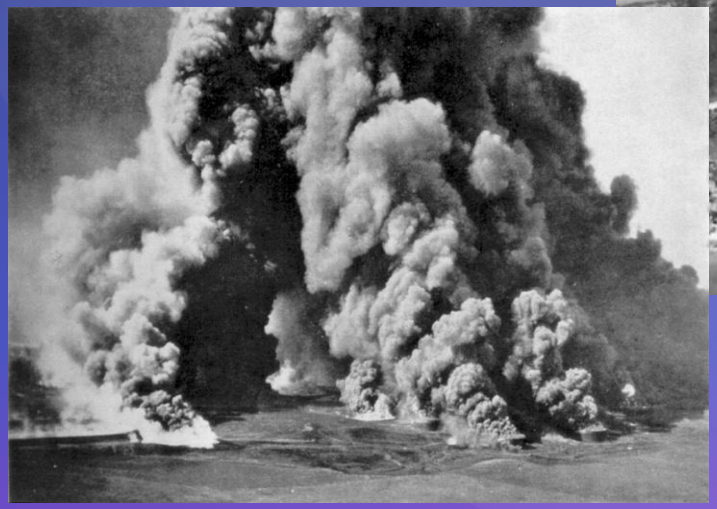
Case Study – SPM/EDGE for Pre-Confirmation Soil Sampling Program



Frank Hagar P.G., C.E.G., C.Hg.
Northgate Environmental Management, Inc. and R-Squared Incorporated

Outline Soil Sampling Case Study

- EQuIS and the Project
- Sampling and Analysis Plan (SAP) Description
- Selection of Sample Plan Module (SPM) and EQuIS Data Gathering Engine (EDGE)
- Implementation
- SPM
- EDGE
- Was it good for you? Was it good for me?

History – How We Got Where We Are Today

- Project description
- SPM – the not ready for prime time software
- Phase B – manual sampling

EQuIS and Project

- Large Industrial Facility – EQuIS has been used for site for last 6 years first as EQuIS 3 then upgraded to EQuIS 5
- Regulatory driven investigation of soil and groundwater. Multiple RPs and facilities
- Soil only portion of DB has over 650,000 records in dt_results for approximately 717 sample locations.

Sampling and Analysis Plan

- Purpose: Identify cut line for excavation of soil contaminated with chemicals of concern (COCs) with concentrations above the Nevada Division of Environmental Protection (NDEP) Basic Comparison Levels (BCLs)
  - Concentrate on upper 10 feet.
  - Schedule critical for completion of excavation by year end

Sampling and Analysis Plan

- 171 Boring Locations
  - 2 Sonic Rigs
  - 1 Geoprobe Rig
  - 1 Asbestos Sampling crew (surface)
- Sample depths 0 – 18 ft bgs (predominately 1 – 10 ft bgs)
- 3 Labs
  - Test America Denver and Sacramento
  - EMSL New Jersey

Sampling and Analysis Plan

- Not all analyses at all locations
- Analyses
  - 8-hr TAT for Hexachlorobenzene (HCB) (SW8081M)
  - 24-hr TAT Dioxin screen (8290 Screen)
  - 3-d TAT Arsenic, Cobalt, Lead, Manganese, Magnesium
  - 3-d TAT Perchlorate (EPA 314.0)
  - 3-d TAT PAH (SW8270C)
  - 3-d TAT Pesticides (SW8081A)
  - 15-d TAT Asbestos by Elutriator

Sampling and Analysis Plan

- Schedule
  - Initial sampling to be completed in 2-weeks with step-out samples to follow
- Week 1 and 2
  - 2200 + Samples at 151 locations

Input Model – from PM to SPM

Line No GBP	COC #	Boring ID	Rig	Drilling Date planned/ actual	Rem. Zone	Grid	Sample Depths	1 Dioxin 1,000 ppt	2 HCB 1.2 mg/kg	4 Arsenic 1.77 mg/kg	5 Cobalt 331 mg/kg	5 Lead 800 mg/kg	5 Mg 100,000 mg/kg	5 Mn 13,700 mg/kg	6 Perchlorate 795 mg/kg	8/9 SVOCs PAHs	10 OCPs	FDs	MS/MSD note: no MSD on screens	FBs/ EBs
								EPA 8290 screen/ EPA 8290 conf.	EPA 8081m screen/ EPA 8270C conf.	EPA 6010B 6020	EPA 6010B 6020	EPA 6010B 6020	EPA 6010B 6020	EPA 6010B 6020	EPA Method 314.0	EPA Method 8270C (Full Suite)	EPA Method 8081A (Full Suite)	Number denotes sample depth	Number denotes sample depth	
1	1820 TAD 1821 TAS	RSAQ3	R1	4/6/2010/ 4/6/2010	1-2 RZ-B	Q3	3' FD 4' 5' 6' 7' 8' 9'	X X Hold Hold Hold Hold Hold		X Hold X Hold Hold Hold Hold						X Hold X Hold Hold Hold Hold		3'		
2	1820 TAD 1821 TAS	SA169	R1	4/6/2010/ 4/6/2010	1-2 RZ-B	Q3	3' 4' 5' 6' FD 7' 8' 9'	X X Hold Hold Hold Hold Hold								X Hold X Hold Hold Hold Hold		6 (SVOC)		
3	1823 TAD	SA110	R1	4/6/2010/ 4/7/2010	1-2 RZ-B	R3	3' 4' 5' 6' 7' 8' 9'									X Hold X Hold Hold Hold Hold				
4	1823 TAD	SA204	R1	4/6/2010/ 4/7/2010	1-2 RZ-B	Q4	3' 4' 5' 6' 7' 8' 9'			X Hold X Hold Hold Hold Hold										
5	1823 TAD	SA203	R1	4/6/2010/ 4/7/2010	1-2 RZ-B	Q4	2' FD 4' 6' 8'			X X X X								2'		
6	1822 TAS 1823 TAD	SA84	R1	4/7/2010 / 4/7/2010	1-2 RZ-B	Q4	3' FD 4' 5' 6' 7' 8' 9'	X X Hold Hold Hold Hold Hold	X X Hold Hold Hold Hold Hold	X Hold X Hold Hold Hold Hold						Hold Hold Hold Hold Hold Hold Hold		3		

Problem:

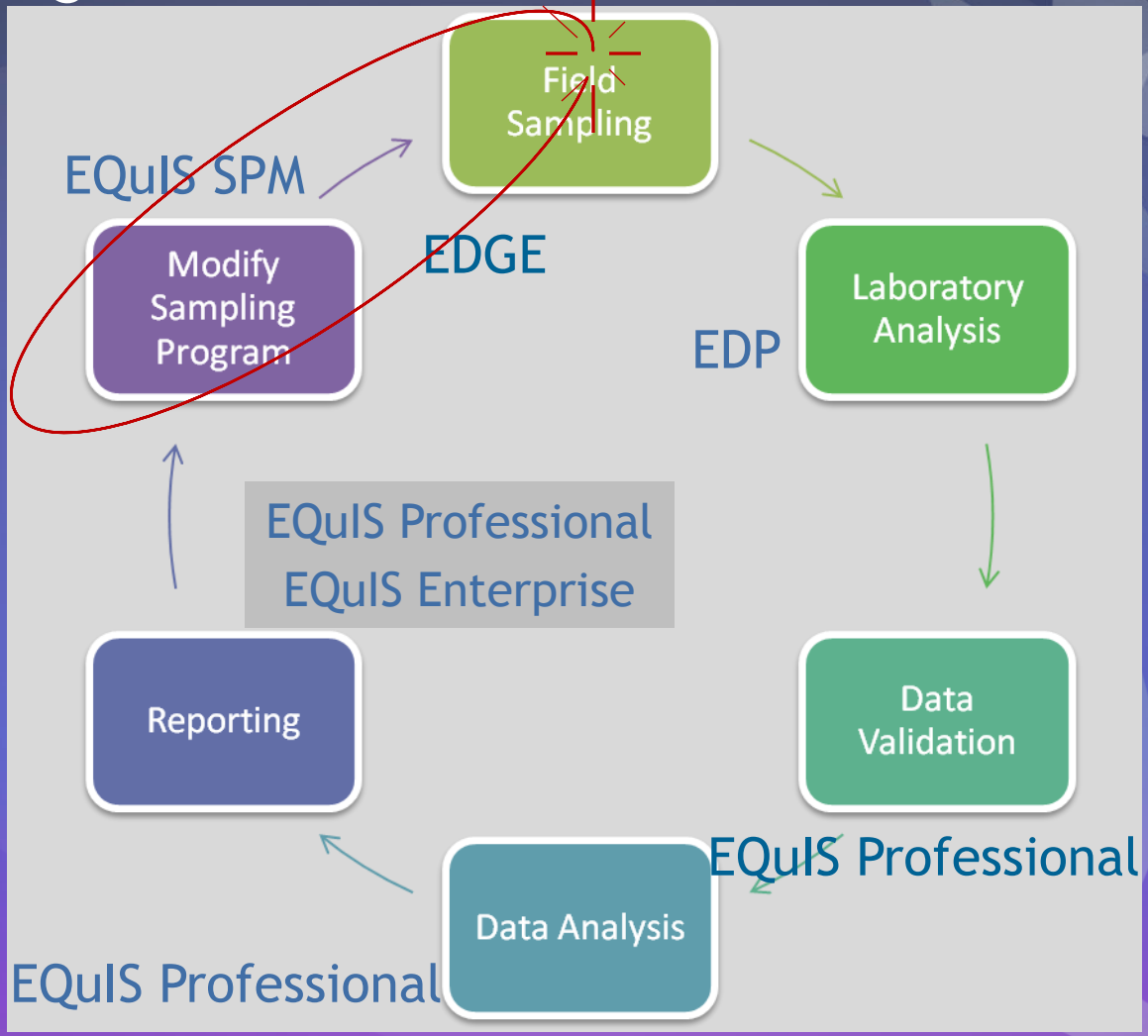
- Manage field activities with short data turnaround for screen samples
- Prepare labels and COCs easily
- Minimize errors and corrections to COCs and laboratory instructions

Solution:

Sample Planning Module (SPM)/EDGE

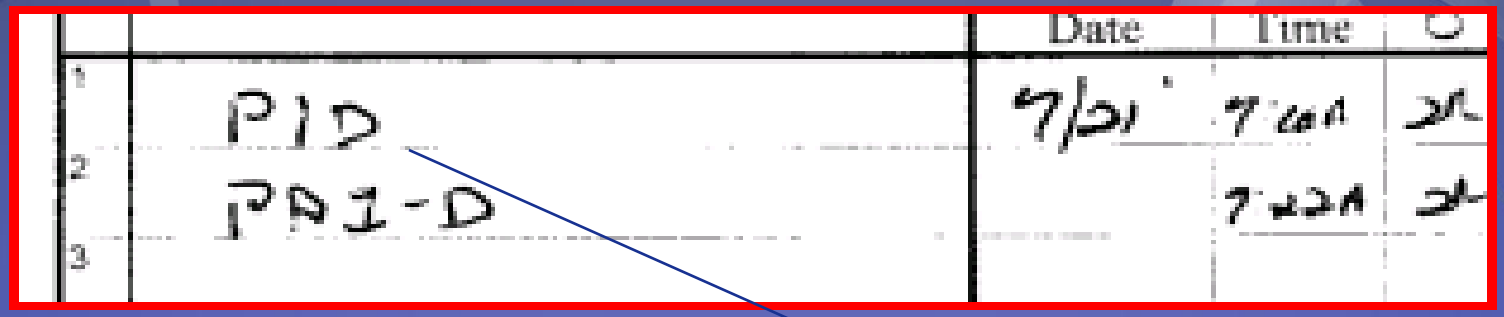
Field Data – The Weak Link!

Managing environmental data is a continuous TQM process



Tales From The Field

Example Errors….



sys_sample_code	sys_loc_code	sample_source
C05110901-009	P1D	FIELD
C06020772-008	P1D	FIELD
C06050793-006	PID	FIELD
C06080962-001	PID-D	FIELD

EarthSoft

Tales From The Field

Example Errors….

From: [redacted]
To: [redacted]; alek.hage@earthsoft.com; [redacted]
Cc: [redacted]
Subject: RE: W9J0195 rpt, coc & subcont.

Message | [redacted] (1 KB)

A couple issues came up compiling the EDD for this work order ([redacted]).

Sys_Loc_Code	Lab_RDL	Cas_Rn	Result_Valu	Detect_Fl	fraction	Test_Type
Sys_Loc_Code	LAB_Report_Li	CAS_RN	Result_Valu	Detect_Flag	FRACTIO	TEST_TYPE
CLYDESDALE RD		PH_LAB	7.59	Y	N	INITIAL
CLYDESDALE RD BERM		PH_LAB	7.77	Y	N	INITIAL
CLYDESDALE TOE OF BERM		MOIST	7.2	Y	N	INITIAL
CLYDESDALE TOE OF BERM	25	107-21-1	25	N	N	INITIAL
CLYDESDALE TOE OF BERM	25	TPH-D	25	N	N	INITIAL
CLYDESDALE TOE OF BERM	100	TPH-MO	100	N	N	INITIAL
CLYDESDALE TOE OF BERM		PH_LAB	7.62	Y	N	INITIAL

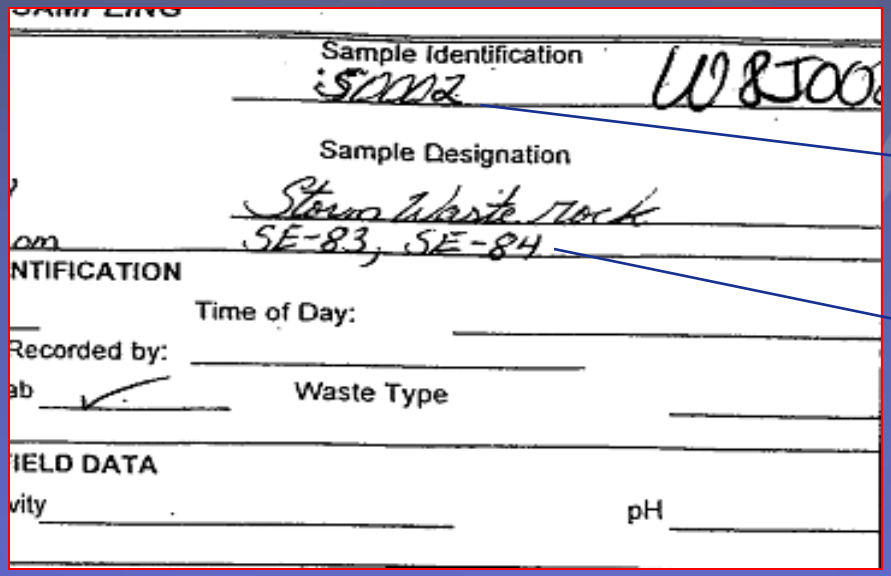
Field size exceeded, rejected by the database…

- Six people received the email
- Fixing these errors is a labor-intensive process

EarthSoft

Tales From The Field

Example Errors….



One Sample ID, but…

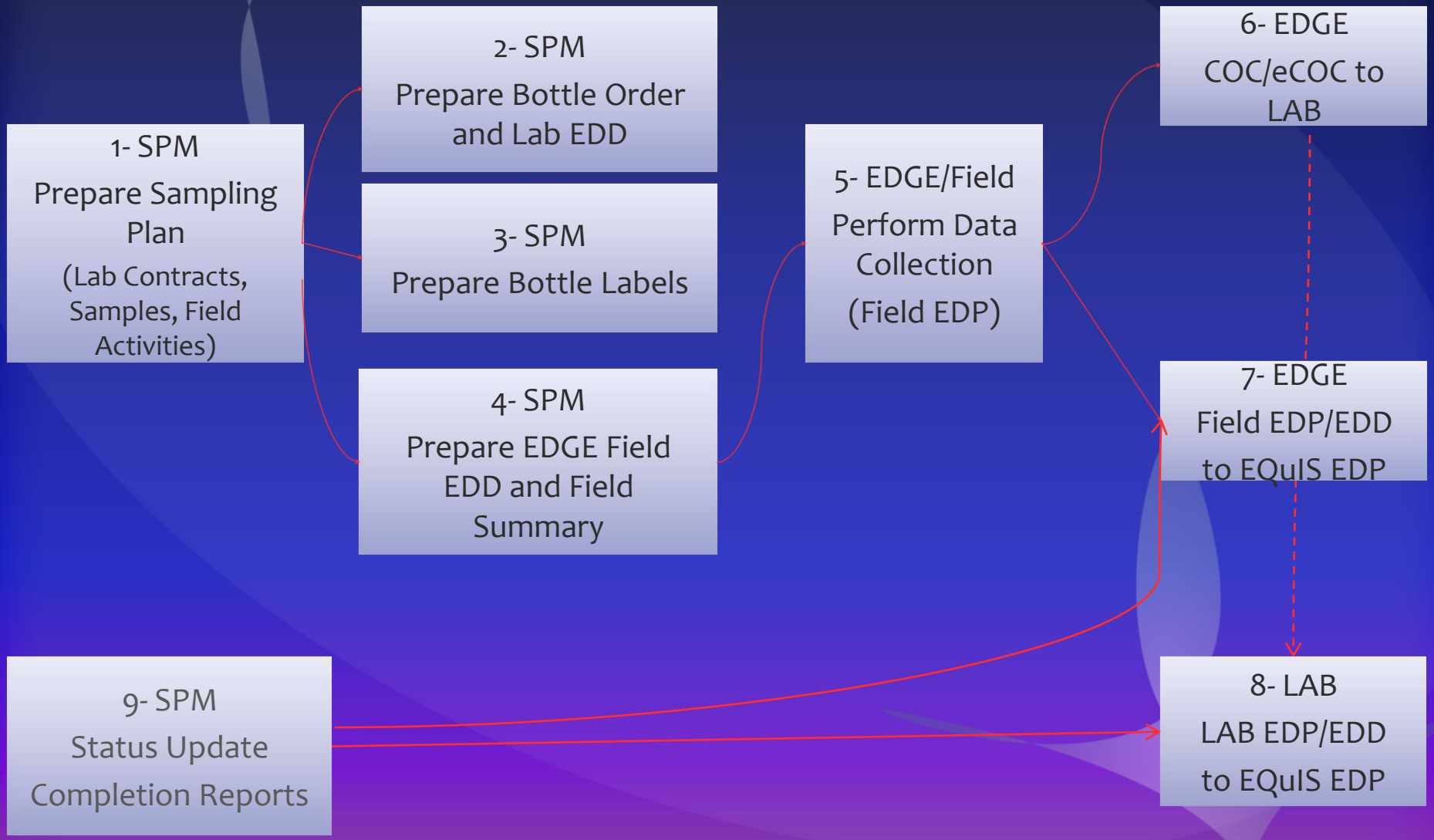
…two samples

Errors here results in the following:

- **-The COC needs to be corrected and resubmitted to the lab.**
- **-The lab needs to revise the lab report.**
- **-The database needs to be changed.**

How: SPM and EDGE?

Field Data Management Work Flow



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								EPA 8290 screen/ EPA 8290 conf.	EPA 8081m screen/ EPA 8270C conf.	EPA 6010B 6020	EPA 6010B 6020	EPA 6010B 6020	EPA 6010B 6020	EPA 6010B 6020	EPA Method 314.0	EPA Method 8270C (Full Suite)	EPA Method 8081A (Full Suite)	Number denotes sample depth	Number denotes sample depth	
1	1820 TAD 1821 TAS	RSAQ3	R1	4/6/2010/ 4/6/2010	1-2 RZ-B	Q3	3' FD 4' 5' 6' 7' 8' 9'	X X Hold Hold Hold Hold Hold		X Hold X Hold Hold Hold Hold						X Hold X Hold Hold Hold Hold		3'		
2	1820 TAD 1821 TAS	SA169	R1	4/6/2010/ 4/6/2010	1-2 RZ-B	Q3	3' 4' 5' 6' FD 7' 8' 9'	X X Hold Hold Hold Hold Hold								X Hold X Hold Hold Hold Hold		6 (SVOC)		
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4	1823 TAD	SA204	R1	4/6/2010/ 4/7/2010	1-2 RZ-B	Q4	3' 4' 5' 6' 7' 8' 9'			X Hold X Hold Hold Hold Hold										
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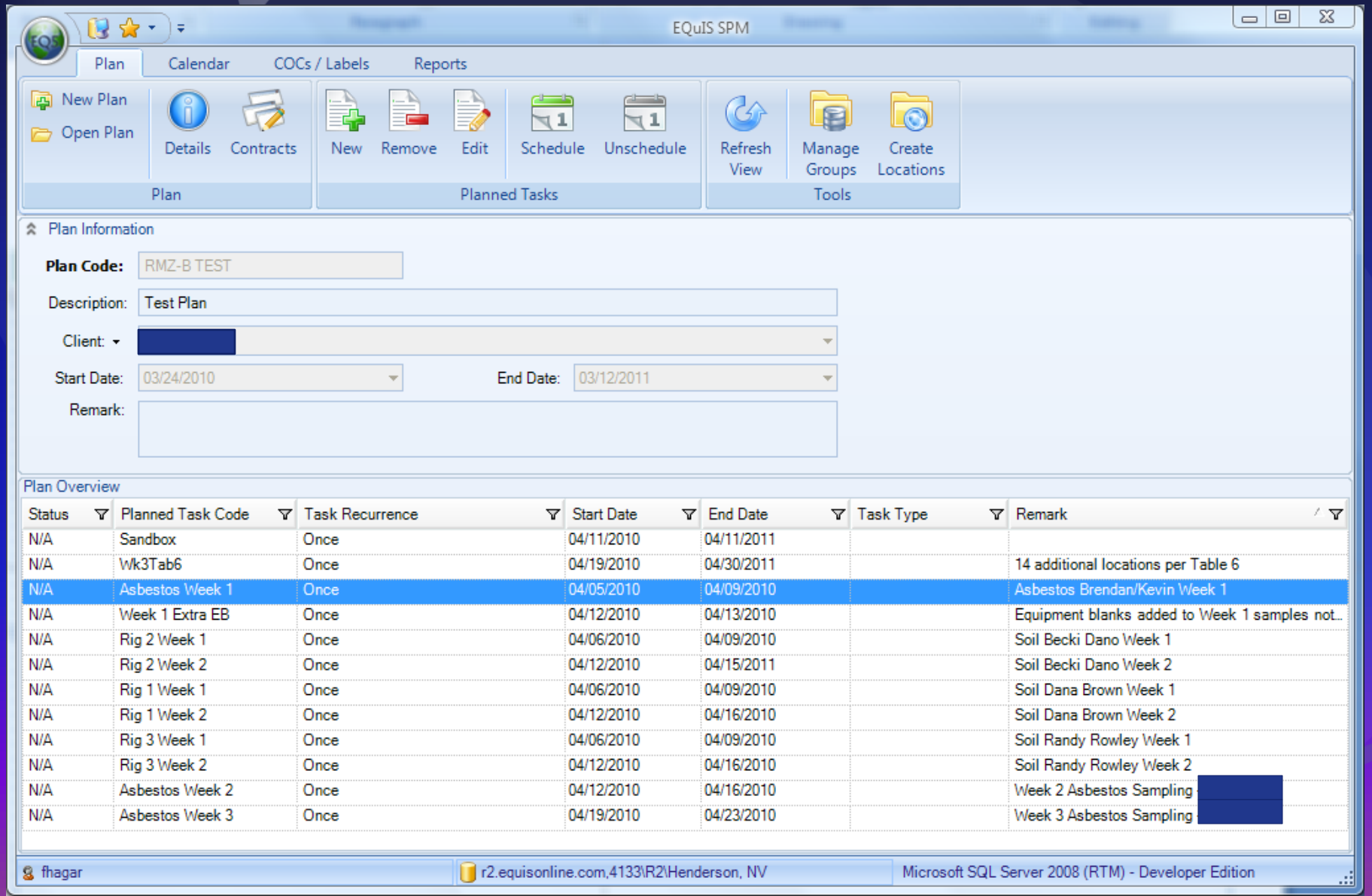
6	1822 TAS 1823 TAD	SA84	R1	4/7/2010 / 4/7/2010	1-2 RZ-B	Q4	3' FD 4' 5' 6' 7' 8' 9'	X X Hold Hold Hold Hold Hold	X X Hold Hold Hold Hold Hold	X Hold X Hold Hold Hold Hold						Hold Hold Hold Hold Hold Hold Hold		3		

SPM – Tasks


EQuIS SPM
Plan
Calendar
COCs / Labels
Reports
New Plan
Open Plan
Details
Contracts
New
Remove
Edit
Schedule
Unschedule
Refresh View
Manage Groups
Create Locations
Plan
Planned Tasks
Tools
Plan Information
Plan Code: RMZ-B TEST
Description: Test Plan
Client:
Start Date: 03/24/2010
End Date: 03/12/2011
Remark:
Plan Overview
Status | Planned Task Code | Task Recurrence | Start Date | End Date | Task Type | Remark
N/A | Sandbox | Once | 04/11/2010 | 04/11/2011 |
N/A | Wk3Tab6 | Once | 04/19/2010 | 04/30/2011 | 14 additional locations per Table 6
N/A | Asbestos Week 1 | Once | 04/05/2010 | 04/09/2010 | Asbestos Brendan/Kevin Week 1
N/A | Week 1 Extra EB | Once | 04/12/2010 | 04/13/2010 | Equipment blanks added to Week 1 samples not...
N/A | Rig 2 Week 1 | Once | 04/06/2010 | 04/09/2010 | Soil Becki Dano Week 1
N/A | Rig 2 Week 2 | Once | 04/12/2010 | 04/15/2011 | Soil Becki Dano Week 2
N/A | Rig 1 Week 1 | Once | 04/06/2010 | 04/09/2010 | Soil Dana Brown Week 1
N/A | Rig 1 Week 2 | Once | 04/12/2010 | 04/16/2010 | Soil Dana Brown Week 2
N/A | Rig 3 Week 1 | Once | 04/06/2010 | 04/09/2010 | Soil Randy Rowley Week 1
N/A | Rig 3 Week 2 | Once | 04/12/2010 | 04/16/2010 | Soil Randy Rowley Week 2
N/A | Asbestos Week 2 | Once | 04/12/2010 | 04/16/2010 | Week 2 Asbestos Sampling
N/A | Asbestos Week 3 | Once | 04/19/2010 | 04/23/2010 | Week 3 Asbestos Sampling
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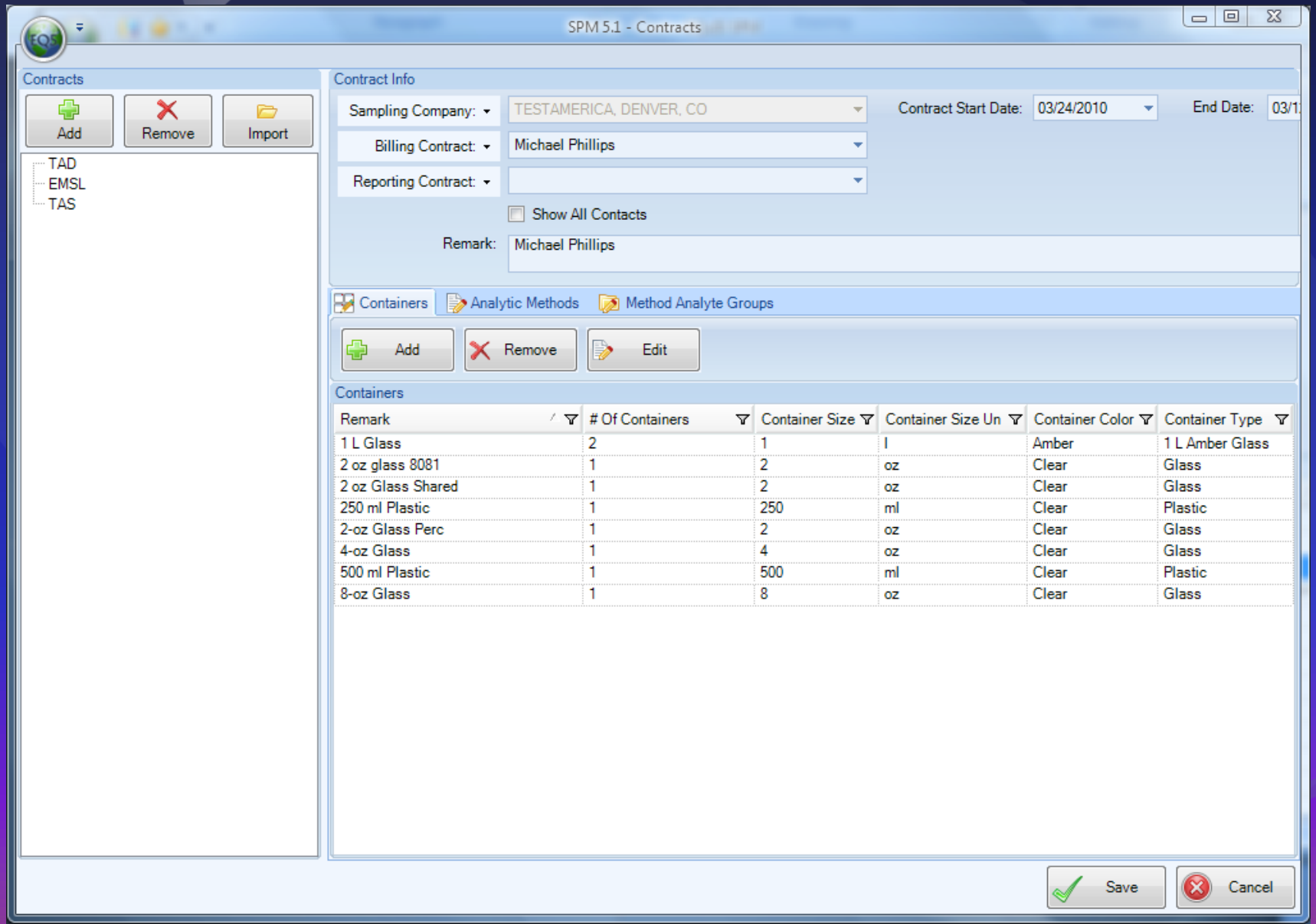
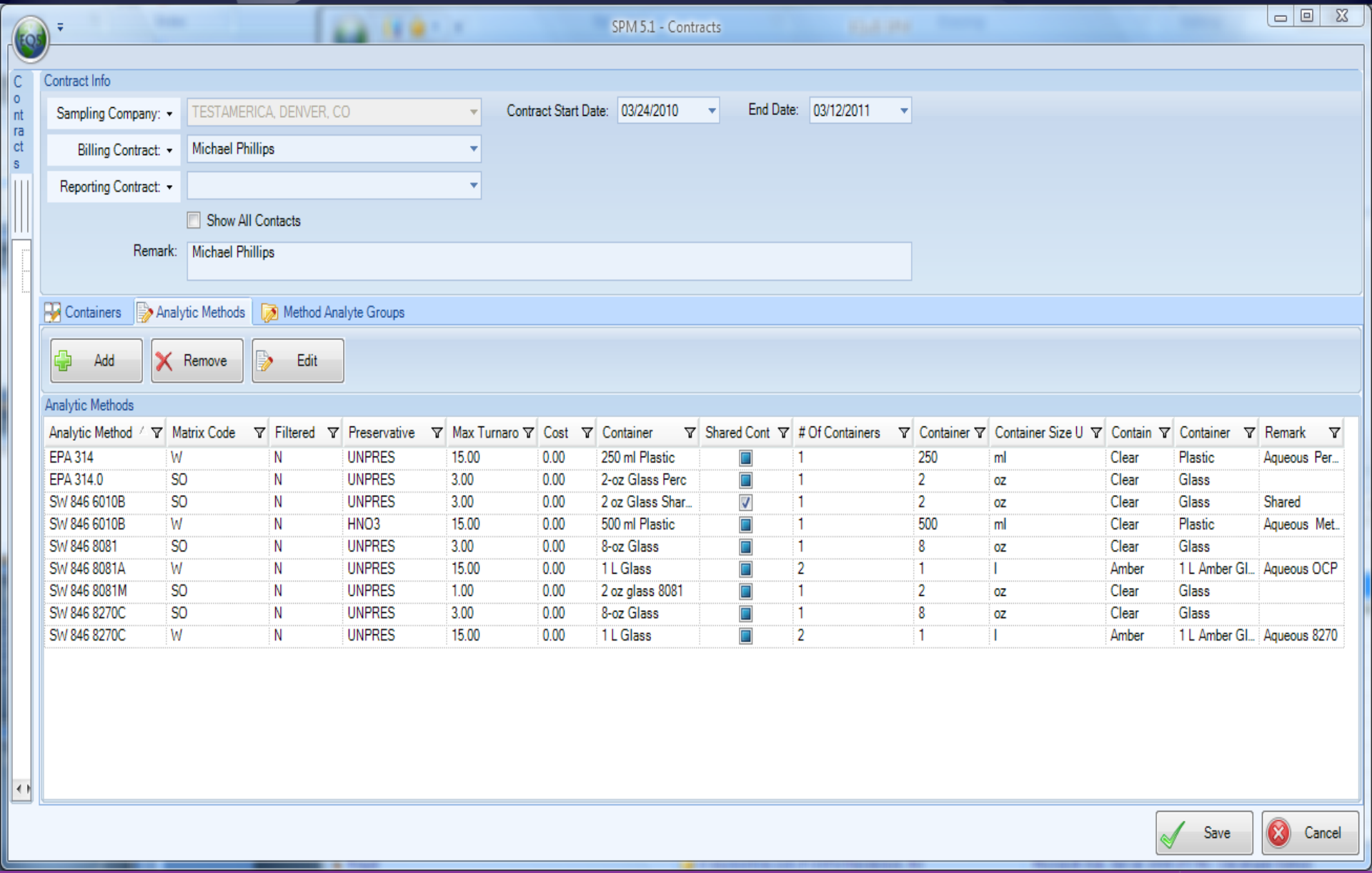
Microsoft SQL Server 2008 (RTM) - Developer Edition

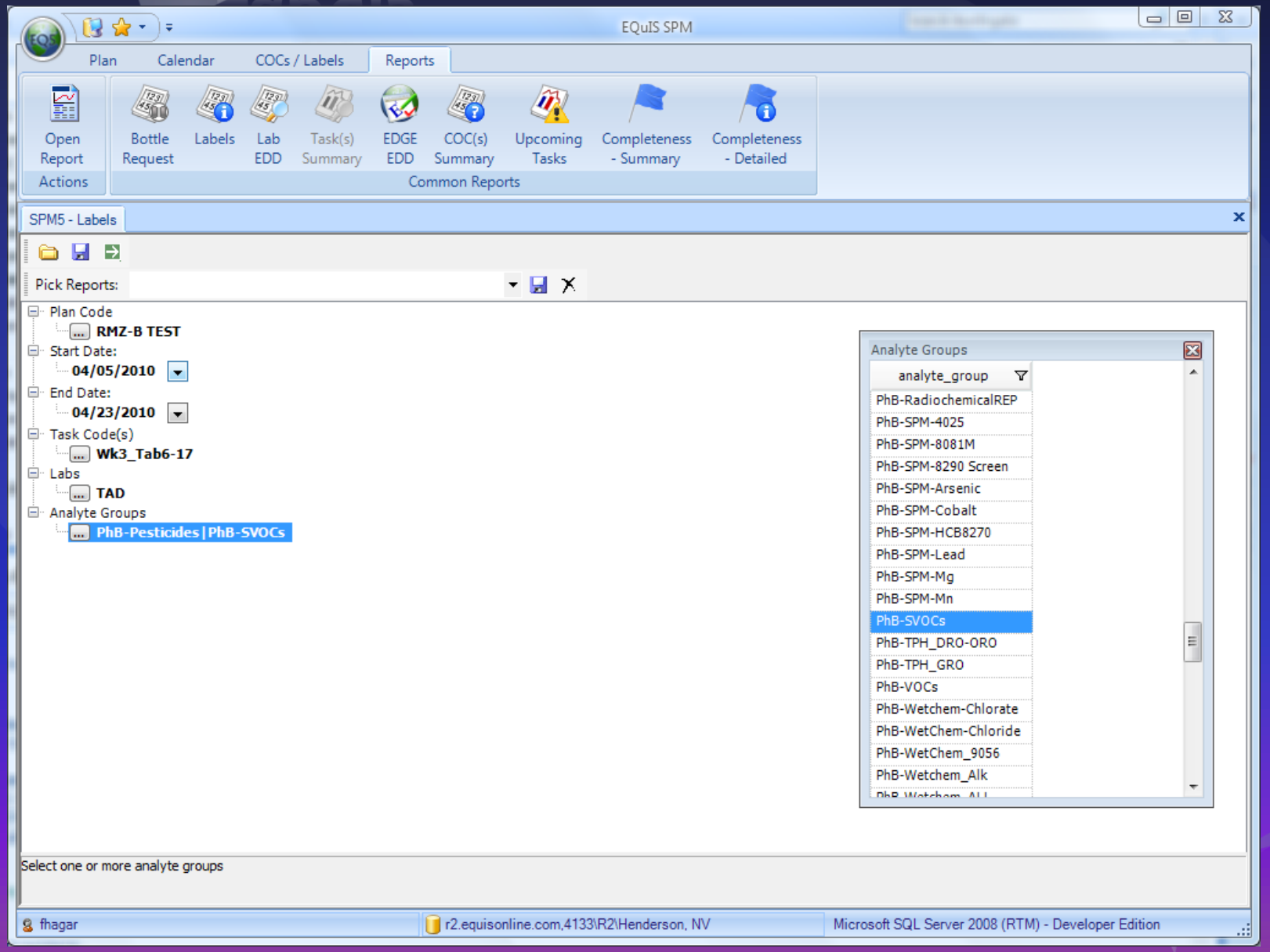
SPM – Containers



SPM – Analytic Methods



Labels


EQuIS SPM
Plan
Calendar
COCs / Labels
Reports
Open Report
Actions
Bottle Request
Labels
Lab EDD
Task(s) Summary
EDGE EDD
COC(s) Summary
Upcoming Tasks
Completeness - Summary
Completeness - Detailed
Common Reports
SPM5 - Labels
Pick Reports:
Plan Code
RMZ-B TEST
Start Date:
04/05/2010
End Date:
04/23/2010
Task Code(s)
Wk3_Tab6-17
Labs
TAD
Analyte Groups
PhB-Pesticides | PhB-SVOCs
Analyte Groups
analyte_group
PhB-RadiochemicalREP
PhB-SPM-4025
PhB-SPM-8081M
PhB-SPM-8290 Screen
PhB-SPM-Arsenic
PhB-SPM-Cobalt
PhB-SPM-HCB8270
PhB-SPM-Lead
PhB-SPM-Mg
PhB-SPM-Mn
PhB-SVOCs
PhB-TPH_DRO-ORO
PhB-TPH_GRO
PhB-VOCs
PhB-Wetchem-Chlorate
PhB-WetChem-Chloride
PhB-WetChem_9056
PhB-Wetchem_Alk
Select one or more analyte groups
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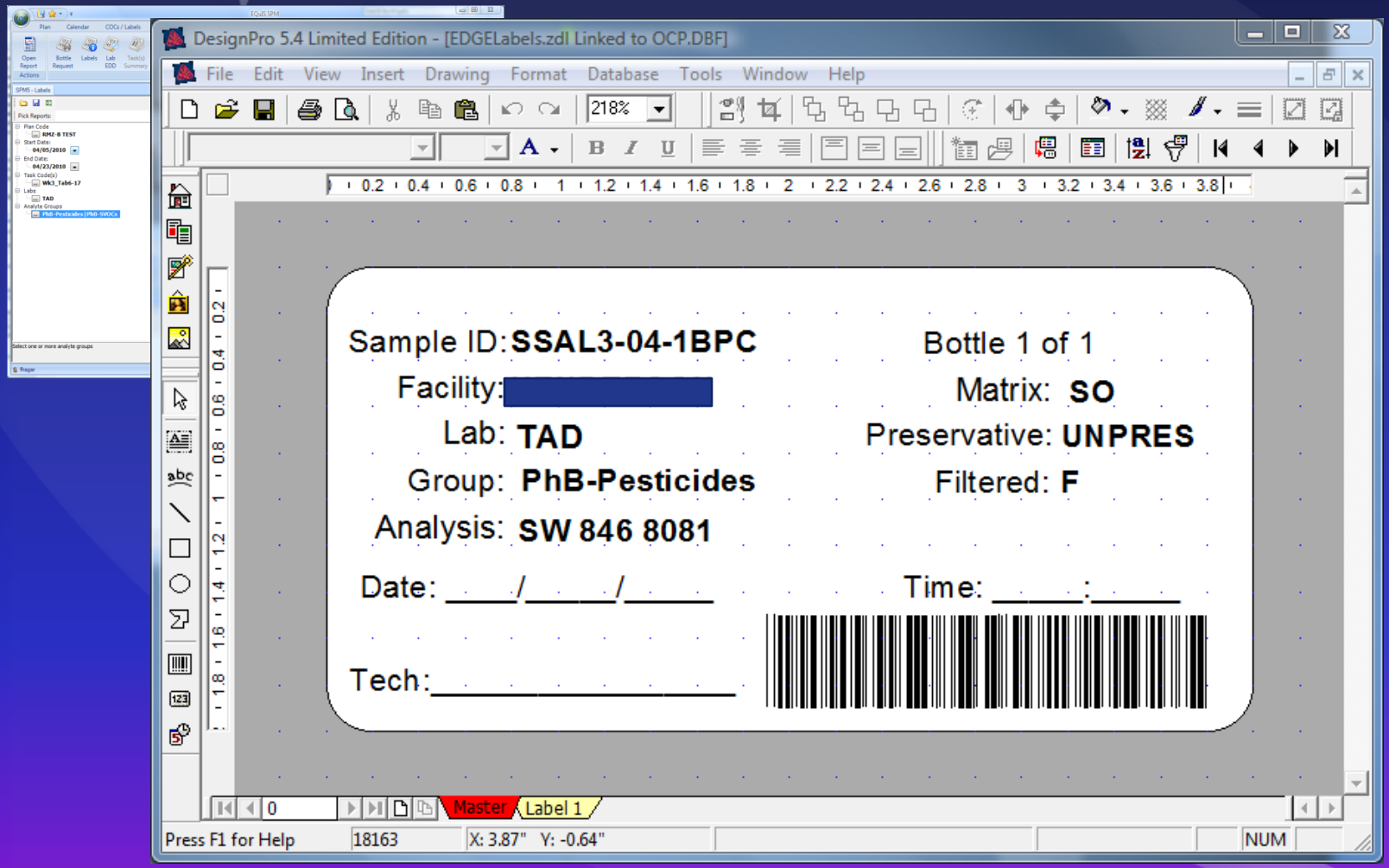
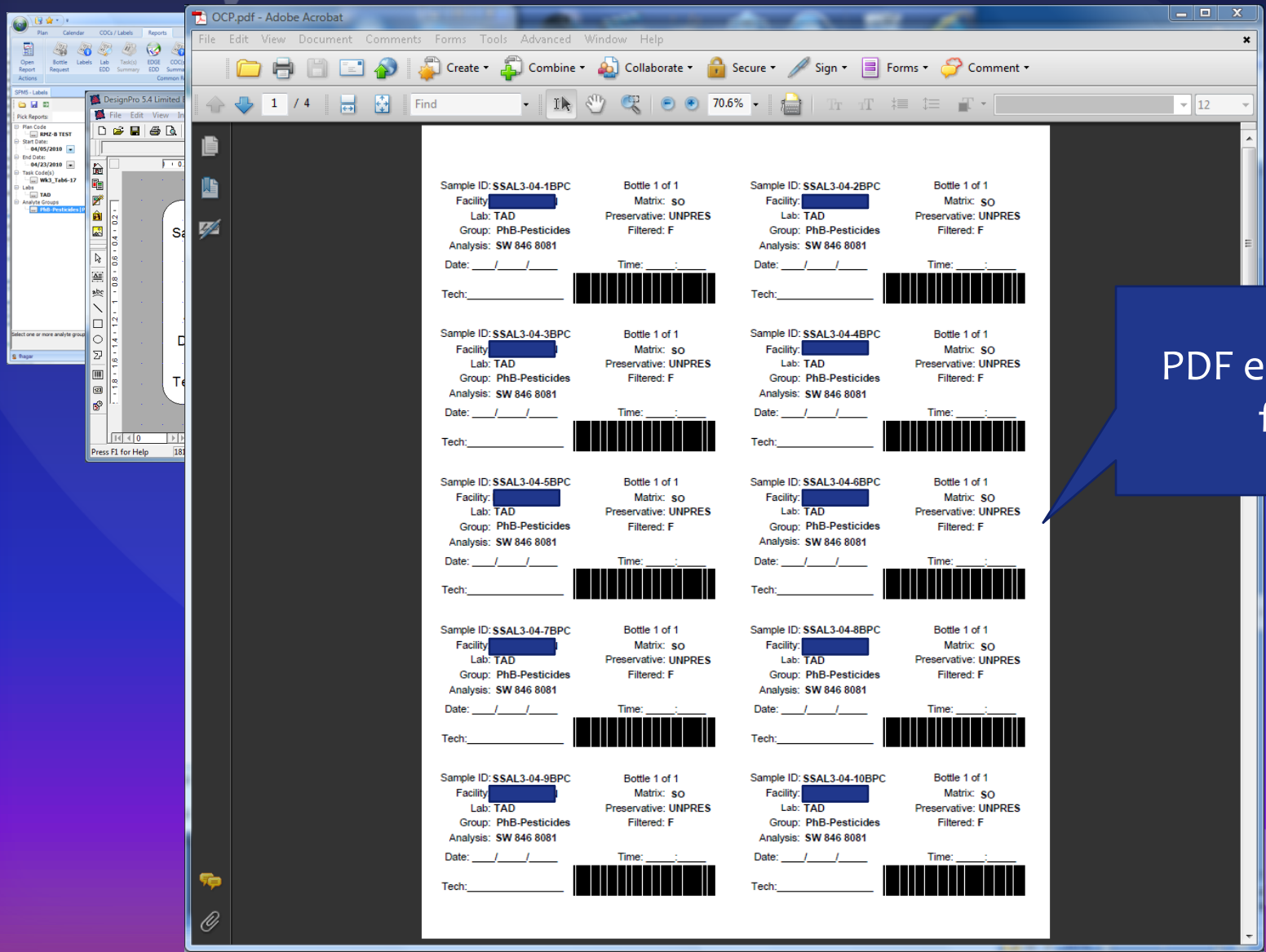
Labels – Avery Design Pro 5.4 Limited Edition



Labels – Avery Design Pro 5.4 Limited Edition



PDF emailed to field

EDGE Implementation

- Use of Netbooks – 4 field crews, 3 rigs, one asbestos sampling crew.
- Software roll out and updates
- Field EDD distribution
- How to get EDD returns for incorporation into EQuIS

EDGE Implementation

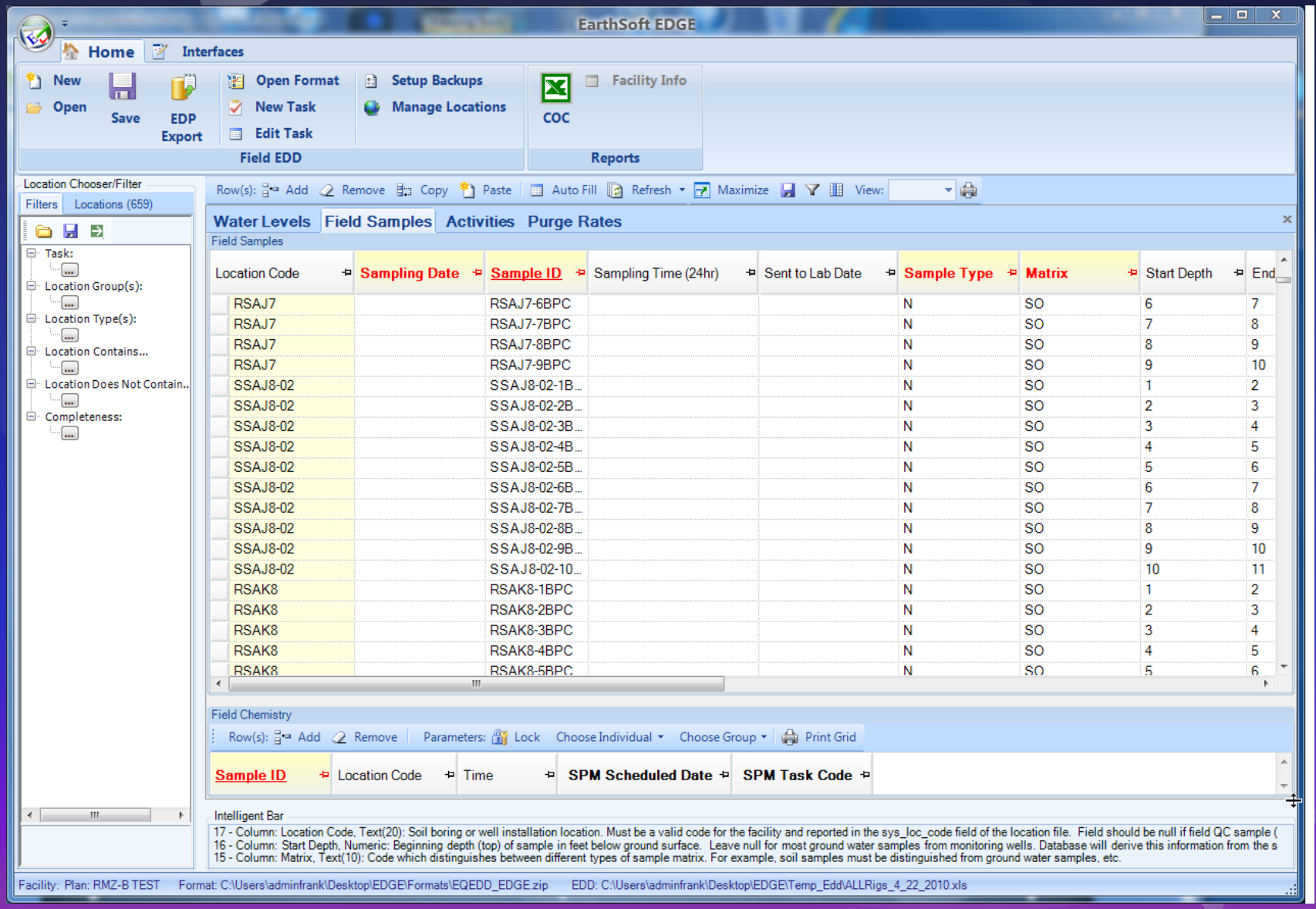
- Netbooks – Typical $350, 1GB memory, 10 to 12 - inch screens, Atom processor, 160 GB hard drive, Windows 7

Pros	Cons
Low Price – A lot of netbooks can go under the wheels for price of a ruggedized laptop	**Small screen**, direct sunlight impaired
Low Maintenance – Long Battery Life (10 hrs)	**Dainty** scared the ham-fisted, old-time rig geologists
Easily Transportable	
Fully Capable (2 ports, wireless internet)	

EDGE Implementation

- Software roll out and updates
  - Installs through a zipped executable emailed or FTP'd to field (16 mb Zip File)
  - Installs with no administrator privilege required
  - Installs to desktop so that directory structure for users is accessible
  - Updates to RVF may be necessary. Send RVF to be inserted into user/EDGE/FORMATS/EQEDD_EDGE.ZIP
  - COC Templates emailed and installed in user/EDGE/FORMATS/EQEDD_EDGE.ZIP

EDGE In the Field



SPM Completeness Report

Facility Code:	[redacted]
Plan Code:	PCS Sampling - Asbestos

Field Samples

	Scheduled				Unscheduled		
	Samples		Locations		Samples	Locations	
Task	Completed (%)	Count	Completed (%)	Count	Count	Count	
PC-ASB-15	85	36/42	85	24/28	2	1	
PC-ASB-16	100	44/44	100	23/23	2	1	
PC-ASB-17	84	32/38	84	16/19	0	0	
PC-ASB-18	100	8/8	100	4/4	0	0	
PC-ASB-19	0	0/9	0	0/4	0	0	
	124/145		**69/80**				TOTALS

Missing Samples	*Samples*	*Locations*	*Comment*
PC-ASB-15	SA04	SA04	No Soil for 150'
	SA05	SA05	No Soil - See SA136 for closest results
	SSAR6-01-0.00BPC	SSAR6-01	No soil - asphalt and debris
	SSAR6-01-0.33BPC	SSAR6-01	No soil - asphalt and debris
	SSAR6-02-0.00BPC	SSAR6-02	No soil - asphalt and debris
	SSAR6-02-0.33BPC	SSAR6-02	No soil - asphalt and debris
PC-ASB-16	**Complete**		
PC-ASB-17	SA19-0.33BPC	SA19	No soil within 200ft see SSAL5-03 for results
	SA19-0.33BPC_FD	SA19	No soil within 200ft see SSAL5-03 for results
	SSAL5-01-0.00BPC	SSAL5-01	No soil see SSAL5-03 for results
	SSAL5-01-0.33BPC	SSAL5-01	No soil see SSAL5-03 for results
	SSAL5-02-0.00BPC	SSAL5-02	No soil see SSAL5-03 for results
	SSAL5-02-0.33BPC	SSAL5-02	No soil see SSAL5-03 for results
PC-ASB-18	**Complete**		
PC-ASB-19	SSAK5-03-0.00BPC	SSAK5-03	Week of 5/10
	SSAK5-03-0.33BPC	SSAK5-03	Week of 5/10
	SSAK5-04-0.00BPC	SSAK5-04	Week of 5/10
	SSAK5-04-0.00BPC_FD	SSAK5-04	Week of 5/10
	SSAK5-04-0.33BPC	SSAK5-04	Week of 5/10
	SSAL5-06-0.00BPC	SSAL5-06	Week of 5/10
	SSAL5-06-0.33BPC	SSAL5-06	Week of 5/10
	SSAN5-02-0.00BPC	SSAN5-02	Week of 5/10
	SSAN5-02-0.33BPC	SSAN5-02	Week of 5/10

Note 1: The number within the task name (PC-ASB-15) refers to the week that it was scheduled for sampling.
Note 2: The unscheduled samples were omiited from EQuIS SPM but were included in the sample plan and therefore were sampled
Note 3: Totals include the scheduled and unscheduled samples.

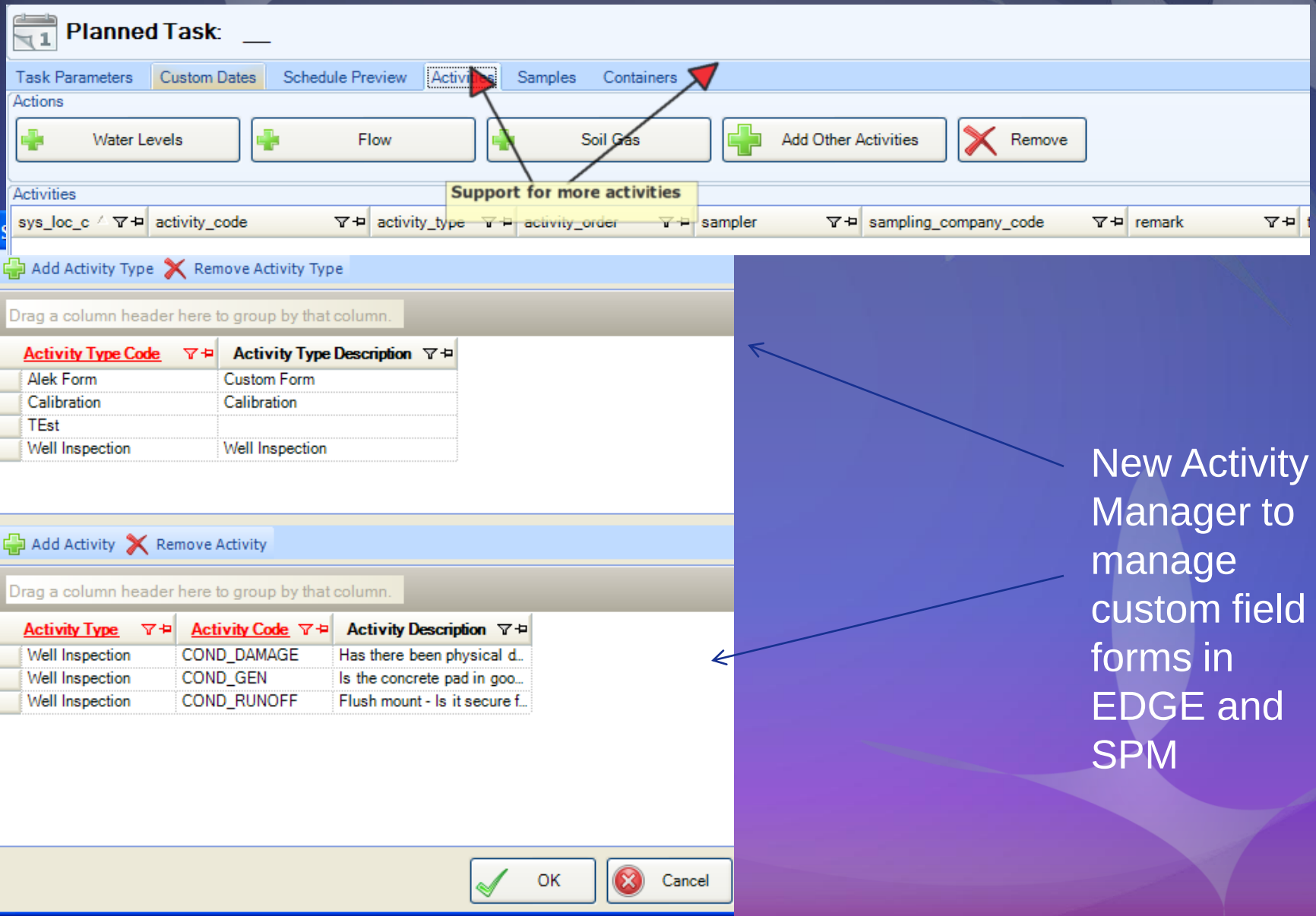
Success: Yes

- Sampling for this phase completed yesterday
- 225 COCs, 3700 labels/samples
- Manpower
  - 1 EQuIS/SPM DBA (full time)
  - 1 Data Technician (50 %)
  - 1 Field Data Technician (full time +)
  - 1 Chemist (40 %)
  - 1 Project Manager
- 65 % of the lab data has been returned, loaded and sent to validation

Success: No

- Field use of EDGE not accepted and fully incorporated into the program by field personnel
- EDGE did become a valuable office tool since not all field crews embraced it
- Field QC data was labor intensive to incorporate into program
- Software improvements being made as we speak
  - SPM V5.0 is in pre-release

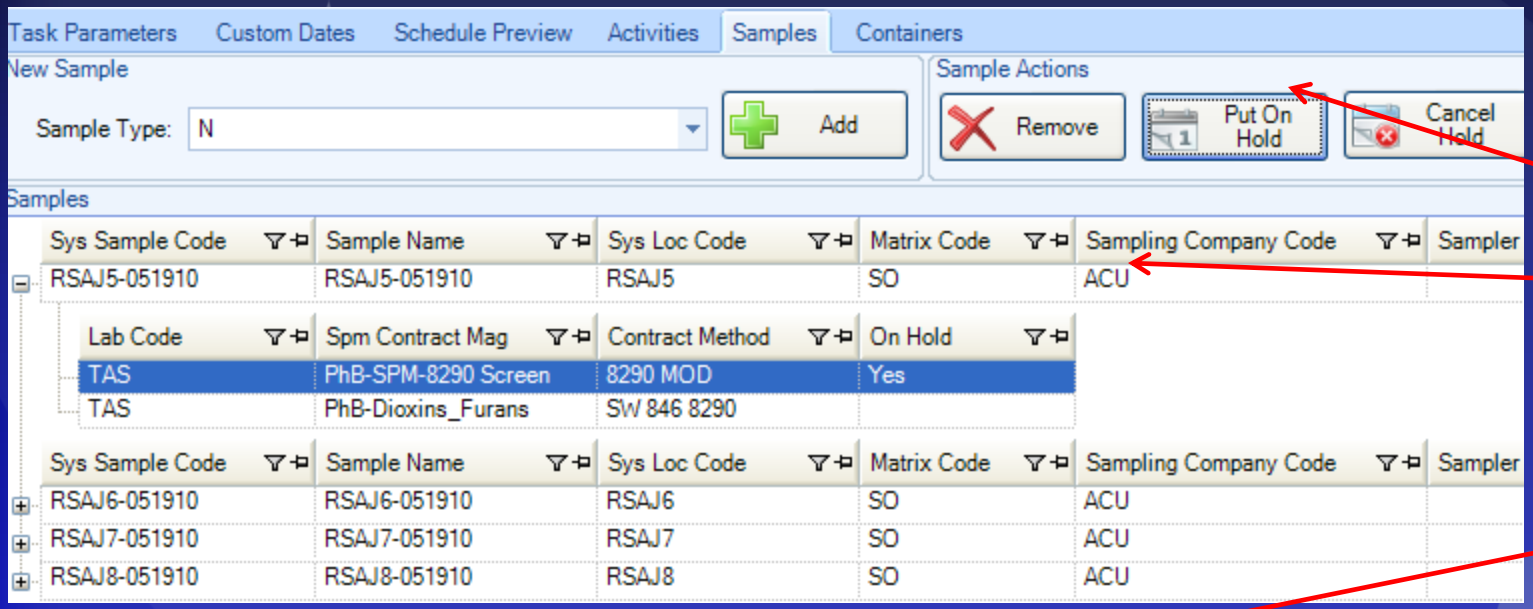
Activities



New Activity Manager to manage custom field forms in EDGE and SPM

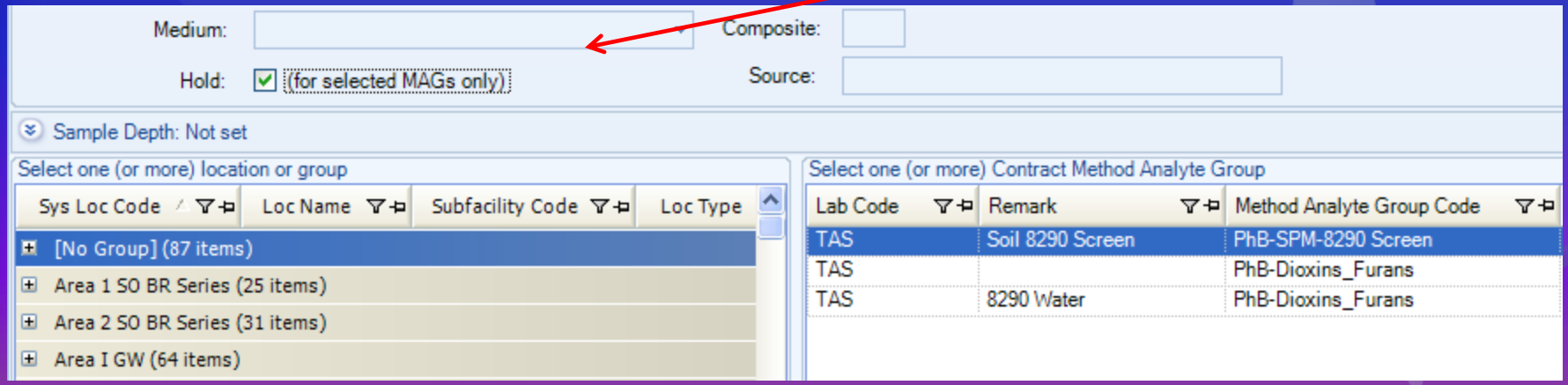
Samples on Hold

(During Planning)



It can be done from the samples tab

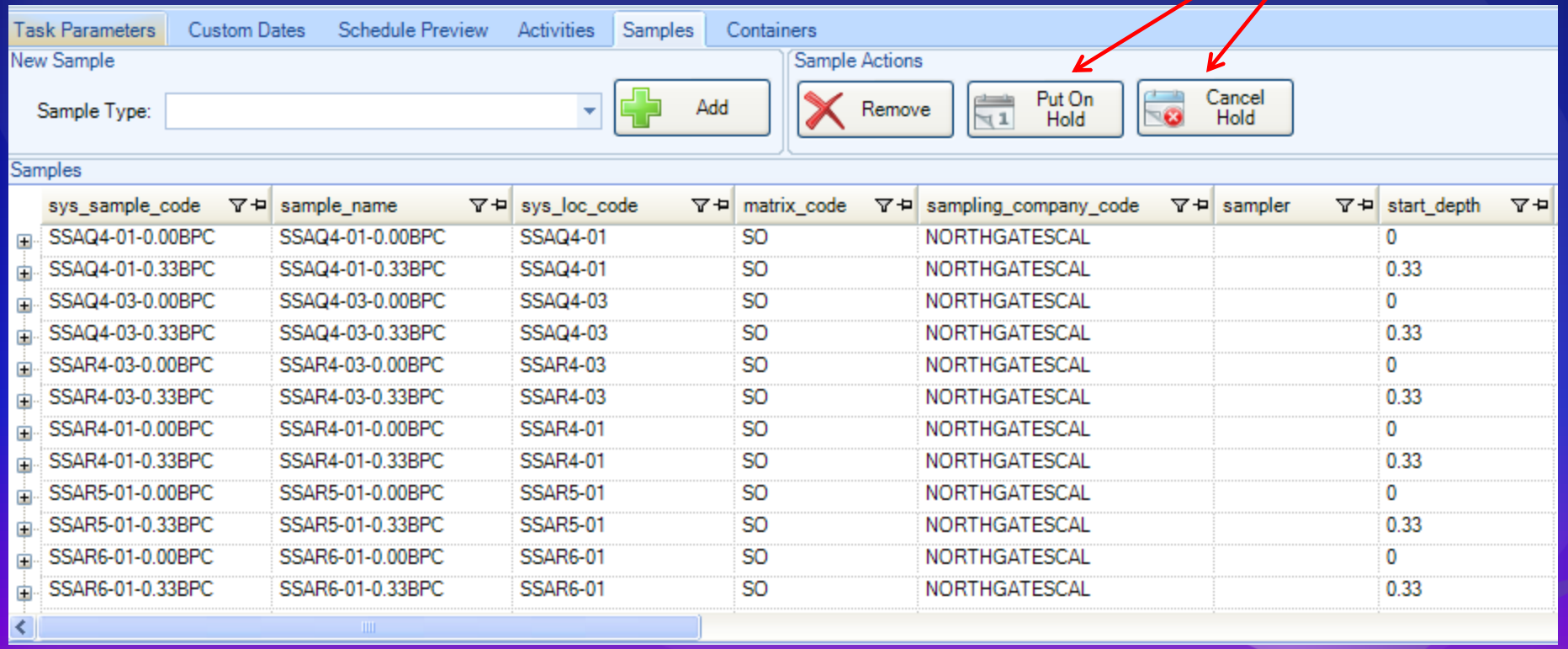
Or during samples setup



Samples on Hold

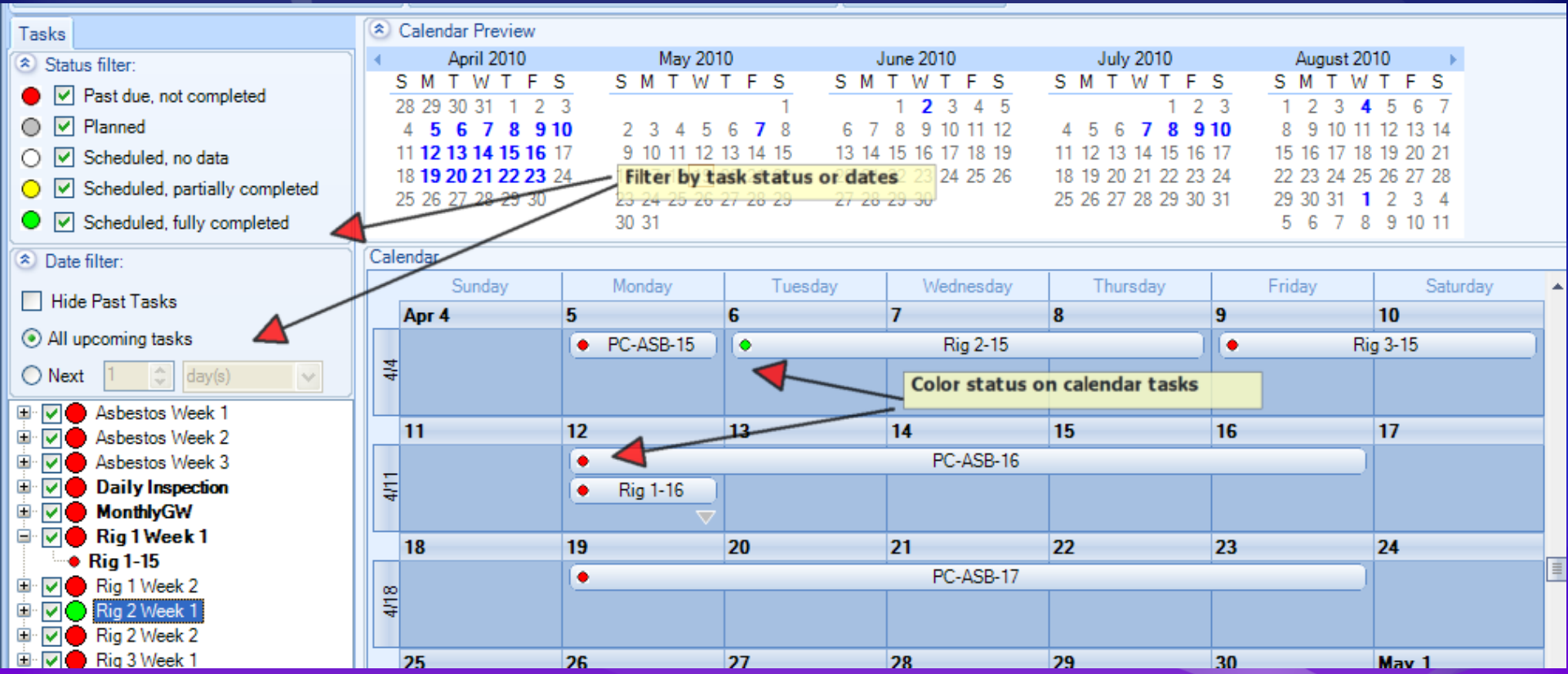
(After Scheduling)

Mange hold status
for Scheduled tasks.



sys_sample_code	sample_name	sys_loc_code	matrix_code	sampling_company_code	sampler	start_depth
SSAQ4-01-0.00BPC	SSAQ4-01-0.00BPC	SSAQ4-01	SO	NORTHGATESCAL		0
SSAQ4-01-0.33BPC	SSAQ4-01-0.33BPC	SSAQ4-01	SO	NORTHGATESCAL		0.33
SSAQ4-03-0.00BPC	SSAQ4-03-0.00BPC	SSAQ4-03	SO	NORTHGATESCAL		0
SSAQ4-03-0.33BPC	SSAQ4-03-0.33BPC	SSAQ4-03	SO	NORTHGATESCAL		0.33
SSAR4-03-0.00BPC	SSAR4-03-0.00BPC	SSAR4-03	SO	NORTHGATESCAL		0
SSAR4-03-0.33BPC	SSAR4-03-0.33BPC	SSAR4-03	SO	NORTHGATESCAL		0.33
SSAR4-01-0.00BPC	SSAR4-01-0.00BPC	SSAR4-01	SO	NORTHGATESCAL		0
SSAR4-01-0.33BPC	SSAR4-01-0.33BPC	SSAR4-01	SO	NORTHGATESCAL		0.33
SSAR5-01-0.00BPC	SSAR5-01-0.00BPC	SSAR5-01	SO	NORTHGATESCAL		0
SSAR5-01-0.33BPC	SSAR5-01-0.33BPC	SSAR5-01	SO	NORTHGATESCAL		0.33
SSAR6-01-0.00BPC	SSAR6-01-0.00BPC	SSAR6-01	SO	NORTHGATESCAL		0
SSAR6-01-0.33BPC	SSAR6-01-0.33BPC	SSAR6-01	SO	NORTHGATESCAL		0.33

Calendar
(more features and filtering added)



Other Changes

- Ability to change sys_sample_code for scheduled tasks (special cases only: blanks and QA/QC samples)
- Improved performance issues. Added a refresh rt_tables button to main menu
- Conflict detection with highlighted duplicates tasks or samples similar to EDP (sys_sample_codes and task_codes have to be unique across a facility).
- Now SPM fully support both SQL and Oracle databases.

Questions???