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March 15, 2011

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J-6

Mr. Dennis R. Lawyer
Health Physicist
Division of Nuclear Materials Safety
US Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Re: NRC License No. 06-00221-08, Docket Number: 030-03759

Subject: Decommissioning of Bethany, Connecticut Site Only

Dear Mr. Lawyer:

This is in response to a written request for additional information from you dated February 08, 2011. Based on discussion during a telephone conversation with you on March 08, 2011, additional information concerning the Bethany decommissioning report is enclosed for your review and approval. We would appreciate your prompt review so that the Bethany site can be removed from the NRC license as soon as possible and it will be available for unrestricted use.

Please note that Chemtura hired Radiation Safety Associates (RSA), Inc. as a consultant for this project and they prepared this report. If you have any questions or issues concerning the report, please directly contact Mr. K. Paul Steinmeyer, RSA (Tel: 860-228-0487 and E-mail: kpstein@radpro.com). If you have any other questions, please contact me.

Sincerely,

JK Nag

Jayanta K. Nag
Radiation Safety Officer
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Chemtura Bethany Site Decommissioning

Response to NRC's Request for Additional Information Dated February 8, 2011

K. Paul Steinmeyer, RRPT
Radiation Safety Associates, Inc.
March 15, 2011

Introduction

This is in response to a written request for additional information from NRC (Dennis Lawyer) dated February 8, 2011.

Question 1: Soil Sampling in the Old Corral

In 1980, Chemtura submitted a license amendment to NRC requesting the free-release of an outdoor area referred to as the Corral[1] to make way for construction of Greenhouse #4 and an extension of the Headhouse containing a Potting Shed (including a Weigh Room and a Spray Lab). NRC granted this amendment based on soil sample results that met the acceptance criteria in place in 1980. In July 1980 Chemtura finalized the construction plans for this addition.

The new Greenhouse #4 was constructed *on top of* the spring-fed irrigation pond located just south of the Corral, and the Potting Shed was constructed on the 680 ft^2 Corral. See Attachments A-1 and A-2. The lower level of Greenhouse #4 is a now the reservoir where both the irrigation pump and fire pump now take their suction.

Just to the north of the new Greenhouse #4 is the new 1,520ft^2 Potting Shed addition. As shown in Attachment A-2, this addition is 31′ 6″ north to south, and 49′ 6″ east to west. The old corral, shown in Attachment A-3 to be located 4' to the north of the irrigation pond, measured 23′ 10″ north to south, and 31′ 11″ east to west, with one corner (~90ft^2) cut off. It is therefore clear that the entire area of the Old Corral is now covered by the slab-on-grade Potting Shed. Attachment A-4 shows the Irrigation Pond and the Old Corral superimposed on the plans for Greenhouse #4 and the New Potting Shed.

Slab-on-grade construction involves excavating and pouring concrete footings (minimum depth[2] in Connecticut is 42"), then pouring concrete foundation walls on the footings that will support the floor slab. A foot or more of soil is removed from within the foundation walls and is replaced by gravel or crushed stone. The concrete slab is then poured onto this underlayment. In this particular case, the soil of the corral (being very close to the spring-fed irrigation pond) was probably quite wet, so more soil than usual is likely to have had to be removed prior to adding crushed stone and pouring the floor. The drawing below shows typical slab-on-grade construction.

[1] See Attachment A-3, approximately 680 ft^2.
[2] From Alvin R. Hill, Building Official, Town of Columbia, CT. State building code section 1805.2.1.

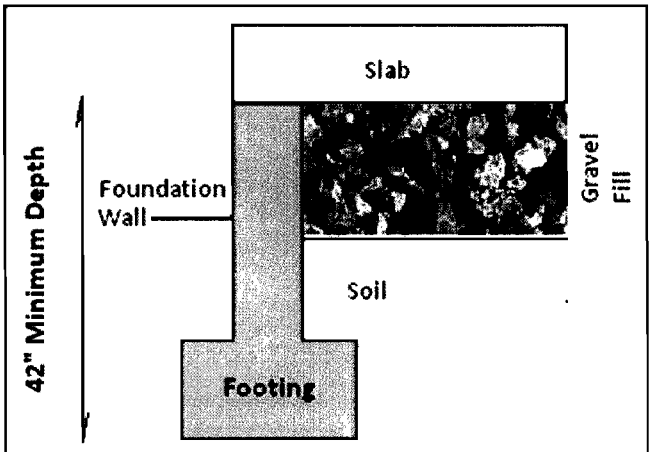


Figure 1. Typical Slab-On-Grade Construction
(Not to scale.)

Conclusions

1. The location of the Old Corral has now been firmly established as being under the slab of the Potting Shed constructed in 1980-81.
2. One or more feet of soil from the Old Corral was removed and disposed during the 1980-81 construction of Greenhouse #4 and the Potting Shed.
3. Any soil currently remaining under the Potting Shed slab would not be representative of the surface soil present in the Old Corral in 1980.
4. Sampling this sub-slab soil cannot be cost justified (ALARA) since no relevant information would be obtained.

Therefore Chemtura believes that an attempt to sample soil under the existing concrete slab is unwarranted.

Question 2: The Peach Tree Area

All the post-remediation data from the Peach Tree area (52 scoping and final status samples), with the exception of FSP-11, are well below the DCGL for C-14. Chemtura believes that sample FSP-11 is not representative of the soil in the Peach Tree area, but rather a statistical outlier. When the results of this single sample became known, Chemtura revised its sampling plan and submitted it to NRC for approval to allow remediation of the small volume of soil around this sample location (2′x2′x2′). Re-sampling the soil in this newly remediated area indicated that there was no significant contamination remaining at that location.

Chemtura recognizes that since the area of the Peach Tree is 425 ft^2, that each of the 15 final status survey samples represented approximately 28 ft^2 (2.6m). A relatively small soil volume was remediated because there had been so many samples taken from this area, all showing

acceptable levels of residual contamination. A professional judgment was made to remediate a smaller volume of soil, based on the evidence at hand.

Statistical Test

At NRC's request, Chemtura utilized MARSSIM section 8.5.2 *Interpretation of Statistical Test Results* and the RESRAD program to solve the inequality 8-2 included in that section.

Given the inequality

$$\frac{\delta}{DCGL_W} + \frac{(avg.\,conc.\,in\,elevated\,area - \delta)}{(area\,factor\,for\,elevated\,area)\,(DCGL_W)} < 1$$

Given:

δ = average of all final status survey data points, not including hot sample = 1.4pCi/g

$\bar{x}$ = avg. conc. in elevated areas = mean of all data points that exceed the DCGL = FSP-11 = 239pCi/g

Area factor (from RESRAD) = 1556 for the 2.6m^2 that is represented by FSP-11.

$$\frac{1.4\text{pCi/g}}{12\text{pCi/g}} + \frac{(239\text{pCi/g} - 1.4\text{pCi/g})}{(1556)\,(12\text{pCi/g})} = 0.1167 + 0.0127 = 0.13 \text{ which is } < 1$$

Utilizing the state limit, the calculation is as follows:

$$\frac{1.4\text{pCi/g}}{9.12\text{pCi/g}} + \frac{(239\text{pCi/g} - 1.4\text{pCi/g})}{(1556)\,(9.12\text{pCi/g})} = 0.1535 + 0. = 0.0167 = 0.17 \text{ which is } < 1$$

Conclusion

This calculation shows that even iff the single hot spot were still present, the Peach Tree area would still be within the free-release criteria specified by NRC and the State of Connecticut.

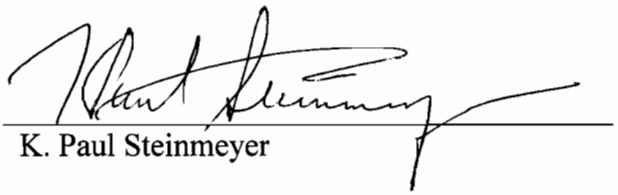
Additional Information

MARSSIM Appendix D.6 "Specify Limits on Decision Errors" states (in part):

> "The purpose of this section is to specify the decision maker's limits on decision errors, which are used to establish performance goals for the data collection design. The goal of the planning team is to develop a survey design that reduces the chance of making a decision error.
> While the possibility of a decision error can never be totally eliminated, it can be controlled. To control the possibility of making decision errors, the planning team attempts to control uncertainty in the survey results caused by sampling design error and measurement error. Sampling design error may be controlled by ***collecting a large number of samples. Using more precise measurement techniques or field duplicate analyses*** can reduce measurement error.

In its scoping survey design, Chemtura collected a large number of post-remediation samples (52) in a very small survey unit (374 ft^2). During the Final Status Survey, the MARSSIM-mandated random start point, diamond distribution pattern was utilized. An off-site lab[3] was chosen to analyze all soil samples. The MDA of their analysis was approximately 0.7 pCi/g (~5.8% of the federal limit, ~7.7% of the state limit). Also in the Peach Tree area, two (2) duplicate samples were analyzed as suggested by MARSSIM D.6.

In summary, Chemtura has collected a large number of post-remediation samples, has used an analysis method that was very precise, and has analyzed duplicate samples, all in an effort to reduce the chances of making a decision error. When a single high sample (out of the 52 collected) was found, Chemtura decided to remediate the area immediately around this sample location (FSP-11) and to then re-sample this area. The two post-remediation samples and the duplicate were less than the MDA for the method (~0.7 pCi/g). This direct approach was used in lieu of trying to use statistical models to show compliance, although the statistical test confirms that Chemtura meets the free-release criteria. Chemtura has a high degree of certainty that the concentration of C-14 in the soil in the Peach Tree area is well within the federal and state limits for free release.



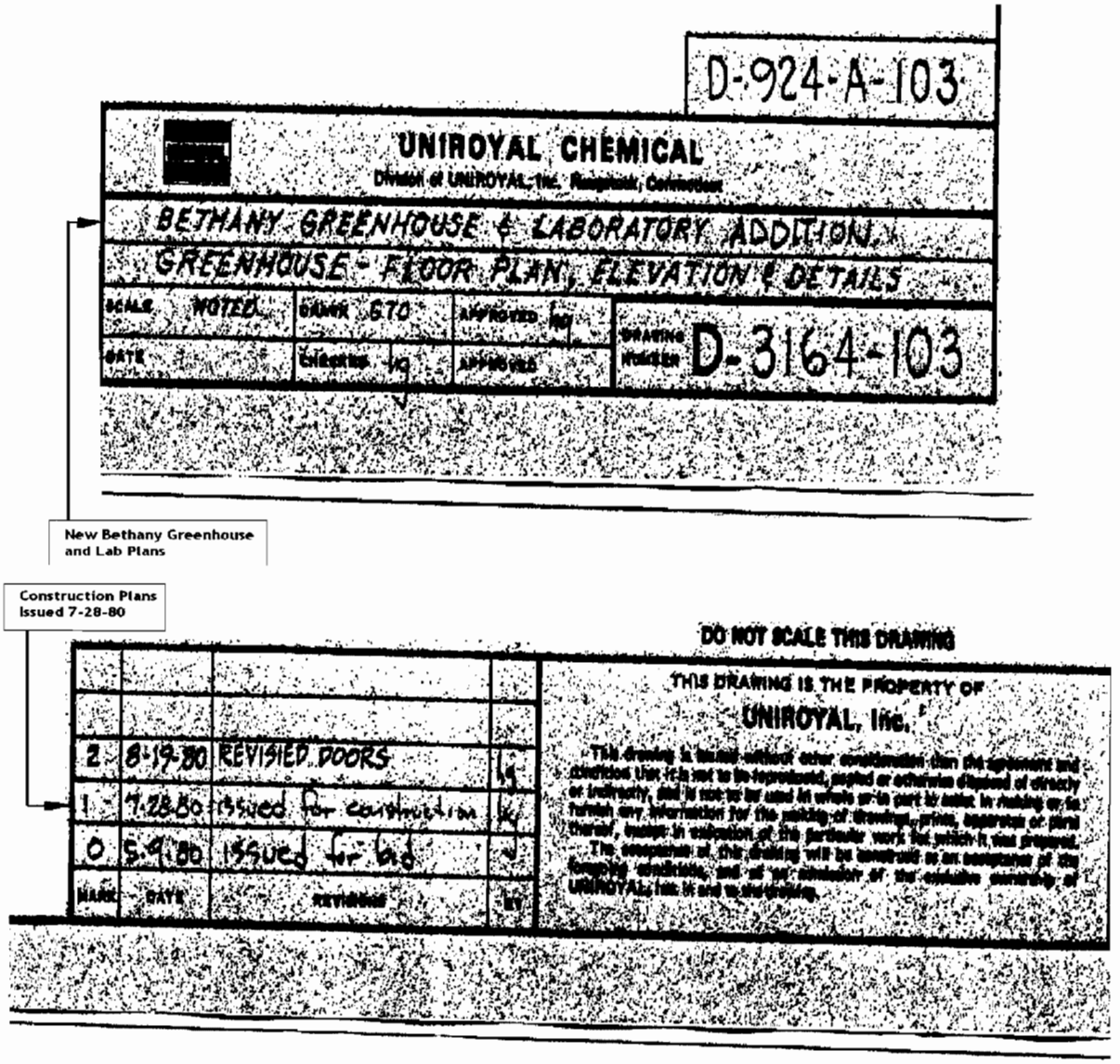
K. Paul Steinmeyer

March 15, 2011

[3] Eberline Services, Oak Ridge, TN.

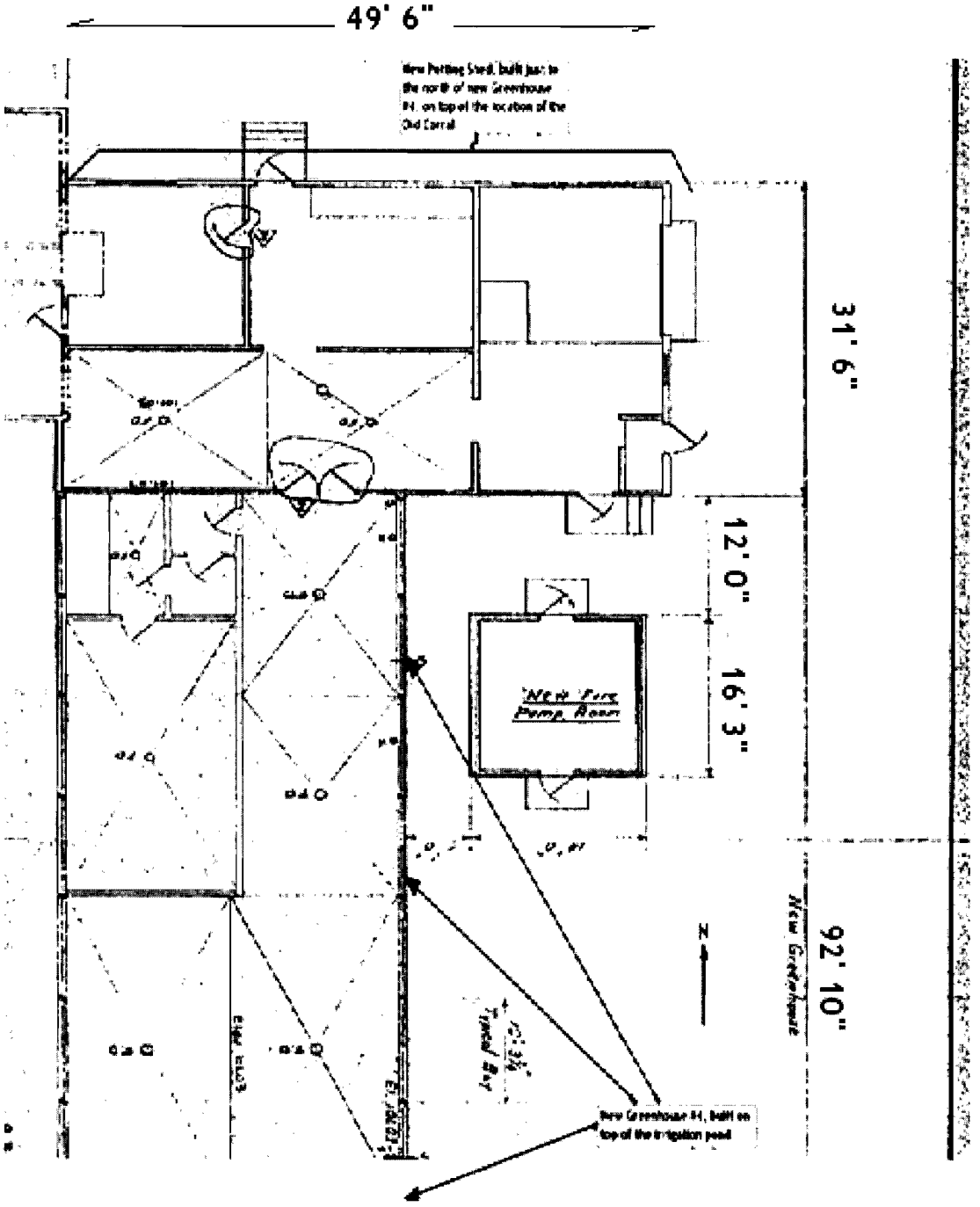
Attachment A-1

Information from building plans for a new greenhouse (#4) at the Chemtura Bethany site (formerly Uniroyal Chemical) 1980.



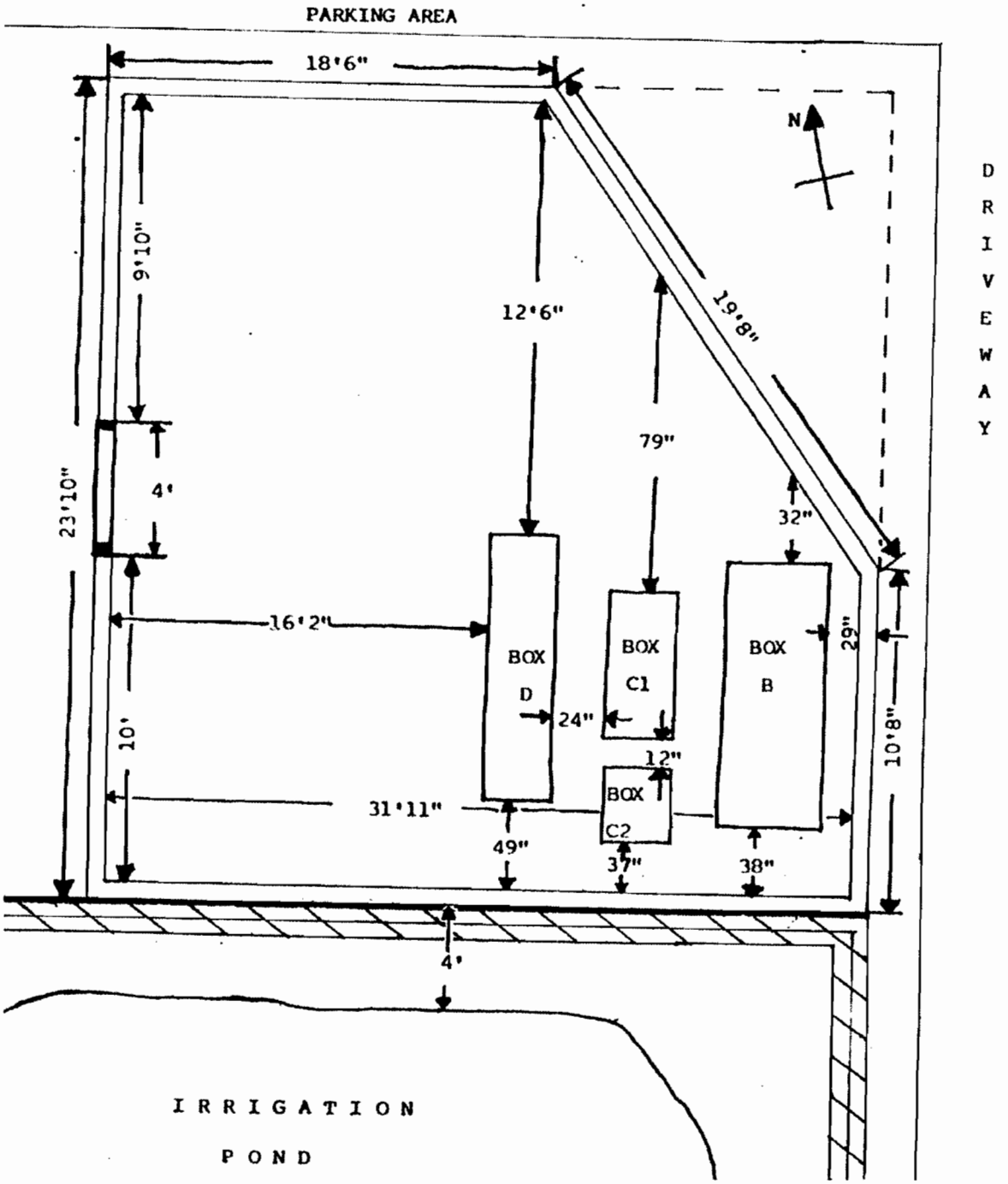
Attachment A-2

Building plans for a new greenhouse (#4) and Potting Shed at the Chemtura Bethany site (formerly Uniroyal Chemical) 1980.



Attachment A-3

From the Drawing of the Old Corral and Irrigation Pond, Included with the 1980 Request for License Amendment and Decommissioning of the Old Corral. Note the Relative Locations of the Pond and the Corral.



Attachment A-4

Building plans for the new greenhouse (#4) and Potting Shed with the Irrigation Pond and Old Corral locations superimposed. The Corral is clearly within the footprint of the new Potting Shed.