82,584	69,420	n/a
Total (tonne):	**3,284,641**	**4,231**	**441.0**	**88,857**	**136,699**	**3,510,197**	**1,396,948**

CO_2 (by Location & Module)	*cid Gas Removal*	*Coke Combustion*	*Cold Vent*	*Combustion*	*Flare*	*Flashing*	*Fugitive*	*Glyco*
Field 123 Well 55 Processing	80,505	408,340	11	132,988	1,031	1,515	n/a	
Field 123 Well 56 Processing	80,505	442,495	0	0	0	0	n/a	
Field 321 Well 77 Processing	0	408,340	0	42,648	0	0	n/a	
Field 321 Well 66 Processing	80,505	0	0	0	0	0	n/a	
Total (tonne):	**241,516**	**1,259,175**	**11**	**175,637**	**1,031**	**1,515**	**0**	

CH_4 (by Location & Module)	*cid Gas Removal*	*Coke Combustion*	*Cold Vent*	*Combustion*	*Flare*	*Flashing*	*Fugitive*	*Glyco*
Field 123 Well 55 Processing	43	n/a	67	3	6	6	2,621	
Field 123 Well 56 Processing	43	n/a	0	0	0	0	0	
Field 321 Well 77 Processing	0	n/a	0	18	0	0	0	
Field 321 Well 66 Processing	43	n/a	0	0	0	0	0	
Total (tonne):	**128**	**0**	**67**	**21**	**6**	**6**	**2,621**	

Setup / Input - Group 1 / Input - Group 2 / Summary / By Location / By Mc

File Edit View Insert Format Tools Chart Window Help



Summary | By Location | By Module | Primary Index | Emission - Group 1

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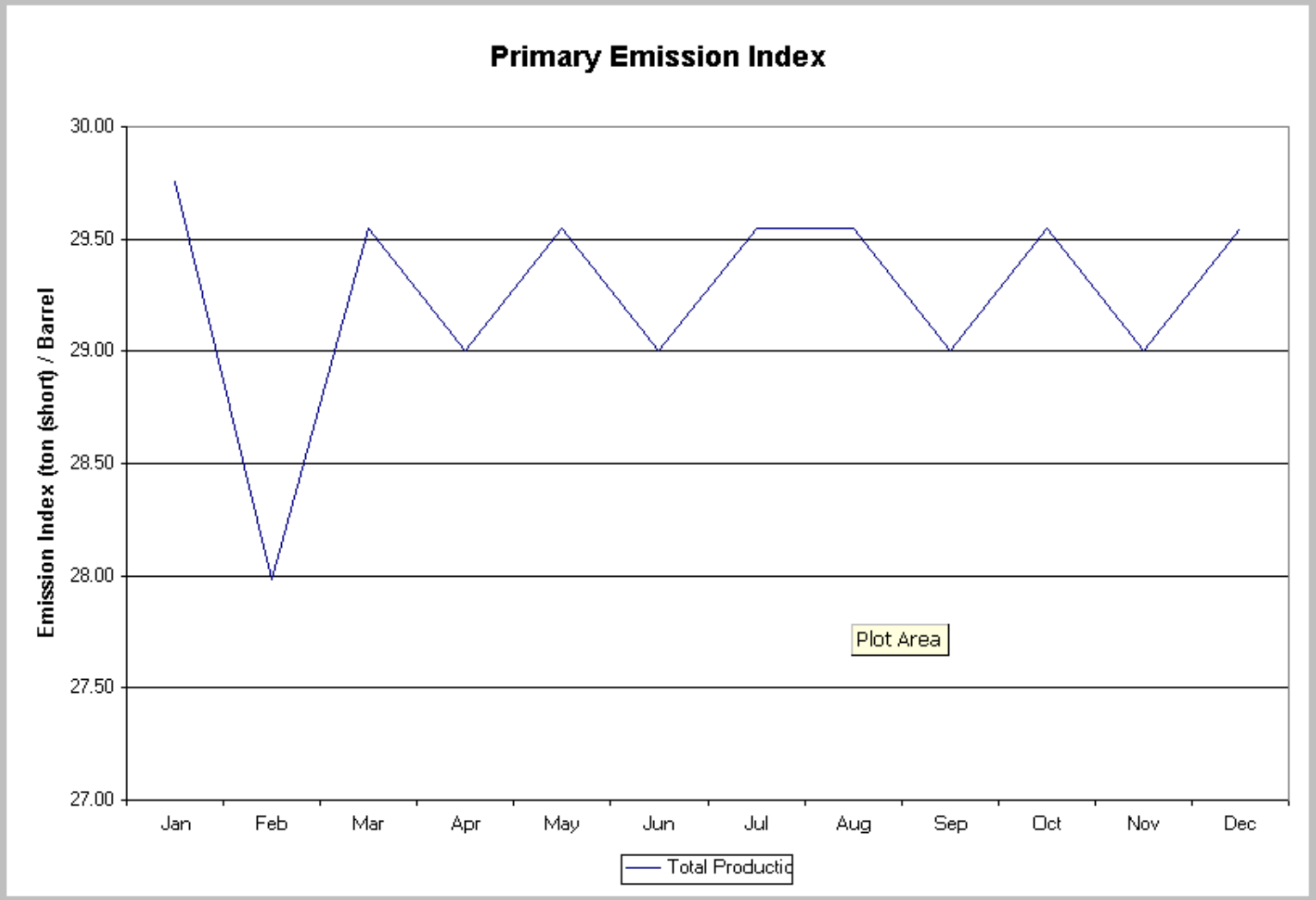

Summary | By Location | By Module | Primary Index | Emission - Group 1

SANGEA™ Software Control System

- Checks, reviews, documentation of results
- Backup electronic copies of data
- Consistent definition of data
- Restricted access for editing, report design
- Enables version control

Data Management

- Corporate
  - Oracle Database developed in tandem with SANGEA™
  - Compatible with SANGEA™
  - Designed to accommodate future organizational changes
- Operating Companies (Opcos)
  - System-generated Excel files or site-specific systems for Opcos
  - Details and specifics determined by each business unit
    - Coordinate with Operational Excellence and local reporting requirements

Lessons Learned
Successes

- Comprehensive system has many advantages
  - Common methodologies
  - Data management
  - Version control
- Able to focus on Quality Assurance/Quality Control at the reporting entity level
- Acceptance of system was facilitated by involving users in its development
- System includes both energy and greenhouse gas, as well as criteria pollutants
- System designed so that upgrades can be easily implemented

Lessons Learned
Areas for Improvement

- Users need to systematically self-check input and output data
- Need to assess materiality
- Users guide is too technical – Needs examples
- Align with petroleum industry standard protocol when issued

Summary

- Systematic, 1+-year effort to develop inventory
  - Project Manager
  - Stakeholder Group
  - 70+ Users
  - Ongoing Help Desk and Upgrades
- Off-the-shelf technology not available
- ChevronTexaco system unique
  - Enterprise-wide deployment
  - Verifiable system
  - Based on API methodology