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A FORECASTING MODEL FOR
PROCUREMENT ADMINISTRATIVE LEAD TIME

by

Douglas J. MacKinnon

September 1992

Thesis Advisor: William G. Kemple

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The thesis objective is to develop a model to forecast the cost and the lead time in awarding a contract. All available, pertinent contract data was obtained and utilized from the Procurement Department of Naval Air Warfare Center Weapons Division, China Lake, California. The data was limited to the years 1989 through 1991. The actual cost of letting a contract has not been recorded, so a prediction model was fit only for the Procurement Administrative Lead Time (PALT). Cost is believed to be positively correlated with PALT. Explanatory data available for each contract were: contract amount, contract type, contract description, and competitive nature. A "complexity score" was also available, which was determined by procurement personnel. Since many of the same variables used to compute complexity were also used to preduct PALT, those variables were verified as possible predictors of cost by building a prediction model for complexity score. The following variables served as good predictors of PALT: contract amount, contract description and contract type. It was also determined that the competitive nature of the contract had little impact on PALT. With this data, it is difficult to forecast PALT precisely for a given contract. However, with the recommended collection of additional data, PALT and the cost of a contract should become predictable with increasing confidence.

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A FORECASTING MODEL FOR
PROCUREMENT ADMINISTRATIVE LEAD TIME

by

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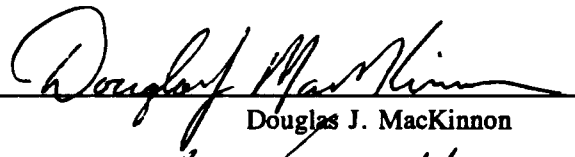
Author: 
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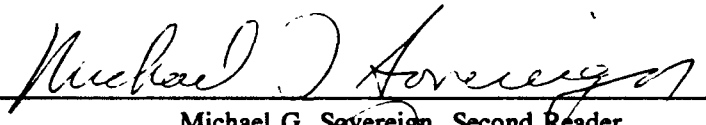
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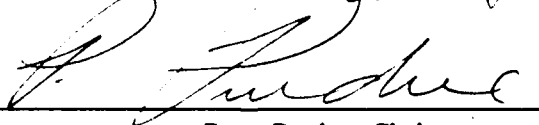
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ABSTRACT

The thesis objective is to develop a model to forecast the cost and the lead time in awarding a contract. All available, pertinent contract data was obtained and utilized from the Procurement Department of Naval Air Warfare Center Weapons Division, China Lake, California. The data was limited to the years 1989 through 1991. The actual cost of letting a contract has not been recorded, so a prediction model was fit only for the Procurement Administrative Lead Time (PALT). Cost is believed to be positively correlated with PALT. Explanatory data available for each contract were: contract amount, contract type, contract description, and competitive nature. A "complexity score" was also available, which was determined by procurement personnel. Since many of the same variables used to compute complexity were also used to predict PALT, those variables were verified as possible predictors of cost by building a prediction model for complexity score. The following variables served as good predictors of PALT: contract amount, contract description and contract type. It was also determined that the competitive nature of the contract had little impact on PALT. With this data, it is difficult to forecast PALT precisely for a given contract. However, with the recommended collection of additional data, PALT and the cost of a contract should become predictable with increasing confidence.

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I. INTRODUCTION

A. BACKGROUND

The Procurement Department of the Naval Air Warfare Center Weapons Division (NAWCWPNS) at China Lake, California awards contracts of all types in support of the current needs of the U. S. Navy. Business is conducted through a decentralized department with seven buying divisions in various locations around the center. Through their cognizant procurement office, technical department personnel of NAWCWPNS, may request contracts to fulfill their missions. These same technical departments currently pay into a combined overhead account to fund the procurement department. This funding accounts for approximately ninety percent of the budget of the procurement department. The remaining funding is generated through the charging of the cost of direct hours. The cost of labor is the major cost incurred by the procurement department. (Telephone call, NAWC, 31 August 1992)

Most recently, however, the Department of Defense has enacted a set of rules and guidelines referred to as Defense Business Operations Fund (DBOF). Although DBOF was implemented 1 October 1991, it is not apparent what the full implications of this new guidance will be. As implementation of DBOF proceeds, it appears that the resulting financial system will require that Department of Defense activities, such as NAWCWPNS, China Lake, conduct business in an increasingly cost effective manner.

General guidance concerning DBOF is contained in the following excerpt from the Defense Management Report Decision, number 971.

> DEFENSE BUSINESS OPERATIONS FUND: To improve the tools available to the managers of the support establishment, the financial system should collect all of the costs related to an output. In addition, the requirements on the level of performance and support required of the support establishment should be established by its customers, and reflected in the prices charged those customers. Expanding the use of cost accounting principles, and performance and activity based budgeting in a newly established "DEFENSE BUSINESS OPERATIONS FUND" (DBOF) should provide the basic building blocks to achieving the goals described above.

However, before a business area can be included in the DBOF it must first meet three requirements: 1) identify the output of that business; 2) identify customers of that business; and 3) develop a cost accounting system that relates cost to those outputs. (DMRD, nr.971, JAN 1992)

In response to these requirements, the identity of output for the procurement department at NAWCWPNS, China Lake is a contract and their customers are the technical departments. To develop a workload measurement and staffing tool for the procurement department, a Workload Management Impact Team (WIT) has been formed. This team has developed standards for determining the complexity of prospective contracts. These accounting changes required by DBOF may reveal which agency operates most cost effectively. However, until DBOF is better understood by the Department of Defense agencies, the Naval Air Weapon Center, China Lake continues

to operate under the existing Department of Defense and Navy Policy. (NAWCWPNS, February 1992, pp.1-6)

As mentioned earlier, the technical departments located at NAWCWPNS, China Lake currently pay a percentage of their budgets toward an overhead fund for the support departments, including the procurement department. Along with the changes required in DBOF, these same technical departments will begin paying only the procurement costs associated with the contracts requested by their departments. It is even anticipated that in the future, DBOF may allow for contracts to be procured through other than China Lake offices in an effort to obtain procurement services at the lowest cost. The desire of the procurement department is to become more competitive in the process of awarding a contract so their potential customers will view them as a cost effective alternative.

There are reasons why the procurement department at NAWCWPNS, China Lake is already an attractive alternative compared to other procurement sources. One reason is the proximity of on-site procurement offices to the laboratories and ranges where the technical departments are located. This closeness allows an increase in the monitoring of contracts and convenience for writing new contracts. Another reason is the high level of customer service to which the technical departments have become accustomed.

B. PROBLEM DESCRIPTION

The Department Head for Procurement at Naval Air Warfare Center (NAWCWPNS), China Lake, California has determined that in order to improve their

competitiveness, a model which provides an accurate prediction of the dollar cost amount and the time spent in awarding a contract must be developed.

So far, a computer based model for the calculation of predicted contract cost is being developed by the procurement department. This model uses as its input the same variables that the regression models developed in this thesis use, yet this model treats these variables differently. It assigns point values obtained from the WIT to the levels of these variables. Each contract then receives points that reflect the complexity involved with writing that contract. For instance a proposed contract with an estimated amount of one hundred thousand dollars receives one hundred complexity points for contract amount, whereas a contract written for ten million receives three hundred points for complexity. This model then takes these terms and sums the point values. This total is used as a multiplier of a basic number of hours, in order to forecast the administrative cost of awarding that contract. (NAWCWPNS, 20 April 1992)

These predictions would be extremely helpful for budgetary planning, both for the procurement department and for those departments or "customers", requesting the contract. This information would be provided to the potential customer by procurement personnel during the initial discussion of the requirement. The primary goal is to determine how much a single contract costs and the secondary goal is to determine the number of days it takes to award a contract.

This competitive edge, though seemingly slight, can manifest itself in hundreds of thousands of dollars annually. The Procurement Department annually processes in excess of 42,000 simplified purchase actions ($25,000 and under) for a value in excess of

$60,000,000. In addition, more than 6,000 large purchase actions are processed yearly, resulting in contracts, delivery orders, or modifications to existing contracts currently in excess of $258,000,000 annually. (NAWCWPNS, April 1989, p.1-2)

Thus far, little data based modelling, has been conducted to forecast these values. A model is required that can use the existing, explanatory data to accurately predict the cost of awarding a contract both in terms of time and of money. Unfortunately, no cost data is available, so little can be done to predict the dollar cost of awarding a contract. The reason for this deficit in data is the cost and the man-hours required to collect such data. The costs of procurement are also difficult to quantify. It is the task of the Workload Management Impact Team (WIT) to determine what work can be measured and the relative complexity, (and thus cost), of that work. These experts' knowledge is captured in a complexity score that is based on cost. (NAWCWPNS, 17 April 1991)

The complexity score will be used by procurement personnel to determine cost by: 1) determining actual average cost of a baseline contract, and 2) multiplying this cost by the complexity score to get a cost estimate for the contract of interest.

Although little data is available regarding procurement cost, much data is available concerning the time it takes to award a contract. This data is located in chronological sequence, 1989 through 1991, in Appendices A, B, and C. The number of days between the approval of the acquisition requirements package (ARP) by the respective procurement division and the final award of a contract is referred to as Procurement Administrative Lead Time (PALT). Although PALT includes the high expense direct labor hours, it also includes that time when a contract remains unprocessed and static.

Therefore, PALT in itself is an imperfect measure of the time required to process a contract. In the near term, a multivariate regression model is desired that can predict PALT, so that the time spent in writing a contract can be forecast.

When cost data becomes available, a similar model can be developed for that factor. In the interim, the assumed positive correlation with PALT can be exploited to predict that the relative cost of contracts will be in the same order as their predicted PALT values.

The process undergone by each contract is lengthy and complex. A very abbreviated example of the process would, however, be of some informational use at this point. The process begins when a technical department requests a specific supply or service. The procurement department formalizes a solicitation, which includes a statement of work or a specification along with prospective contractual terms and conditions, which is then made available to perspective contractors. The contractors then submit their proposals, the government evaluates the offers, and after the negotiation a contractor is awarded the contract.

A detailed representation of this process is found in the flowchart contained in Appendix D. The WIT has assigned points that reflect labor cost at each phase. These are accumulated into a "complexity" score for each contract. It is possible that this complexity score may be a better response variable for fitting a cost model than PALT, because it does not consider the dead-time that sometimes occurs.

C. SCOPE

The analysis in this study is limited to large purchases occurring at the Naval Air Weapon Center, China Lake, California within the past four years. Data on Procurement Administrative Lead Time (PALT) was selected beginning in 1989 because of accessibility. Also, considering that regulatory changes are often implemented which affect processing methods that tend to increase PALT, it was desirable to use recent fiscal year data.

Though available, data from 1992 was not included because it might not accurately represent the entire year. The reason for this misrepresentation is that the technical departments tend to submit their requirements at the midpoint of the fiscal year or later, resulting from a late receipt of budgetary information. This causes an increase in the number of contracts awarded in the last quarter of the fiscal year, which in turn may cause a seasonal rise in PALT. The increase in the number of acquisition requirements packages being processed leads to an increased workload for the procurement department and therefore increases the bottlenecks in the procurement process. As a result, a contract processed in the beginning of the fiscal year may have a decreased PALT compared to the same contract processed in the end of the fiscal year. Therefore, the entire years of 1989, 1990 and 1991 were considered for this study.

Additionally, the years of 1989 and 1990 are grouped together to develop the quadratic regression model required for predicting PALT. This model is then used to predict 1991 PALT to verify the model.

This chapter has defined the problem, its motivation and its background. The scope of the research and the intended solution have also been described so that the next step, exploratory data analysis, can be taken.

II. METHODOLOGY

A. INITIAL ANALYSIS

As often happens, some of the data available for analysis is continuous and some is categorical, as shown in Appendices A through C. Data for each contract included the following continuous variables: contract amount, complexity score and PALT. Contract amount, given in dollars, is the total amount expected to be paid for the particular supply or service. Complexity score, given in points, refers to the difficulty in processing that particular contract. This point system was initially developed by the procurement department to investigate the effort required to accomplish a division's workload so that staffing levels could be determined. Additionally, this point system is being used to determine the relative cost of writing a contract.

These points are based in part on the same variables used in this study. Procurement Administrative Lead Time (PALT), given in days, was also treated as continuous. The exploratory data analysis indicated that PALT has large variability (spread > one year) at almost every level of each predictor when viewed bivariately with PALT. It also revealed that the contract amount values are dense at the low end and very spread out at the large end. A common procedure that is used to examine this type of data is to take the natural logarithm to spread the data more evenly to facilitate analysis. Once this was done the model fitting proceeded. Figure 1 shows this spread along with a fitted LOWESS curve indicating the average rise in PALT for increasing

contract amount. The term LOWESS stands for *locally weighted regression scatter plot smoothing*, (Chambers,1983, p.94). In other words it shows an average value at any point along the curve.

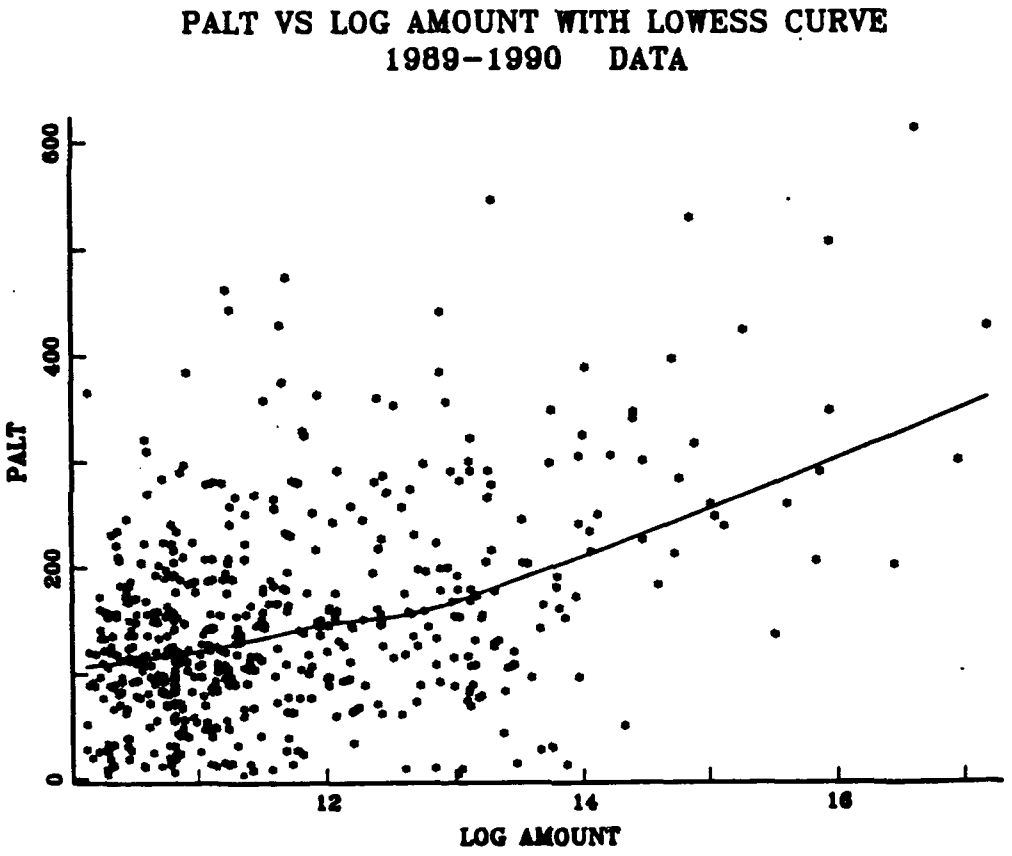

Figure 1. Scatter plot: PALT vs. Log Amount with LOWESS curve 1989-1990

Figure 2 uses a number of box plots to explain the range of PALT for different levels of contract amount. Each box plot is made up of a box with a center line and small circle generally located within the box. The top and bottom edges of the box indicate upper and lower quartiles of the data. The median is indicated by the interior

line passing within the box. The circle within the box denotes the mean value of the data. The lines that extend from the box indicate the tails of the data that lie outside the inner quartile range and their length is equal to 1.5 times the inner quartile range. Values outside these outer lines are denoted first by hollow circles then by filled circles. (Chambers,1983, p.21)

Figure 2 reveals that PALT varied greatly over different contract amounts, generally for more than a year's time. This graph also reveals that as amount increases so do the mean and variance of PALT.

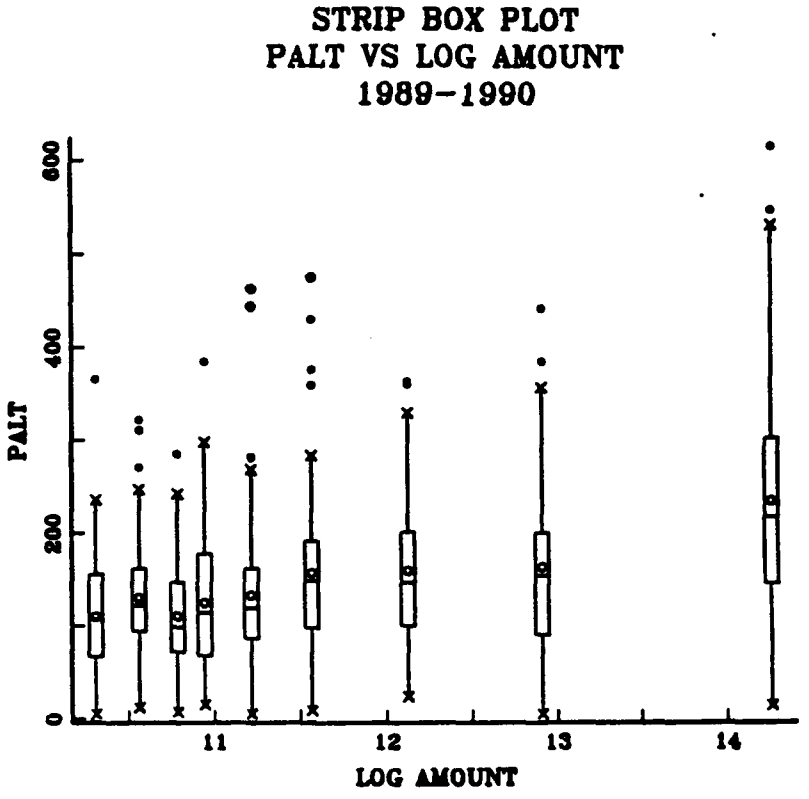

Figure 2. Strip box plot: PALT vs. Log Amount 1989-1990

Categorical variables included in this study included contract type, contract amount, contract description, and competitive nature. Contract description is separated into three self-explanatory categories: service, supply, and research and development. Figure 3 shows the average PALT associated with the three levels of contract description. The number of contracts for each type is: research and development - 70, supply contracts - 450, and service - 62.

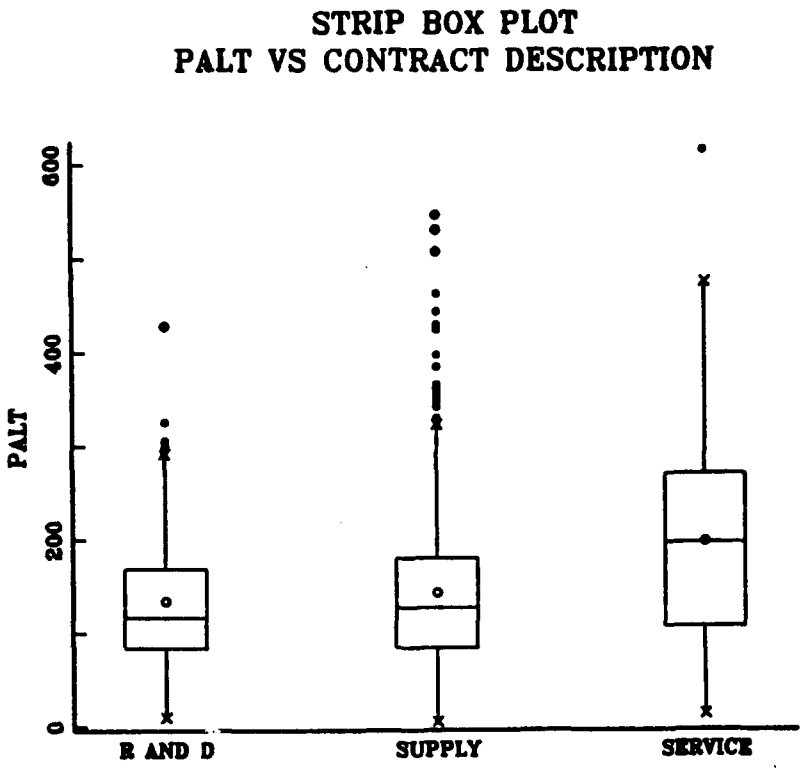

Figure 3. Strip box plot: PALT vs. Contract Description (1989-1990)

Contract type is separated into two categories, cost reimbursable and fixed price. To explain, a cost reimbursable contract has as its contract amount a ceiling figure, up to which the contractor may spend. For example, if a variation arises in the number of tests required for the contract, no modification to the contract would be required as long as the contract amount is not exceeded. Conversely, the fixed price contract features a firm price which will be paid to the contractor upon acceptance of the supply or service. Figure 4 represents the 1989-1990 PALT values associated with the two levels of contract type. The number of contracts for each level is: cost reimbursable - 69, and fixed price - 490.

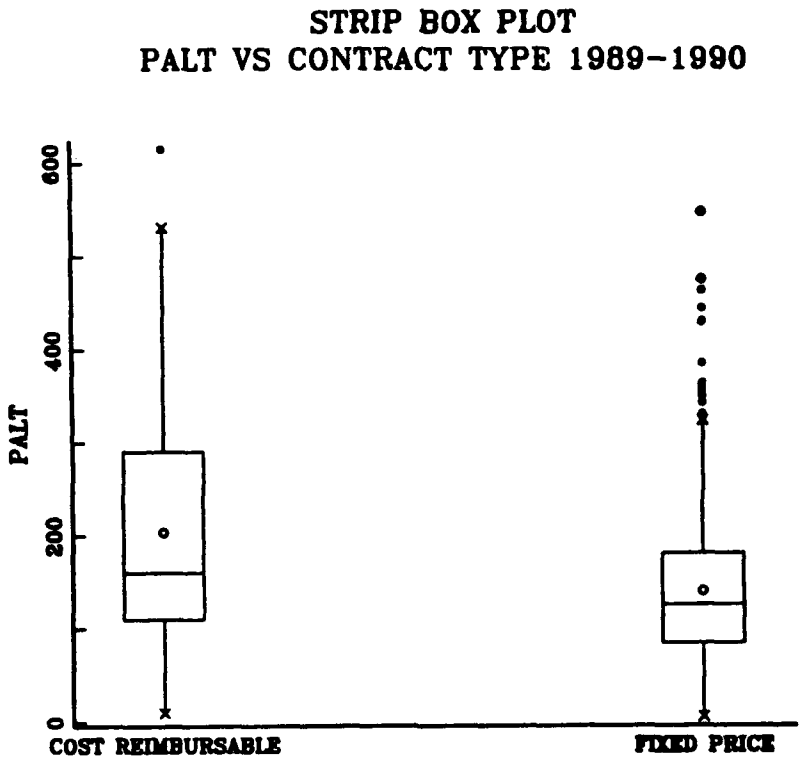

Figure 4. Strip box plot: PALT vs. Contract Type 1989-1990

Finally, the competitive nature of each contract was noted. A contract is either awarded on a competitive basis, or it is awarded on a sole source basis, that is, there is only one source that can satisfy the government requirement. The number of contracts for each competitive nature is: competitive - 413, and sole source - 76. (NAWCWPNS, 6 November 1989)

The data was only available in typed form. It was scanned and edited into workable form using a word processor (Word Perfect 5.1, User's Manual, 1991). Once complete, the data was next sent as an ASCII file to a data manipulation program to enable the use of other mathematically based software packages (CSS, User's Manual, 1990). It was in this form that final editing took place and data analysis began.

B. ASSUMPTIONS

After the data was initially reviewed, three outliers were detected in the 1991 data in the PALT field. The average PALT value for that year is 147.4 with a standard deviation of 98.554. These three PALT values were 8018, 8032 and 8146 days, approximately twenty-two years each, for contract numbers: N6053090R002, N6053090C0118 and N6053090C0298, respectively. After consultation with the procurement department at NAWCWPNS China Lake, the three values were dropped under the assumption that they were administrative errors. (Telephone conversation, July 1992)

Also, contracts whose type was time and material / labor hour (TM/LH) were not considered because of the small number of contracts they represent, (Telephone

conversation, NAWCWPNS, August 1992). This type of contract comprised less than one percent of the contracts analyzed.

Therefore, total number of contracts analyzed from the grouped years of 1989 and 1990 was 559 , and the number from 1991 was 275.

C. MODEL TYPE

The model used to predict Procurement Administrative Lead Time (PALT) must be able to utilize both continuous and categorical variables as described earlier. Exploratory data analysis revealed that a quadratic function of contract amount should be included in the model. (This subsequently resulted in better full model fits for 1989-1990 and 1991 data, and did a better job of predicting 1991 PALT using a fitted model.) Therefore, a multivariate, regression model was fit with a quadratic continuous variable and indicator variables for the levels of the categorical variables. It was implemented in the MINITAB software package as an analysis of covariance so that interactions between the continuous and categorical variables could be revealed. The following example shows how an analysis of covariance model is formed. It is a full model with one categorical variable at m levels and one continuous variable. (Fountain and Ward, 1992, p.8)

$$Yi = \beta_0 + \beta_1 X_{i1} + \beta_m X_{im} + \tau_1 w_{i1} + \ldots + \tau_m w_{im} + \epsilon_i ,$$

where

$$X_{ij} = \begin{cases} 1 & ; \text{ if observation i is from level j of the treatment} \\ 0 & ; \text{ otherwise} \end{cases}$$

$$w_{ij} = X_{ij} \times Z_i ;$$

where Y represents the response being measured (PALT),

β represents the regression coefficient for that categorical variable X,

Z is a continuous variable (contract amount or complexity score),

w is an interaction effect that uses two or more variables,

i is the observation number,

j is a level of categorical variable X.

The exploratory data analysis helped ensure that an appropriate model would be developed. Through the use of graphical methods, PALT was shown to be highly varied. This meant that PALT would be difficult to forecast. Also, no single variable could be identified as having relatively strong predictive capability. Therefore, all variables would have to be considered for use in the model.

III. MODEL DEVELOPMENT

A. MODEL TO PREDICT PALT

A parsimonious model that accurately predicts PALT using only a small set of explanatory variables is desired. Only those variables that are useful for prediction should be included since a small model is easier to understand, and data for a small model is easier and less expensive to collect. Also, a large model, with more explanatory variables, produces a smaller Sum of Squared Errors (SSE), but the additional variables may result in an increased Mean Square Error (MSE), meaning that predictions made with the model are less precise (greater variance). MSE=SSE/(n-p-1), where n is the number of observations, and p is the number of explanatory variables in the model. As additional variables are added, the numerator (SSE) decreases, but so does the denominator. If the decrease in SSE is not enough to offset the decrease in (n-p-1), MSE will increase. To obtain a parsimonious model, the full model utilizing all the variables and all possible interactions, was first fit. Then, terms that were deemed to be poor predictors were sequentially eliminated. As each model was fit, estimates of the coefficients (β's from the model expression above) were calculated for the terms included in the model. These estimates are random variables. Assuming that the PALT values are realizations of normally distributed random variables with constant variance, the estimates are also normally distributed for each coefficient, this distributional assumption was use to calculate the probability that an estimate as far from zero as the

one realized would obtain if the true coefficient were in fact zero (that is, if the corresponding explanatory variable had no predictive power). These probabilities were reported as p-values. At each iteration the term with the largest p-value was eliminated until no term with a p-value greater than 0.10 remained.

As stated, the p-values are based on the assumption that PALT is a normally random variable. Exploratory data analysis indicates that this is not the case. Normally distributed, random variables are symmetric, but the exploratory data analysis revealed that the observed PALT has a right skew. This is not surprising since PALT is a non-negative variable virtually unbounded. A power transformation, SYMPALT= $PALT^{.4}$, was utilized to reduce this right skew. The symmetry and normal probability plots showed a reduction in skew, but the full model utilizing this term does not fit as well for the 1989-1990 data, and does not predict either data set as well. Since the goal of this study is to predict PALT, this transformation of the data was not used. Thus the p-values should not be used for formal hypothesis tests about the regression coefficients, but they can be used to identify variables that are candidates for elimination.

Another transformation did however assist in the fitting of the model. The log of each contract amount was squared and used in the model. Numerically, the correlation between actual and predicted PALT for the model without the squared log amount is 0.492, while the same correlation for the model containing the squared term is 0.523. Therefore, the squared log contract amount was used. The terms listed in Table 1 below, are the best choices in terms of a well-fitted model. The expression "level" refers to the different possibilities each categorical variable might contain. Actual

levels used are located inside the box next to each categorical variable. The table lists all values of the fitted regression model.

TABLE 1. FITTED REGRESSION MODEL USING 1989 - 1990 DATA

Term	Level	Coeff (β)	Stdev	t-value	P
Constant	-	-53.7650	27.03	-1.99	0.047
Contract Type	CR	-58.4521	27.03	-2.16	0.031
Contract Description	R&D	-46.4607	8.277	-5.61	0.000
Contract Description	SUPP	19.8525	8.133	-2.44	0.015
(ln (Contract Amount))^2	-	1.4648	0.1574	9.30	0.000
Contract type* Contract Description	CR R&D	-29.1581	8.277	-3.52	0.000
Contract type* Contract Description	CR SUPP	23.0586	8.133	2.84	0.005
(ln (Contract Amount))^2 * Contract Type	CR	0.4286	0.1574	2.71	0.007

Competitive nature, a categorical variable, is not used because it had little predictive power at either of its levels.

The term Coeff refers to the coefficient multiplied by the variable it represents. However if the variable type is not present the coefficient is multiplied by zero. The only term that is always present in the calculation of PALT is the constant term.

The reason some levels of the categorical variables appear, and others do not, is because that absent level of each of these variables has been assumed as part of the constant term. Therefore, the categorical variables shown intrinsically assume the existence of one more level. For instance, contract type shows cost reimbursable but not fixed price, because fixed price contracts were chosen to be assumed into the constant term. Any contract with contract type at the cost reimbursable level results in -58.4521 days toward the prediction of PALT. If two contracts are identical except for the contract type, the cost reimbursable contract will have a predicted PALT that is 58.4521 days shorter.

The following is an example of how PALT is predicted through the use of this model. If a fixed price, sole source, supply contract were written for the amount of $1,000,000 its prediction of PALT would equal:

$$-53.7650+0*(-58.4521)+0*(46.4607)+1*(19.8525)+(\ln(1{,}000{,}000))^2*(1.4648)+$$
$$0*(-29.1581)+0*1*(23.0586)+(\ln(1{,}000{,}000))^2*0*(0.4286)$$
$$= 245.67 \text{ days of PALT}$$

B. COMPLEXITY MODEL

To take a preliminary look at the predictability of cost using the available predictors, without cost data, a model was built for complexity score using the 1989-1990 data to predict 1991 complexity scores. The complexity point totals for the 1989-1990

data were put through this fitted regression model. This model also utilized the squared log amount for one of its explanatory variables. Results are given in Chapter IV.

C. ALTERNATIVE MODEL

Another fitted model was developed in order to determine if better predictive capabilities could be produced. This model used only those contracts whose PALT was less than or equal to one year. The predictive capability of this model was not as strong as the model using all of the data, therefore, the model was not analyzed any further.

Thus far, the full model was reduced and fitted to produce the best predictions of PALT. An example helped to show how the model is used. The complexity model was also fitted to reveal predictability of complexity points. The analysis of the results from these models follows.

IV. ANALYSIS OF RESULTS

A. PREDICTED VS. ACTUAL PALT FOR 1989-1990

An upper bound on the accuracy that could be expected when using the fitted model as a predictor was determined by forecasting PALT for the 1989-1990 data, having derived the model from this same data. Because 1989-1990 data was used to develop the fitted model, no ensuing prediction of PALT from the following year should be more accurate than the predicted PALT for the year upon which the model was based. The results of comparing predicted to actual values of PALT showed that it is a difficult variable to predict. The Pearson product moment correlation coefficient (r-value), from this analysis is 0.523. Therefore, this model explains just over one-quarter, (R^2 = 0.274), of the variability found in PALT. The term, r-value, refers to the amount of linear correlation between the two variables considered. The next section gives the results of using this model to predict 1991 PALT.

B. 1991 PALT PREDICTED USING 1989-1990 FITTED MODEL

The following table will help to illustrate the effect of each of the variables listed as having a significant predictive capability toward PALT. The p-value, as explained earlier, was shown to be below 0.1 for all variable combinations.

TABLE 2. STATISTICAL ANALYSIS OF THE FITTED MODEL

Source	DF	SeqSS	Adj MS	F	p
Contract Type	1	254200	32035	4.68	0.031
Contract Description	2	172242	108070	15.77	0.000
(Log Contract Amount)^2	1	653516	593169	86.56	0.000
Contract Type* Contract Description	2	94628	50622	7.39	0.001
Contract Type* (Log Contract Amount)^2	1	50353	50353	7.35	0.001
Error	547	3748265	6852	-	-
Total	554	4973204	-	-	-

The results from this analysis reveal the predictive capabilities of the fitted model. The r-value derived in comparing actual 1991 PALT to predicted PALT, having used the fitted model, is 0.356. This low value confirms the exploratory data analysis that PALT is a difficult variable to forecast.

C. COMPLEXITY MODEL

In the long term, NAWCWPNS, China Lake wants to predict the administrative cost of writing a contract. But, no cost data are available. It is believed, however, that cost should be more predictable than PALT since only the time actually spent working on the contract is included in the cost. A preliminary examination of this issue was conducted by fitting a second multivariate regression model to the available data using the complexity score as the response variable. Using the 1989-1990 data, this model was

used to predict 1991 complexity scores. The results were very good. The correlation coefficient for predicted score and actual score was 0.825. If the assumed relationship between complexity score and cost is true, good predictions should result from a model based on currently available data items. Although the data available was useful more continuous data would help to predict complexity score. The accuracy obtained in forecasting PALT was low, however, the complexity model used the same explanatory data with better results. Both PALT and complexity score could be better forecast, however, if more data were available.

V. CONCLUSIONS

A. PALT

There exists a significant relationship between Procurement Administrative Lead Time (PALT) and: contract type, contract amount and contract description. However, the competitive nature of the contract had little impact on predicting PALT. PALT is a difficult variable to forecast with precision.

B. COST

Once cost data is recorded, actual cost should be statistically predictable for the purposes of the Defense Business Operations Fund (DBOF). This conclusion is based on the predictability of the complexity score, and because while the PALT data exhibited a high standard deviation, the model lost very little explanation of variability when the prediction for 1991 was made using a fitted model based on 1989-1990 data.

C. ADDITIONAL DATA

Once cost data is accumulated, the model should get increasingly accurate in its prediction of PALT as well as cost. The collection of cost data may, unfortunately, cause PALT to increase.

VI. RECOMMENDATIONS

A. DATA COLLECTION

The first recommendation is that award date should be included as part of the regular data base. This will further categorize the contracts into monthly segments. In doing this, forecasting PALT and eventually the cost of awarding a contract, will be facilitated by making available one more explanatory variable for the analysis. This will enable a thorough analysis of seasonal differences for both PALT and cost.

The second recommendation is to continue recording the complexity scores along with all other data entries. This will ensure the constant tracking of this variable to ensure accuracy in assigning points to contract attributes.

The third recommendation is that cost data be taken over a wide range of different contracts according to the following minimum data collection plan. This plan will ensure that all types of contracts are considered without missing a specific type of contract. An entry of one indicates the category of contract to be recorded.

TABLE 3. DATA COLLECTION PLAN FOR COVERAGE OF ALL CONTRACT TYPES

Contract Description			Contract Type		Competitive Nature	
SUPP	SERV	R&D	FP	CR	COMP	SS
1	0	0	1	0	1	0
1	0	0	1	0	0	1
1	0	0	0	1	1	0
1	0	0	0	1	0	1
0	1	0	1	0	1	0
0	1	0	1	0	0	1
0	1	0	0	1	1	0
0	1	0	0	1	0	1
0	0	1	1	0	1	0
0	0	1	1	0	0	1
0	0	1	0	1	1	0
0	0	1	0	1	0	1

If this plan is followed, the recorded data should represent a complete coverage over the range of contracts. This plan may be expanded, for example, to ensure proper coverage of all categories of contract amounts simply by including all of the above contracts for each of the amount categories. Since twelve different combinations exist in the above plan and currently contract amounts are separated into five groups, sixty different contracts would be necessary to cover all the possible combinations. By

collecting data over the different categories of contract amount, the variance of the updated model should be reduced.

Since collecting data is costly and time consuming, data should be collected on several baseline contracts and especially on those contracts whose levels appeared important for prediction.

The correlation coefficients between predicted and actual PALT, revealed that the fitted, PALT model was able to explain over one quarter of the variance of the data. This statistic could be improved by including more variables in the data base. These variables include, but are not limited to those used to accumulate points for complexity. The recommendation is therefore made that the same variables used to determine complexity scores, be made available to determine PALT. Point assignments are available in Appendix E.

B. MODEL UPDATES

The fitted, PALT model should be updated upon the completion of the cost data collection over at least one year. At that point a cost model should also be developed. Once this is done both models should be updated regularly (e.g. every two years) to verify their accuracy. The model presented in this study grouped two years together to build a model in order to predict a third. This method was necessary and seems reasonable in view of current economic trends. If too many years are used as a group, the opportunity remains for the model to become out of date with current time and cost considerations.

Using these recommendations on data collection and data use will help determine the most accurate predictions of cost and number of days required to write a contract.

APPENDIX A: 1989 DATA

Contract Number	CT	Desc.	Amount	CN	PALT	Score
N6053089C0002	FP	SERV	259284.50	COMP	272	100
N6053089C0003	FP	SUPP	52343	COMP	189	115
N6053089C0005	FP	SUPP	38021.95	COMP	78	100
N6053089C0006	FP	SERV	120144	COMP	197	115
N6053089C0008	FP	SUPP	52725	COMP	120	100
N6053089C0009	FP	SUPP	30270.98	SS	121	135
N6053089C0010	FP	SUPP	8340000	COMP	349	315
N6053089C0014	FP	SUPP	121374	COMP	165	100
N6053089C0015	FP	SUPP	100376	COMP	147	100
N6053089C0016	FP	SUPP	73315	COMP	190	100
N6053089C0017	FP	SUPP	45500	COMP	85	100
N6053089C0018	FP	SUPP	63960	COMP	142	100
N6053089C0019	FP	SUPP	30750	COMP	137	100
N6053089C0020	FP	SUPP	67900	COMP	144	100
N6053089C0021	FP	RD	49785	COMP	206	100
N6053089C0025	FP	SUPP	413900	SS	357	135
N6053089C0026	FP	SUPP	38622	COMP	205	100
N6053089C0029	FP	SUPP	248217	COMP	147	135
N6053089C0032	FP	SUPP	49926	COMP	113	115
N6053089C0033	FP	SUPP	37155	COMP	157	100
N6053089C0036	FP	SUPP	49990	COMP	57	200
N6053089C0037	FP	SUPP	54082	COMP	57	70
N6053089C0038	CR	SUPP	48854	COMP	242	200
N6053089C0040	FP	SUPP	105500	COMP	189	100
N6053089C0041	FP	SUPP	571619	COMP	292	150
N6053089C0042	FP	SUPP	42350	COMP	150	100
N6053089C0043	FP	SERV	49979	COMP	62	100
N6053089C0044	FP	SERV	50000	COMP	72	100
N6053089C0045	FP	SERV	24648	COMP	225	100
N6053089C0046	FP	SUPP	46417	COMP	94	100
N6053089C0048	FP	SERV	52335	COMP	73	100
N6053089C0051	FP	SUPP	29500	COMP	107	100
N6053089C0052	FP	SUPP	98618	COMP	114	115
N6053089C0053	FP	SUPP	45281.50	COMP	285	100
N6053089C0056	FP	SUPP	46777	COMP	199	100
N6053089C0060	FP	SUPP	29570	COMP	154	100

N6053089C0061	CR	SUPP	197559	COMP	65	200
N6053089C0062	CR	SERV	243268	COMP	219	200
N6053089C0063	CR	SERV	200684	COMP	66	200
N6053089C0064	FP	SUPP	43087.25	COMP	194	100
N6053089C0065	FP	SUPP	311107.74	COMP	275	100
N6053089C0066	FP	SUPP	162248	COMP	97	115
N6053089C0067	CR	SUPP	2442398.47	COMP	398	415
N6053089C0070	FP	SUPP	49800	SS	151	135
N6053089C0071	FP	SERV	86585.36	COMP	209	100
N6053089C0075	CR	SERV	395585	COMP	442	200
N6053089C0081	FP	SUPP	62543	COMP	80	100
N6053089C0083	FP	SUPP	113691	COMP	430	100
N6053089C0084	FP	SUPP	40300	SS	311	135
N6053089C0085	FP	SUPP	53478	COMP	211	100
N6053089C0086	FP	SUPP	25537	SS	90	135
N6053089C0088	FP	SUPP	940000	COMP	31	150
N6053089C0090	FP	SUPP	39579	COMP	322	100
N6053089C0092	FP	SUPP	40500	COMP	83	100
N6053089C0093	FP	SUPP	77380	COMP	444	100
N6053089C0094	FP	SUPP	76278.72	COMP	49	115
N6053089C0095	FP	RD	29169192	COMP	429	450
N6053089C0096	FP	SUPP	81926	COMP	144	100
N6053089C0097	FP	SUPP	30025	COMP	20	100
N6053089C0098	FP	SUPP	49255	COMP	193	100
N6053089C0099	FP	SUPP	428275	COMP	292	100
N6053089C0100	CR	RD	457126	COMP	283	200
N6053089C0101	FP	SUPP	40000	COMP	169	100
N6053089C0102	CR	SUPP	76392	COMP	210	200
N6053089C0103	FP	SUPP	1164672	SS	242	335
N6053089C0107	FP	SERV	55366.80	COMP	185	100
N6053089C0111	FP	SUPP	40736	SS	271	135
N6053089C0113	FP	SUPP	395000	COMP	179	100
N6053089C0114	FP	SUPP	67120	COMP	282	100
N6053089C0115	FP	SERV	87321	SS	252	150
N6053089C0117	FP	SERV	141420	COMP	101	100
N6053089C0121	FP	SUPP	197591	COMP	259	100
N6053089C0125	FP	SUPP	232778	COMP	196	115
N6053089C0128	FP	SUPP	86940	COMP	224	100
N6053089C0129	FP	SUPP	94490	COMP	146	100
N6053089C0132	FP	SUPP	31761.60	COMP	119	100
N6053089C0133	CR	SUPP	4248817	COMP	425	400
N6053089C0134	FP	SUPP	1500000	COMP	307	300
N6053089C0137	FP	SUPP	49750	SS	217	135

N6053089C0139	FP	SUPP	87674.40	SS	157	135
N6053089C0140	FP	SUPP	50203	COMP	178	100
N6053089C0144	FP	SUPP	49600	SS	7	135
N6053089C0145	FP	SUPP	85465.80	SS	68	150
N6053089C0147	FP	SUPP	150015	COMP	218	100
N6053089C0148	FP	SUPP	124556	SS	283	135
N6053089C0151	FP	SUPP	39605.70	SS	224	135
N6053089C0155	FP	SUPP	63854	COMP	280	100
N6053089C0156	CR	RD	1200000	COMP	326	400
N6053089C0158	FP	SUPP	35074	COMP	151	100
N6053089C0162	CR	SERV	1220708	COMP	390	415
N6053089C0164	CR	RD	273070	COMP	116	200
N6053089C0165	FP	SUPP	74210.12	COMP	109	100
N6053089C0166	FP	SUPP	450000	COMP	193	100
N6053089C0171	FP	RD	500000	COMP	180	100
N6053089C0176	FP	SUPP	36312.25	SS	137	135
N6053089C0177	FP	SUPP	65308.57	COMP	48	115
N6053089C0178	FP	SUPP	67500	COMP	190	115
N6053089C0181	FP	SUPP	146808.46	COMP	253	100
N6053089C0182	FP	SUPP	53628.86	COMP	298	100
N6053089C0183	CR	RD	1941308	COMP	227	400
N6053089C0185	CR	SUPP	85960	SS	107	235
N6053089C0186	FP	SERV	74173	SS	97	135
N6053089C0188	CR	RD	246392	COMP	147	200
N6053089C0189	FP	SUPP	75615	SS	15	135
N6053089C0190	FP	SERV	109040	SS	266	150
N6053089C0194	FP	SUPP	137384	SS	326	135
N6053089C0196	FP	SUPP	51999.98	COMP	25	100
N6053089C0197	FP	SUPP	294000	COMP	258	100
N6053089C0198	FP	SUPP	36000	SS	127	135
N6053089C0199	FP	SUPP	98575	COMP	152	115
N6053089C0201	FP	SUPP	71824	COMP	156	100
N6053089C0202	FP	SUPP	49255	COMP	159	100
N6053089C0204	FP	SUPP	65000	COMP	188	100
N6053089C0205	FP	SUPP	42250	SS	26	135
N6053089C0206	FP	SUPP	57140	COMP	187	100
N6053089C0208	FP	SUPP	38564	COMP	206	100
N6053089C0209	FP	SUPP	32500	COMP	208	100
N6053089C0210	FP	SUPP	1355162	COMP	251	300
N6053089C0211	FP	SUPP	30690	COMP	68	100
N6053089C0212	FP	SUPP	110500	COMP	74	100
N6053089C0214	FP	SUPP	63184	SS	71	150
N6053089C0215	FP	SUPP	49655	COMP	157	100

N6053089C0216	CR	SUPP	247966	COMP	157	200
N6053089C0217	FP	SUPP	549013	COMP	156	100
N6053089C0219	FP	SUPP	49993	COMP	58	100
N6053089C0220	FP	SUPP	54014	COMP	148	100
N6053089C0221	FP	SUPP	249911	COMP	149	100
N6053089C0222	FP	SUPP	89970	SS	112	135
N6053089C0223	FP	SUPP	35100	COMP	171	100
N6053089C0224	FP	SUPP	108276	COMP	184	100
N6053089C0225	FP	SUPP	30990	COMP	34	100
N6053089C0229	FP	SUPP	77844	SS	16	135
N6053089C0233	FP	SUPP	76233.71	COMP	91	100
N6053089C0234	FP	SUPP	50951	SS	235	135
N6053089C0235	FP	SUPP	120762.70	COMP	40	100
N6053089C0236	FP	SUPP	37000	COMP	172	100
N6053089C0240	FP	SUPP	32176.80	SS	211	135
N6053089C0241	FP	SUPP	49556.60	COMP	88	100
N6053089C0247	FP	SUPP	28850	SS	123	135
N6053089C0250	FP	SUPP	119000	COMP	110	100
N6053089C0251	FP	SUPP	32400	SS	72	135
N6053089C0252	FP	SUPP	27590	COMP	27	100
N6053089C0253	CR	SERV	1131952	COMP	173	400
N6053089C0254	FP	SUPP	29544	COMP	27	100
N6053089C0255	FP	SUPP	31852	COMP	155	100
N6053089C0256	FP	SUPP	749000	COMP	205	150
N6053089C0258	FP	SUPP	32650	COMP	184	100
N6053089C0259	FP	SUPP	78800	COMP	190	100
N6053089C0261	CR	SERV	780708	COMP	204	250
N6053089C0263	FP	SUPP	46297	COMP	191	100
N6053089C0265	FP	SUPP	165506.25	SS	160	135
N6053089C0268	FP	SUPP	35000	COMP	168	100
N6053089C0270	FP	SUPP	116390	COMP	181	115
N6053089C0271	FP	SUPP	29302	COMP	5	100
N6053089C0272	FP	SUPP	876892	COMP	165	150
N6053089C0276	FP	SUPP	33933	COMP	174	100
N6053089C0278	FP	SUPP	47250	COMP	165	100
N6053089C0282	FP	SUPP	34173	SS	40	135
N6053089C0284	FP	SUPP	330358	COMP	127	100
N6053089C0288	FP	SUPP	177027	COMP	160	100
N6053089C0291	FP	SUPP	452500	COMP	180	100
N6053089C0295	FP	SUPP	139800	COMP	177	100
N6053089C0297	FP	SUPP	35525	SS	142	135
N6053089C0298	CR	SUPP	666041	SS	106	285
N6053089C0299	FP	SUPP	34717	SS	20	135

N6053089C0302	FP	SUPP	153931	COMP	145	100
N6053089C0303	FP	SUPP	108979.20	COMP	99	100
N6053089C0304	FP	SUPP	491113	COMP	83	100
N6053089C0306	FP	SUPP	199305	COMP	144	100
N6053089C0307	FP	SUPP	541538	COMP	80	150
N6053089C0308	FP	SUPP	135037	COMP	24	100
N6053089C0310	FP	SUPP	111322	COMP	167	100
N6053089C0311	CR	SUPP	166844	SS	163	235
N6053089C0312	CR	SUPP	43828.37	COMP	149	200
N6053089C0313	CR	RD	490068	COMP	117	200
N6053089C0314	FP	SUPP	66340	COMP	157	100
N6053089C0315	FP	SUPP	40604	COMP	157	100
N6053089C0317	FP	SUPP	90736	COMP	165	100
N6053089C0318	FP	SUPP	43240	COMP	155	100
N6053089C0319	FP	SUPP	35990	COMP	93	100
N6053089C0320	FP	SUPP	316277	COMP	157	100
N6053089C0321	FP	SUPP	155165	COMP	137	135
N6053089C0324	FP	SUPP	36900	SS	149	100
N6053089C0325	FP	SUPP	44000	COMP	160	100
N6053089C0326	FP	SUPP	75000	COMP	177	100
N6053089C0327	FP	SUPP	998196	COMP	162	150
N6053089C0332	FP	SUPP	89500	COMP	105	100
N6053089C0333	FP	SUPP	30000	COMP	158	100
N6053089C0336	FP	SUPP	50000	SS	97	135
N6053089C0337	CR	SUPP	207493	SS	69	235
N6053089C0338	FP	SUPP	31865	SS	158	135
N6053089C0341	FP	SUPP	29246	SS	158	200
N6053089C0344	CR	RD	174125	COMP	154	135
N6053089C0345	FP	SUPP	440811	SS	155	100
N6053089C0346	FP	SUPP	26680	COMP	89	135
N6053089C0347	FP	SUPP	5419492	COMP	137	315
N6053089C0349	FP	SUPP	118720.80	SS	28	100
N6053089C0351	FP	SUPP	30240	COMP	13	135
N6053089C0353	FP	SUPP	55541	SS	41	150
N6053089C0354	FP	RD	44200	COMP	134	235
N6053089C0355	CR	SERV	66472.91	SS	144	235
N6053089C0356	CR	SERV	40510	SS	137	135
N6053089C0358	FP	SUPP	49840	SS	119	100
N6053089C0359	FP	SUPP	53735	COMP	116	100
N6053089C0360	FP	SUPP	38750	COMP	104	100
N6053089C0363	FP	SUPP	34000	COMP	64	100
N6053089C0364	FP	SUPP	165296	SS	146	135
N6053089C0367	FP	SUPP	28950	COMP	134	100

N6053089C0370	FP	SUPP	73568	SS	17	135
N6053089C0371	FP	SUPP	34800	COMP	137	100
N6053089C0373	FP	RD	200000	SS	35	185
N6053089C0374	FP	SUPP	60903	COMP	119	100
N6053089C0375	FP	SUPP	80257.50	COMP	137	100
N6053089C0376	FP	SUPP	35450	SS	28	135
N6053089C0378	FP	SERV	382812	COMP	134	100
N6053089C0379	FP	SUPP	32110	COMP	82	100
N6053089C0380	FP	SUPP	175000	COMP	61	100
N6053089C0381	FP	SUPP	43249	SS	122	135
N6053089C0383	CR	RD	90578	COMP	118	200
N6053089C0384	FP	SERV	70000	SS	126	135
N6053089C0385	FP	SUPP	71900	COMP	123	100
N6053089C0388	FP	SUPP	51374	COMP	111	100
N6053089C0390	FP	SUPP	67000	COMP	41	100
N6053089C0391	FP	SUPP	34900	SS	40	135
N6053089C0392	FP	SUPP	195250	SS	112	135
N6053089C0393	FP	SERV	74805	COMP	105	100
N6053089C0395	FP	SERV	69292.42	COMP	87	115
N6053089C0397	FP	SUPP	58043	COMP	98	100
N6053089C0398	FP	SUPP	61769	SS	110	135
N6053089C0399	FP	RD	25115	COMP	53	150
N6053089C0401	FP	SUPP	76212	COMP	106	100
N6053089C0403	FP	SUPP	60457	COMP	108	100
N6053089C0404	FP	SUPP	69918	COMP	111	100
N6053089C0417	FP	SUPP	80400	COMP	91	100
N6053089C0418	FP	SUPP	26151.06	COMP	21	100
N6053089C0420	FP	SUPP	57960	COMP	60	100
N6053089C0421	FP	SUPP	41100	COMP	73	100
N6053089C0423	FP	SUPP	45014	SS	84	135
N6053089C0425	FP	SUPP	45493	COMP	94	100
N6053089C0426	FP	SUPP	184755	SS	94	135
N6053089C0430	FP	SUPP	166777	SS	98	135
N6053089C0431	FP	SUPP	31285	COMP	92	100
N6053089C0433	FP	SUPP	336107	COMP	90	100
N6053089C0439	FP	SUPP	42782	SS	91	135
N6053089C0440	FP	SUPP	79154	SS	92	135
N6053089C0441	FP	SUPP	165065	SS	90	135
N6053089C0442	FP	SUPP	47684	SS	33	135
N6053089C0444	FP	SUPP	30000	SS	90	150
N6053089C0452	FP	SUPP	92219.86	COMP	69	115
N6053089C0456	FP	SUPP	97600	SS	42	135
N6053089C0457	FP	SUPP	47370	COMP	81	100

N6053089C0470	FP	RD	69049	COMP	50	150
N6053089C0471	FP	RD	62965	COMP	48	150
N6053089C0475	FP	SUPP	46977	COMP	70	100
N6053089C0489	FP	SUPP	34470	COMP	32	100
N6053089C0496	FP	RD	29180	COMP	29	150
N6053089C0497	FP	SUPP	65905	COMP	15	100
N6053089C0502	FP	SUPP	81510	COMP	33	100
N6053089C0511	FP	SUPP	19340	COMP	15	100
N6053089C0512	FP	SERV	45000	SS	13	135
N6053089C0516	FP	SUPP	91790	SS	9	135
N6053089C0517	CR	RD	1050860	COMP	14	400
N6053089C0519	FP	SUPP	120000	COMP	160	100
N6053089D0001	FP	SERV	66082.95	COMP	88	100
N6053089D0013	CR	SUPP	1280000	COMP	216	400
N6053089D0050	FP	SUPP	23000000	COMP	302	415
N6053089D0059	CR	SERV	115575	COMP	376	200
N6053089D0068	CR	SUPP	8371072	COMP	508	400
N6053089D0082	FP	SUPP	593905	COMP	547	150
N6053089D0087	CR	SUPP	940000	COMP	349	250
N6053089D0089	FP	SUPP	67410	COMP	209	115
N6053089D0122	CR	SERV	1938217	SS	302	435
N6053089D0126	FP	SUPP	345151.62	COMP	299	301
N6053089D0146	FP	SUPP	5987309	COMP	261	300
N6053089D0195	FP	RD	83981	SS	138	185
N6053089D0207	FP	SUPP	34480	COMP	247	100
N6053089D0226	CR	SERV	418421	SS	201	235
N6053089D0249	FP	SUPP	104260	COMP	167	100
N6053089D0290	FP	SUPP	2183160	COMP	184	300
N6053089D0328	FP	SUPP	307043	COMP	159	100
N6053089D0352	FP	SUPP	186000	COMP	127	100
N6053089D0427	FP	SUPP	25000	SS	29	135
N6053089D0432	FP	SUPP	1160200	COMP	97	300

APPENDIX B: 1990 DATA

Contract Number	CT	Desc.	Amount	CN	PALT	Score
N6053090C0002	FP	SUPP	34796	COMP	115	100
N6053090C0009	CR	RD	3415128	COMP	249	400
N6053090C0012	FP	SUPP	178700	COMP	132	100
N6053090C0016	FP	SUPP	111181.35	COMP	125	100
N6053090C0017	FP	SUPP	163424	COMP	122	100
N6053090C0019	FP	SUPP	83554	COMP	133	100
N6053090C0021	FP	SUPP	193600	SS	96	135
N6053090C0023	FP	SUPP	30009155	COMP	874	400
N6053090C0029	FP	SUPP	49200	SS	127	135
N6053090C0030	FP	SUPP	49140	SS	223	135
N6053090C0031	FP	SUPP	77350.80	COMP	259	115
N6053090C0032	FP	SERV	171684	SS	244	150
N6053090C0037	CR	SUPP	572325	SS	267	285
N6053090C0039	FP	SUPP	51050	COMP	154	100
N6053090C0040	FP	SUPP	27864	COMP	98	100
N6053090C0042	FP	SUPP	99600	COMP	159	100
N6053090C0043	FP	RD	46863	COMP	155	100
N6053090C0045	FP	SUPP	119000	COMP	234	115
N6053090C0046	FP	SUPP	52380	COMP	119	100
N6053090C0047	FP	SERV	383148.08	COMP	224	100
N6053090C0048	FP	SUPP	135702	COMP	330	100
N6053090C0049	FP	SUPP	319824	COMP	136	100
N6053090C0051	CR	RD	492497	SS	301	235
N6053090C0053	FP	SUPP	393360	COMP	385	115
N6053090C0056	FP	RD	49775.49	COMP	143	100
N6053090C0057	CR	RD	3672902	COMP	240	400
N6053090C0059	FP	SUPP	25594	SS	121	135
N6053090C0061	FP	SUPP	67200	SS	84	135
N6053090C0062	FP	SUPP	331948	SS	199	135
N6053090C0063	FP	SUPP	109200	COMP	257	115
N6053090C0064	FP	SUPP	77200	COMP	242	115
N6053090C0065	FP	SUPP	176620	COMP	293	115
N6053090C0067	CR	SERV	249968	COMP	228	200
N6053090C0072	FP	SUPP	54950	SS	385	135
N6053090C0073	FP	SUPP	74955	COMP	463	100
N6053090C0077	FP	SUPP	241332	SS	361	135
N6053090C0078	FP	SUPP	93749	SS	270	135

N6053090C0079	FP	SUPP	100624	SS	359	135
N6053090C0084	FP	SUPP	586404	SS	279	285
N6053090C0085	FP	SUPP	42652	COMP	160	100
N6053090C0087	FP	SUPP	251960	COMP	127	100
N6053090C0088	FP	SUPP	55700	COMP	124	100
N6053090C0091	CR	SERV	921222	SS	299	285
N6053090C0092	FP	RD	589141	SS	217	235
N6053090C0095	FP	SUPP	118624.97	COMP	180	100
N6053090C0096	FP	SERV	58674	COMP	188	115
N6053090C0097	FP	SUPP	747606	COMP	246	150
N6053090C0098	CR	SUPP	1807978	SS	348	435
N6053090C0099	FP	SUPP	27968	SS	142	135
N6053090C0100	FP	SUPP	62440	SS	138	135
N6053090C0102	FP	SUPP	215988	SS	246	135
N6053090C0105	FP	SUPP	34300	SS	178	135
N6053090C0108	FP	SUPP	173958	COMP	177	100
N6053090C0109	FP	SUPP	274929	COMP	354	100
N6053090C0113	FP	SUPP	32055	COMP	236	100
N6053090C0114	FP	SUPP	52763	COMP	68	100
N6053090C0115	FP	RD	394656	COMP	200	150
N6053090C0116	CR	RD	644191	SS	44	285
N6053090C0117	FP	SERV	353156	SS	197	135
N6053090C0118	FP	SUPP	52037	COMP	72	100
N6053090C0119	FP	SERV	93050	COMP	105	100
N6053090C0122	FP	RD	30550	SS	232	185
N6053090C0125	FP	SUPP	119412	COMP	65	100
N6053090C0127	FP	SUPP	65285.04	COMP	128	115
N6053090C0128	FP	SUPP	297732	COMP	176	100
N6053090C0129	FP	SUPP	99545	COMP	178	100
N6053090C0133	FP	SUPP	499248	COMP	323	100
N6053090C0134	FP	SUPP	151000	COMP	150	100
N6053090C0135	FP	SUPP	69230	COMP	50	100
N6053090C0148	FP	SUPP	42900	SS	97	135
N6053090C0149	FP	SERV	251904	COMP	288	100
N6053090C0153	FP	SERV	235872	COMP	282	115
N6053090C0155	FP	SUPP	46000	COMP	225	100
N6053090C0158	FP	RD	49998	COMP	112	100
N6053090C0161	FP	SUPP	49992	COMP	20	100
N6053090C0162	FP	SERV	74412	COMP	196	100
N6053090C0163	FP	SUPP	47250	COMP	123	100
N6053090C0167	FP	SUPP	290706	COMP	62	115
N6053090C0168	FP	SUPP	59331.60	SS	55	135
N6053090C0169	CR	RD	497180	COMP	292	200

N6053090C0170	FP	RD	68650	COMP	94	150
N6053090C0171	FP	RD	74355	COMP	121	150
N6053090C0172	FP	SERV	52000	COMP	291	70
N6053090C0173	FP	SERV	7707283	COMP	291	300
N6053090C0176	FP	SUPP	392379	COMP	93	100
N6053090C0178	FP	SUPP	359873	COMP	145	100
N6053090C0179	CR	RD	699196	COMP	121	250
N6053090C0180	CR	RD	599694	COMP	126	250
N6053090C0184	FP	SUPP	130000	COMP	281	100
N6053090C0185	FP	SUPP	439980	COMP	89	115
N6053090C0186	FP	SUPP	45500	COMP	83	100
N6053090C0188	FP	SUPP	35280	COMP	116	100
N6053090C0189	FP	SUPP	24168	COMP	150	100
N6053090C0190	FP	SUPP	32594	COMP	114	100
N6053090C0191	FP	SUPP	47710	SS	21	135
N6053090C0192	FP	SUPP	34320	COMP	169	100
N6053090C0194	FP	SUPP	66140	COMP	123	100
N6053090C0195	FP	SUPP	123610	COMP	231	100
N6053090C0201	FP	SUPP	49980	COMP	194	100
N6053090C0203	CR	RD	1044498	COMP	153	400
N6053090C0204	FP	SERV	63576	COMP	209	115
N6053090C0207	FP	SUPP	57660	COMP	225	100
N6053090C0208	FP	RD	497120	COMP	169	150
N6053090C0209	FP	SUPP	37151	COMP	115	100
N6053090C0210	FP	SUPP	71367	COMP	105	100
N6053090C0212	FP	RD	215688	SS	152	185
N6053090C0215	FP	SUPP	1271932	COMP	235	300
N6053090C0217	CR	RD	348433	COMP	160	200
N6053090C0218	FP	RD	35000	COMP	184	150
N6053090C0219	CR	RD	506546.07	COMP	90	250
N6053090C0222	FP	SUPP	32000	SS	118	135
N6053090C0223	CR	RD	531264	COMP	78	250
N6053090C0224	CR	RD	497883	COMP	70	200
N6053090C0225	FP	SUPP	75623	COMP	205	100
N6053090C0227	FP	RD	240942	COMP	72	150
N6053090C0228	FP	SUPP	30887	COMP	14	100
N6053090C0229	FP	RD	31800	COMP	222	150
N6053090C0232	FP	SUPP	980371	COMP	192	150
N6053090C0233	CR	RD	248518	COMP	63	200
N6053090C0235	FP	SUPP	99755	COMP	182	100
N6053090C0236	FP	SUPP	51000	SS	122	135
N6053090C0237	FP	SUPP	44160	SS	203	135
N6053090C0238	FP	SUPP	58800	COMP	178	115

N6053090C0239	FP	SUPP	601785	COMP	178	150
N6053090C0240	FP	SUPP	563952	SS	206	185
N6053090C0244	FP	SUPP	974586	COMP	182	100
N6053090C0245	FP	SUPP	35420	COMP	188	100
N6053090C0246	FP	SUPP	28000	COMP	161	100
N6053090C0248	FP	RD	55282	COMP	104	100
N6053090C0249	FP	RD	50000	COMP	84	100
N6053090C0250	FP	SUPP	28400	SS	111	135
N6053090C0251	FP	SUPP	47960.10	COMP	159	100
N6053090C0253	FP	SUPP	517046	COMP	132	150
N6053090C0254	FP	SUPP	101130	COMP	144	100
N6053090C0255	FP	SUPP	50255	COMP	88	100
N6053090C0256	FP	SUPP	13873313	SS	203	435
N6053090C0259	FP	SUPP	83882	COMP	131	100
N6053090C0263	CR	SERV	499990	SS	108	235
N6053090C0265	FP	SUPP	81250	COMP	155	100
N6053090C0266	FP	SUPP	28390	COMP	78	100
N6053090C0269	FP	SERV	41000	SS	51	135
N6053090C0271	FP	SUPP	65500	COMP	124	100
N6053090C0272	FP	SUPP	124488	COMP	15	100
N6053090C0273	FP	SUPP	55023	COMP	112	100
N6053090C0274	FP	SUPP	133530	COMP	105	100
N6053090C0276	FP	SUPP	52000	COMP	42	100
N6053090C0277	FP	SUPP	39372	COMP	109	100
N6053090C0278	FP	SUPP	61544	COMP	129	100
N6053090C0280	FP	SUPP	26995	COMP	119	100
N6053090C0283	FP	SUPP	47155	COMP	137	100
N6053090C0284	FP	SUPP	49952	SS	98	135
N6053090C0285	FP	SUPP	81440	SS	119	135
N6053090C0287	FP	RD	432080	COMP	169	150
N6053090C0288	FP	SUPP	61000	COMP	27	100
N6053090C0289	FP	SUPP	27700	COMP	173	100
N6053090C0293	FP	SUPP	106240	COMP	10	100
N6053090C0294	FP	SUPP	33197	COMP	94	100
N6053090C0295	FP	SUPP	28000	COMP	134	100
N6053090C0297	FP	SUPP	89803.72	SS	15	135
N6053090C0298	FP	SUPP	377982	COMP	11	100
N6053090C0299	FP	SUPP	75000	SS	57	135
N6053090C0300	CR	SUPP	522842	COMP	174	250
N6053090C0325	FP	SUPP	241330.89	SS	162	135
N6053090C0326	FP	SUPP	99950	COMP	148	100
N6053090C0334	CR	SUPP	156110	COMP	152	200
N6053090C0336	FP	SUPP	484467	SS	75	135

N6053090C0337	FP	SUPP	46255	SS	118	135
N6053090C0340	FP	SUPP	39040	SS	14	135
N6053090C0342	FP	SUPP	136435	COMP	139	100
N6053090C0343	FP	SUPP	458901	COMP	154	100
N6053090C0344	FP	SUPP	77920	COMP	98	100
N6053090C0345	FP	SERV	196650	COMP	146	100
N6053090C0348	FP	SERV	543831	SS	153	185
N6053090C0349	FP	SUPP	50040	COMP	60	100
N6053090C0351	FP	SERV	97606	SS	148	135
N6053090C0352	CR	RD	799672	SS	97	285
N6053090C0353	CR	RD	857742	COMP	143	250
N6053090C0354	FP	SUPP	47500	SS	125	135
N6053090C0356	CR	RD	131845	SS	142	235
N6053090C0360	FP	SUPP	325000	COMP	74	100
N6053090C0362	FP	SUPP	47236.50	SS	119	135
N6053090C0363	FP	SUPP	49999	SS	56	135
N6053090C0364	FP	SUPP	30868	COMP	88	100
N6053090C0367	FP	SUPP	30365	COMP	127	100
N6053090C0369	FP	SERV	218000	COMP	90	100
N6053090C0370	FP	SUPP	80490	COMP	130	100
N6053090C0371	FP	SUPP	61802	SS	98	150
N6053090C0373	FP	SUPP	37800	SS	112	135
N6053090C0374	FP	SUPP	34800	SS	125	135
N6053090C0375	FP	SUPP	38826	SS	118	135
N6053090C0376	FP	SUPP	50640	SS	122	135
N6053090C0377	FP	SUPP	46000	COMP	99	100
N6053090C0381	FP	SUPP	95000	COMP	118	100
N6053090C0388	FP	SUPP	35210	COMP	113	100
N6053090C0389	FP	SUPP	48240	COMP	125	100
N6053090C0391	FP	SUPP	41440	SS	98	135
N6053090C0393	CR	RD	299992	SS	119	235
N6053090C0396	FP	SUPP	41500	COMP	109	100
N6053090C0397	FP	SUPP	40000	SS	119	135
N6053090C0399	FP	SUPP	129847	SS	28	135
N6053090C0401	CR	SERV	89736	COMP	113	200
N6053090C0403	FP	SUPP	32834.32	COMP	84	100
N6053090C0404	FP	SUPP	36920	SS	110	135
N6053090C0405	FP	RD	50000	COMP	104	100
N6053090C0406	FP	RD	70000	SS	103	185
N6053090C0407	FP	SUPP	145230	COMP	108	100
N6053090C0409	CR	RD	44832	COMP	99	100
N6053090C0410	FP	RD	49930	COMP	93	100
N6053090C0411	FP	RD	53194	COMP	49	100

N6053090C0412	FP	SERV	50000	COMP	24	100
N6053090C0413	CR	RD	518162	SS	109	285
N6053090C0414	FP	RD	50073	COMP	105	100
N6053090C0415	FP	RD	43921	COMP	101	165
N6053090C0416	FP	RD	381692	COMP	109	100
N6053090C0417	FP	SUPP	49974	COMP	96	100
N6053090C0418	FP	SUPP	70002	COMP	105	100
N6053090C0419	FP	SUPP	26275	SS	93	135
N6053090C0424	FP	RD	49921	COMP	100	100
N6053090C0425	FP	RD	50000	COMP	93	100
N6053090C0427	FP	SUPP	37426	SS	95	135
N6053090C0428	FP	SUPP	32957	COMP	98	100
N6053090C0430	FP	SUPP	298345	SS	10	135
N6053090C0435	FP	SUPP	36945	SS	80	135
N6053090C0436	FP	SUPP	87901	COMP	92	100
N6053090C0445	FP	SUPP	56884	COMP	84	100
N6053090C0446	FP	SUPP	50000	COMP	60	100
N6053090C0447	FP	SUPP	69500	COMP	85	100
N6053090C0448	FP	SUPP	649996	COMP	84	150
N6053090C0449	FP	SUPP	49717	COMP	73	100
N6053090C0450	FP	SUPP	493921	COMP	86	100
N6053090C0451	FP	SUPP	49512	COMP	60	100
N6053090C0455	FP	SUPP	143752	COMP	78	115
N6053090C0456	FP	SUPP	131856	COMP	78	115
N6053090C0462	FP	SUPP	46700	COMP	72	100
N6053090C0465	FP	SUPP	24116.50	COMP	55	100
N6053090C0470	FP	SUPP	34339	COMP	68	100
N6053090C0472	FP	SUPP	64554	COMP	55	100
N6053090C0473	FP	SUPP	85914	COMP	61	100
N6053090C0477	FP	SUPP	858328.92	COMP	28	150
N6053090C0480	FP	RD	49939	COMP	74	100
N6053090C0482	FP	SUPP	43385	SS	57	135
N6053090C0483	FP	SUPP	450200	SS	5	135
N6053090C0486	CR	RD	1676684	COMP	51	400
N6053090C0487	FP	SERV	49826.76	COMP	32	100
N6053090C0488	FP	RD	51150	COMP	44	100
N6053090C0489	FP	SUPP	48198.75	COMP	15	100
N6053090C0490	CR	RD	712018	COMP	15	250
N6053090C0491	FP	SUPP	84867	COMP	5	100
N6053090C0493	FP	SUPP	29475	SS	35	135
N6053090C0494	FP	SUPP	69000	SS	13	135
N6053090C0500	FP	SUPP	464300	COMP	10	70
N6053090C0502	FP	SUPP	29110	SS	10	70

N6053090C0507	FP	SUPP	125000	COMP	64	100
N6053090C0508	FP	SUPP	39500	COMP	12	100
N6053090C0509	CR	RD	463681	COMP	10	200
N6053090CO131	FP	SUPP	621210	COMP	132	165
N6053090D0010	CR	SUPP	25491.55	COMP	366	200
N6053090D0013	FP	SUPP	1799253	SS	342	335
N6053090D0020	FP	SUPP	120678	COMP	79	115
N6053090D0022	FP	SERV	119850	SS	475	150
N6053090D0026	FP	SUPP	7500000	COMP	207	315
N6053090D0027	FP	SERV	2490000	COMP	214	315
N6053090D0028	FP	SERV	72121.28	COMP	281	115
N6053090D0038	FP	SUPP	152168	COMP	364	100
N6053090D0055	FP	SERV	80880	COMP	268	100
N6053090D0058	CR	SUPP	2826656	COMP	531	400
N6053090D0080	CR	SERV	2573400	COMP	285	400
N6053090D0089	CR	RD	1159999	COMP	306	400
N6053090D0090	FP	RD	699706	SS	109	235
N6053090D0107	CR	SERV	16507057	SS	615	435
N6053090D0126	FP	SERV	141336.95	COMP	119	100
N6053090D0136	CR	SERV	2908282	COMP	318	400
N6053090D0152	FP	SUPP	599000	COMP	129	150
N6053090D0156	CR	SERV	3311795	COMP	261	400
N6053090D0159	FP	SUPP	153863.65	COMP	149	100
N6053090D0199	FP	SUPP	322225	COMP	232	100
N6053090D0333	FP	SERV	438400	COMP	116	100

APPENDIX C: 1991 DATA

Contract Number	Amount	PALT	CT	C Desc.	CN	Score
N6053091C0003	1262465	317	FP	SUPP	COMP	300
N6053091C0011	849411	115	FP	SERV	SS	200
N6053091C0013	38173	816	FP	SUPP	SS	135
N6053091C0018	199996	364	FP	SUPP	COMP	100
N6053091C0019	34650	122	FP	SUPP	SS	135
N6053091C0020	219701	141	FP	SERV	SS	135
N6053091C0029	116431	98	CR	SERV	SS	235
N6053091C0038	1320433	338	CR	RD	COMP	400
N6053091C0042	162725	261	FP	SUPP	COMP	100
N6053091C0044	276816	222	FP	SERV	COMP	100
N6053091C0046	170884	340	FP	SUPP	COMP	100
N6053091C0047	1771045	141	CR	RD	COMP	400
N6053091C0048	28520	123	FP	SUPP	COMP	100
N6053091C0051	189764	217	CR	RD	COMP	200
N6053091C0052	89923	241	CR	SUPP	COMP	200
N6053091C0060	61820	101	FP	SUPP	COMP	0
N6053091C0070	1212826	291	FP	SUPP	COMP	300
N6053091C0074	54537	220	FP	SUPP	COMP	100
N6053091C0076	1532155	404	FP	SUPP	COMP	300
N6053091C0077	282085	154	FP	SUPP	SS	135
N6053091C0087	1501338	319	FP	SUPP	COMP	300
N6053091C0096	34400	130	FP	SUPP	COMP	100
N6053091C0097	85000	261	FP	SUPP	COMP	100
N6053091C0098	74165	126	FP	SUPP	COMP	100
N6053091C0104	48908	174	FP	SUPP	COMP	100
N6053091C0105	49997	82	FP	SUPP	COMP	100
N6053091C0107	44700	80	FP	SUPP	SS	135
N6053091C0111	91161.90	125	FP	SERV	COMP	100
N6053091C0112	306930	199	FP	SERV	COMP	100
N6053091C0115	36639	90	FP	SUPP	COMP	100
N6053091C0120	498659	105	FP	RD	COMP	100
N6053091C0121	81750	105	FP	SUPP	COMP	100
N6053091C0123	109548.70	206	FP	SUPP	SS	135
N6053091C0124	82085.80	26	FP	SUPP	SS	135
N6053091C0126	850000	278	FP	SERV	COMP	150
N6053091C0127	1400000	300	FP	SERV	COMP	315
N6053091C0128	115500	182	FP	SUPP	COMP	100

N6053091C0129	36950	78	FP	SUPP	COMP	100
N6053091C0130	454730	61	FP	SUPP	SS	135
N6053091C0131	83292	151	FP	SUPP	COMP	100
N6053091C0132	218762.30	157	FP	SUPP	COMP	100
N6053091C0134	191000	162	FP	SUPP	COMP	100
N6053091C0137	42650	260	FP	SUPP	COMP	100
N6053091C0139	84150	273	FP	RD	COMP	150
N6053091C0141	2900000.13	287	CR	SERV	COMP	400
N6053091C0142	130000	91	FP	SUPP	COMP	115
N6053091C0143	78720	142	FP	SUPP	COMP	100
N6053091C0144	72000	129	FP	RD	SS	185
N6053091C0145	39249	129	FP	SUPP	COMP	100
N6053091C0146	39342	25	FP	SUPP	COMP	135
N6053091C0147	83900	18	FP	SUPP	SS	150
N6053091C0150	27100	141	FP	SUPP	COMP	100
N6053091C0151	296033	168	FP	SUPP	SS	135
N6053091C0152	76500	139	FP	SUPP	COMP	100
N6053091C0154	147059	202	FP	SUPP	COMP	100
N6053091C0157	517000	259	CR	SUPP	SS	285
N6053091C0159	460000	206	FP	SERV	COMP	115
N6053091C0161	478870	126	FP	SUPP	COMP	100
N6053091C0162	217945	207	FP	SUPP	COMP	100
N6053091C0164	40082	237	FP	SUPP	COMP	100
N6053091C0170	114553	208	FP	SUPP	COMP	100
N6053091C0171	300000	3	FP	SUPP	SS	135
N6053091C0172	46000	126	FP	RD	SS	150
N6053091C0173	50022	106	FP	SUPP	COMP	100
N6053091C0174	49910	106	FP	SUPP	COMP	100
N6053091C0175	54860	163	FP	SUPP	COMP	100
N6053091C0177	49320	21	FP	SUPP	SS	135
N6053091C0178	29188.50	1	FP	SUPP	SS	135
N6053091C0179	1800000	217	CR	RD	COMP	400
N6053091C0181	54475	161	FP	SUPP	COMP	115
N6053091C0182	90030	203	FP	SUPP	COMP	115
N6053091C0184	1600000	153	FP	SERV	COMP	315
N6053091C0188	35690	41	FP	SUPP	SS	135
N6053091C0190	2636329	208	CR	SERV	SS	435
N6053091C0192	2500000	200	FP	SERV	COMP	315
N6053091C0193	135000	186	FP	SERV	COMP	115
N6053091C0194	99800	189	FP	RD	COMP	0
N6053091C0195	50000	58	FP	RD	COMP	100
N6053091C0196	96024	99	FP	SUPP	COMP	100
N6053091C0197	76400	197	FP	SUPP	COMP	100

N6053091C0198	97521	89	FP	SERV	SS	135
N6053091C0199	92578	132	FP	SERV	COMP	100
N6053091C0200	101290	193	FP	SUPP	COMP	100
N6053091C0206	62334	136	FP	SUPP	SS	135
N6053091C0208	103889.05	153	FP	SERV	SS	135
N6053091C0211	91370	182	FP	SUPP	SS	135
N6053091C0212	66557	180	FP	RD	COMP	150
N6053091C0213	37494	118	FP	RD	COMP	150
N6053091C0214	2110309	155	CR	RD	COMP	400
N6053091C0215	49444	104	FP	RD	COMP	100
N6053091C0216	49725	164	FP	RD	COMP	100
N6053091C0217	49960	154	FP	RD	COMP	100
N6053091C0218	49906	136	FP	RD	COMP	100
N6053091C0219	49941	169	FP	RD	COMP	100
N6053091C0220	55960	81	FP	SUPP	COMP	115
N6053091C0221	50853	149	FP	RD	COMP	100
N6053091C0224	50000	99	FP	RD	COMP	100
N6053091C0226	234045	51	FP	SUPP	SS	135
N6053091C0228	398241	137	FP	SUPP	COMP	100
N6053091C0231	38624	50	FP	SUPP	COMP	100
N6053091C0232	49843	54	FP	SUPP	COMP	100
N6053091C0233	49888.47	80	FP	SUPP	COMP	100
N6053091C0234	49987	144	FP	RD	COMP	100
N6053091C0236	48510	149	FP	RD	COMP	100
N6053091C0237	26864	148	FP	SUPP	COMP	100
N6053091C0239	49978	82	FP	RD	COMP	100
N6053091C0240	36250	103	FP	SUPP	COMP	100
N6053091C0241	66319	104	FP	RD	COMP	150
N6053091C0242	45100	96	FP	SUPP	COMP	100
N6053091C0243	57280	75	FP	RD	COMP	100
N6053091C0244	45000	4	FP	SUPP	SS	135
N6053091C0245	35592	129	FP	SUPP	SS	135
N6053091C0246	493271.64	159	FP	SUPP	COMP	100
N6053091C0249	343282	158	CR	RD	COMP	200
N6053091C0250	30000	109	FP	SUPP	SS	135
N6053091C0253	29821.50	140	FP	SUPP	COMP	100
N6053091C0254	2292450	148	CR	RD	SS	435
N6053091C0255	48510	14	FP	SUPP	SS	135
N6053091C0256	49912	139	FP	RD	COMP	100
N6053091C0258	49987	75	FP	RD	COMP	100
N6053091C0259	50000	144	FP	RD	COMP	100
N6053091C0260	51556	130	FP	SUPP	COMP	100
N6053091C0262	49940	70	FP	RD	COMP	100

N6053091C0263	56674	91	FP	RD	COMP	100
N6053091C0264	55000	125	FP	RD	COMP	100
N6053091C0265	74050	90	FP	SUPP	COMP	100
N6053091C0278	50000	97	FP	SUPP	COMP	100
N6053091C0279	49400	72	FP	SUPP	COMP	100
N6053091C0280	49886	126	FP	SUPP	COMP	100
N6053091C0281	50600.77	105	FP	SUPP	COMP	100
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N6053091C0283	49635	131	FP	RD	SS	100
N6053091C0284	49999	134	FP	RD	COMP	100
N6053091C0285	50000	128	FP	RD	COMP	100
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N6053091C0289	52614	116	FP	SUPP	COMP	100
N6053091C0291	56552	120	FP	RD	SS	100
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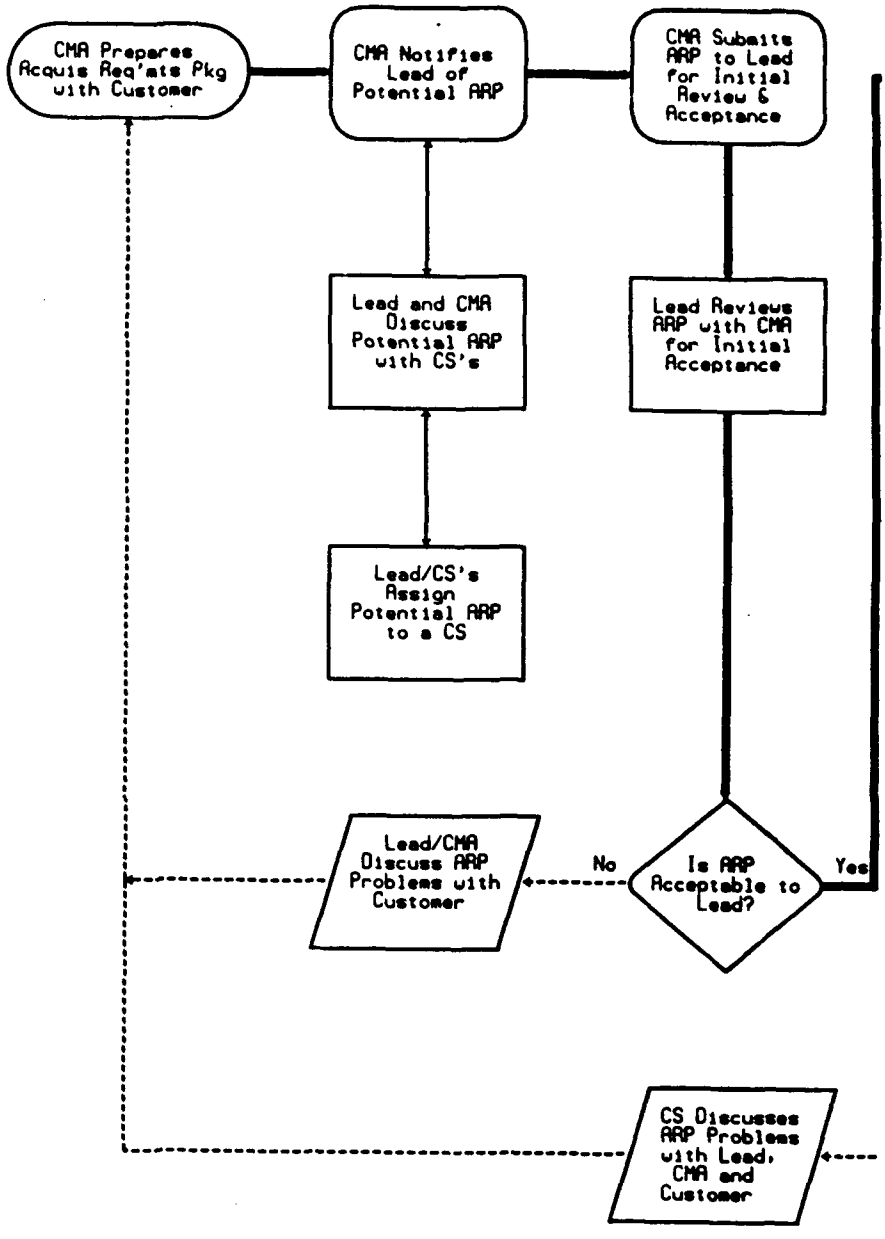
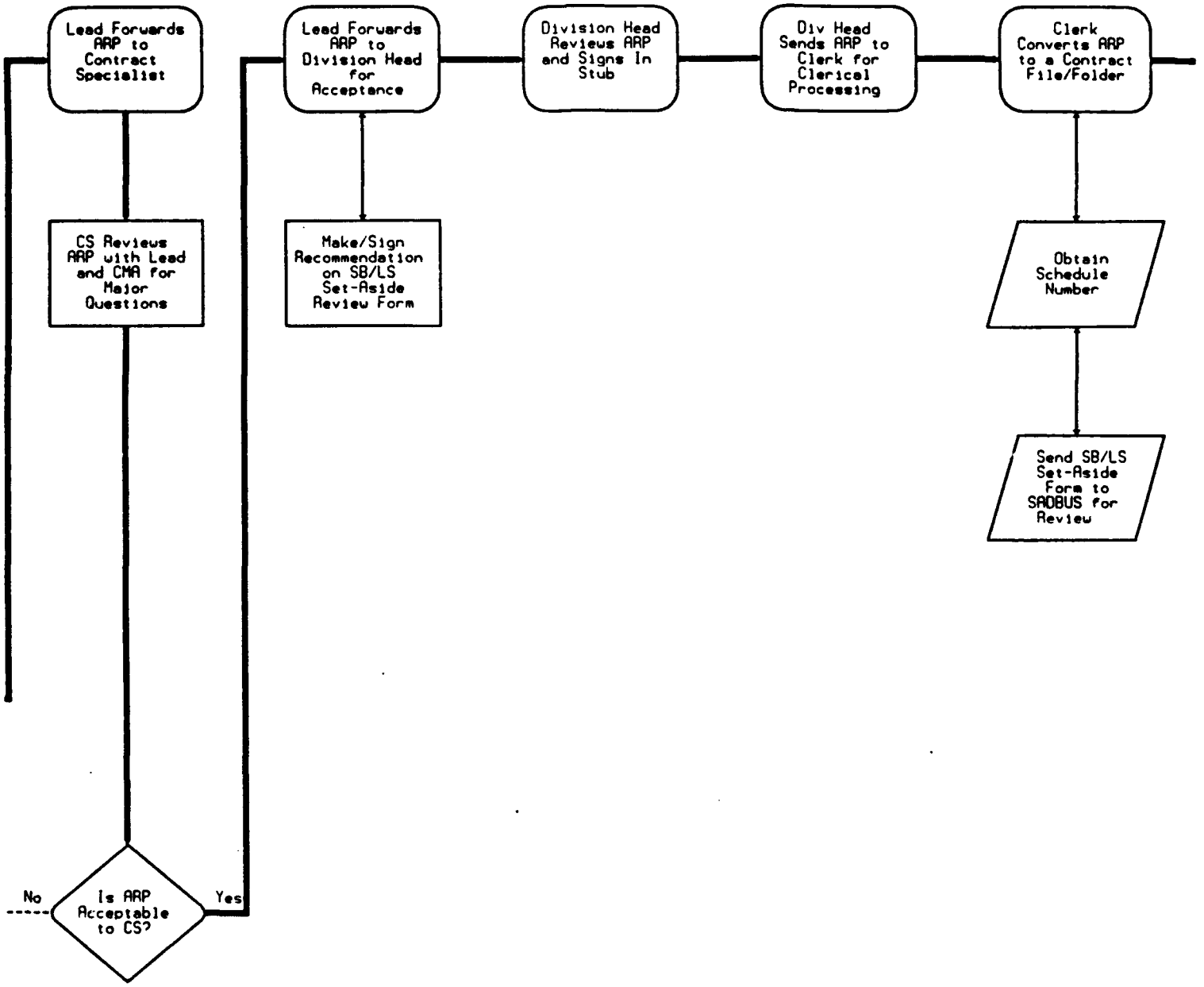
N6053091C0296	60275	112	FP	SUPP	SS	135
N6053091C0297	50000	131	FP	RD	COMP	100
N6053091C0298	44300	131	FP	SUPP	SS	100
N6053091C0300	44245	11	FP	SUPP	SS	135
N6053091C0301	60000	132	FP	SUPP	SS	135
N6053091C0303	55906	136	FP	RD	SS	150
N6053091C0305	46733	136	FP	SUPP	SS	135
N6053091C0306	48000	103	FP	SUPP	SS	135
N6053091C0309	66065	113	FP	SUPP	COMP	135
N6053091C0310	51000	133	FP	SUPP	COMP	100
N6053091C0313	25025	131	FP	SUPP	COMP	135
N6053091C0314	34295.25	110	FP	SUPP	SS	135
N6053091C0315	95300	116	FP	SUPP	COMP	100
N6053091C0316	46070	1	FP	SUPP	SS	100
N6053091C0317	269300	83	FP	SUPP	COMP	100
N6053091C0320	51274	35	FP	RD	SS	100
N6053091C0322	72000	99	FP	RD	SS	185
N6053091C0323	41051	7	FP	SUPP	SS	135
N6053091C0324	49900	120	FP	RD	SS	150
N6053091C0327	41959.53	111	FP	SUPP	COMP	100
N6053091C0328	49316	7	FP	SUPP	SS	135
N6053091C0333	146500	62	FP	SUPP	SS	135
N6053091C0334	44762.10	7	FP	SUPP	SS	135
N6053091C0335	476367	46	FP	SUPP	SS	135
N6053091C0336	36438	102	FP	SUPP	SS	100
N6053091C0337	30000	60	FP	RD	SS	150

N6053091C0338	45260	107	FP	SUPP	SS	135
N6053091C0339	48500	60	FP	RD	SS	185
N6053091C0340	49907.32	78	FP	RD	SS	185
N6053091C0341	50000	7	FP	SUPP	SS	135
N6053091C0345	147564	87	FP	SUPP	COMP	115
N6053091C0346	75575	103	FP	SERV	SS	135
N6053091C0348	168216	103	FP	SUPP	COMP	100
N6053091C0350	48568	84	FP	RD	COMP	100
N6053091C0351	53550	102	FP	SUPP	COMP	100
N6053091C0352	49131	101	FP	SUPP	COMP	100
N6053091C0354	60991	92	FP	SUPP	COMP	100
N6053091C0356	49735	85	FP	SUPP	COMP	100
N6053091C0360	138777.35	62	FP	SUPP	SS	135
N6053091C0361	34000	22	FP	SUPP	SS	135
N6053091C0363	940225	71	FP	SUPP	COMP	150
N6053091C0364	75894	69	FP	RD	SS	185
N6053091C0365	37440	83	FP	SUPP	SS	135
N6053091C0372	56477	71	FP	RD	COMP	100
N6053091C0376	244894	73	FP	SUPP	COMP	115
N6053091C0380	145840	70	FP	SUPP	COMP	100
N6053091C0382	25246	64	FP	SUPP	COMP	100
N6053091C0383	27000	41	FP	SUPP	COMP	100
N6053091C0384	49982	56	FP	RD	SS	185
N6053091C0385	95510.50	23	FP	SUPP	SS	135
N6053091C0388	61810	29	FP	SUPP	SS	135
N6053091C0394	31980	6	FP	SUPP	SS	135
N6053091C0396	228000	33	CR	RD	COMP	200
N6053091C0397	48000	3	FP	SUPP	SS	135
N6053091C0400	65699	20	FP	SUPP	SS	150
N6053091C0402	1900000	217	CR	SUPP	COMP	400
N6053091D0004	79455	251	CR	SERV	COMP	200
N6053091D0022	8067985	337	CR	SERV	COMP	400
N6053091D0024	1000000	223	FP	SUPP	SS	185
N6053091D0039	997787.92	246	CR	RD	SS	285
N6053091D0041	548601	186	FP	SUPP	COMP	150
N6053091D0053	1198426	308	CR	RD	COMP	400
N6053091D0061	3081240.82	239	FP	SUPP	COMP	300
N6053091D0063	1142193	679	CR	SERV	COMP	400
N6053091D0064	133958	356	CR	SERV	COMP	400
N6053091D0067	436150	643	CR	RD	COMP	200
N6053091D0079	157750	229	FP	SUPP	COMP	100
N6053091D0080	113516	349	FP	SUPP	COMP	100
N6053091D0081	4057413	309	CR	SERV	COMP	400

N6053091D0083	1348673	87	CR	SERV	COMP	400
N6053091D0085	1408018	612	CR	SERV	SS	435
N6053091D0091	192787	344	FP	SUPP	COMP	100
N6053091D0106	820895	67	CR	SERV	COMP	285
N6053091D0124	982000	171	FP	SERV	COMP	150
N6053091D0168	484190	175	FP	SUPP	COMP	100
N6053091D0169	92880	161	FP	SUPP	COMP	100
N6053091D0180	9901008	218	CR	SERV	SS	435
N6053091D0185	50000	164	FP	SUPP	COMP	100
N6053091D0203	770775	193	FP	SUPP	COMP	150
N6053091D0229	430550	169	FP	SUPP	COMP	100
N6053091D0290	6268210.65	130	FP	SUPP	COMP	315
N6053091D0312	158750	131	FP	SUPP	COMP	100
N6053091D0369	75000	27	FP	SUPP	COMP	115
N6053091D0370	75000	46	FP	SUPP	COMP	115
N6053091D0371	50000	38	FP	SUPP	COMP	100
N6053091D0390	2421639	45	CR	SERV	SS	435

APPENDIX D: FLOW DIAGRAM OF THE PROCUREMENT PROCESS





FLOWCHART CREATED BY
RICHARD HACKNEY, CODE 254
NAWC-WPNS, CHINA LAKE, CA

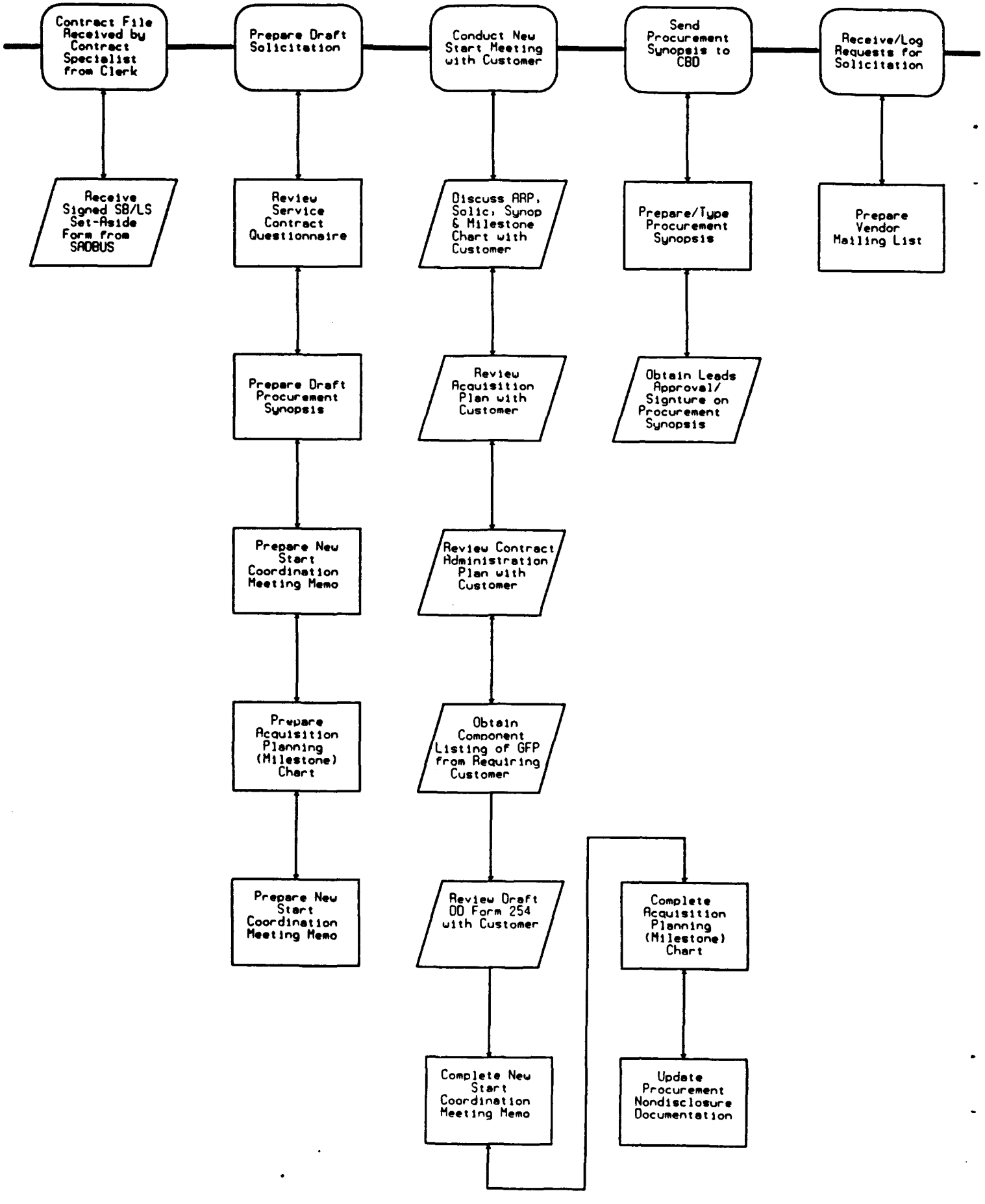
LEGEND

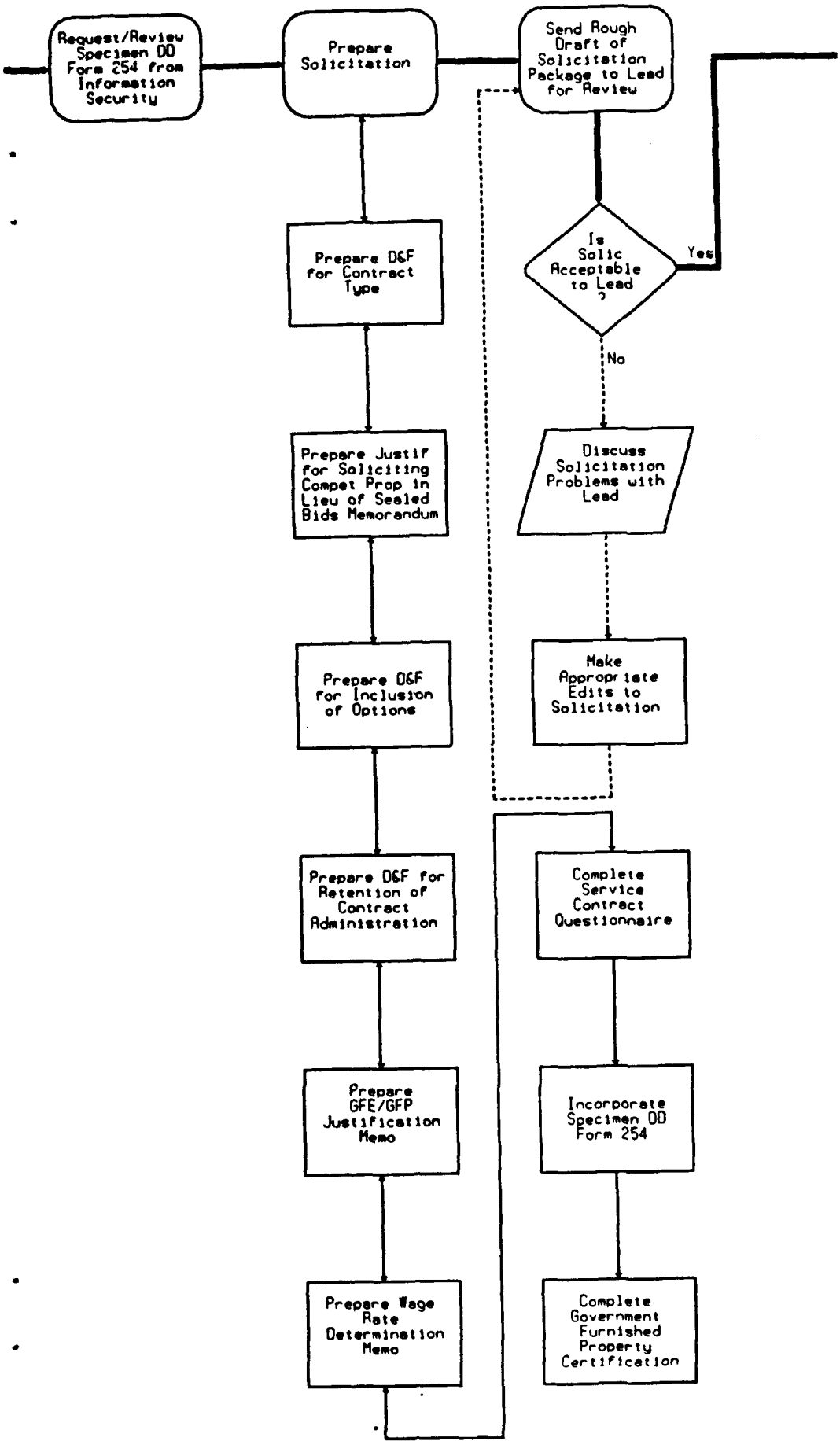
Critical Process Step

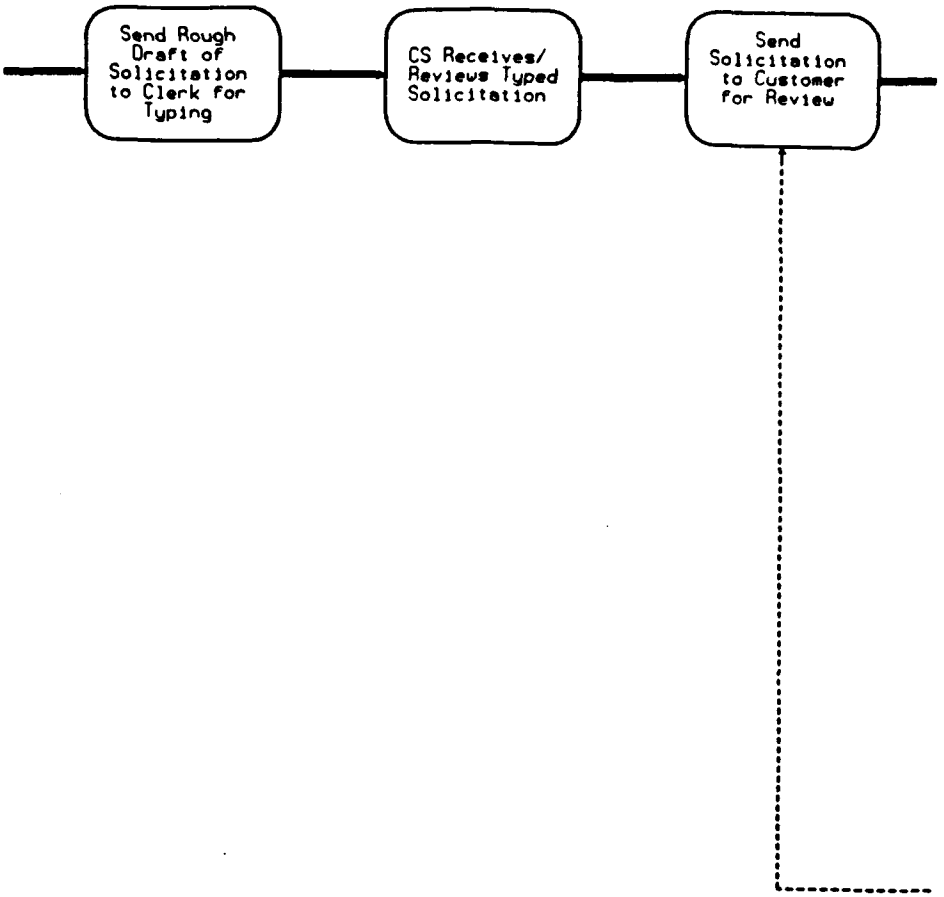
Subprocess Accomplished by Contract Specialist or Clerk

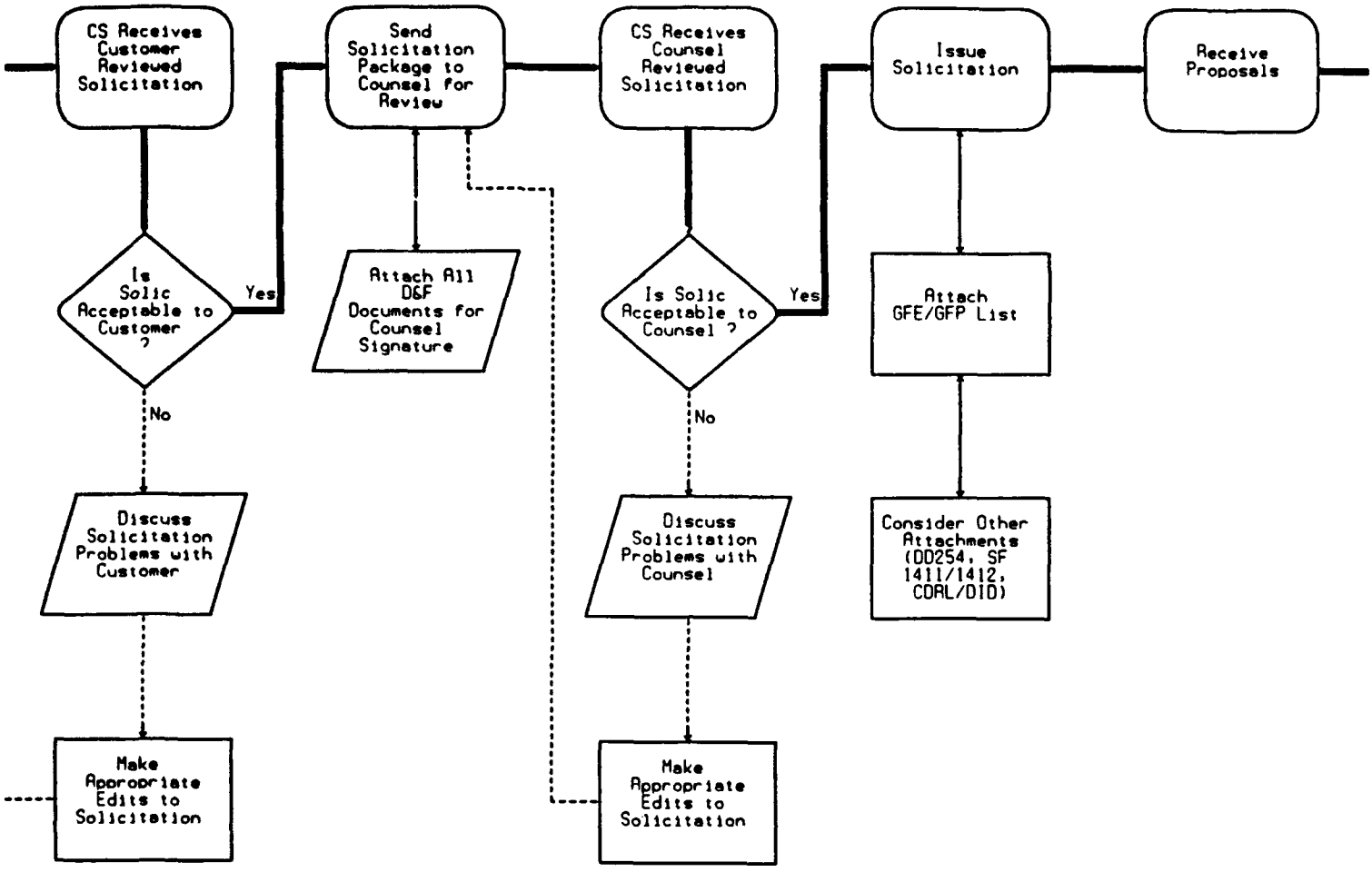
Information from Outside Source

Decision Point

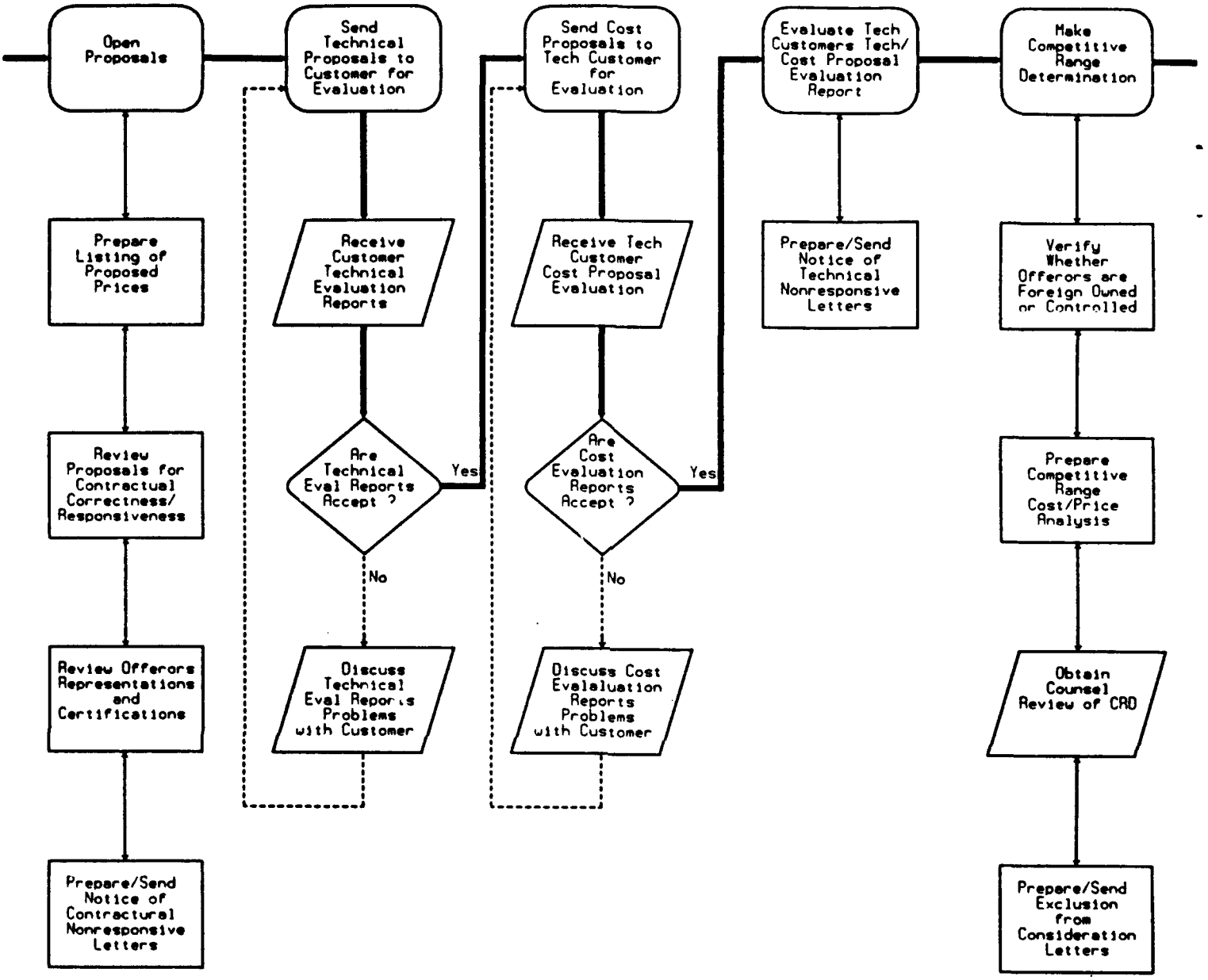

Contract File Received by Contract Specialist from Clerk
Prepare Draft Solicitation
Conduct New Start Meeting with Customer
Send Procurement Synopsis to CBD
Receive/Log Requests for Solicitation
Receive Signed SB/LS Set-Aside Form from SADBUS
Review Service Contract Questionnaire
Discuss ARP, Solic, Synop & Milestone Chart with Customer
Prepare/Type Procurement Synopsis
Prepare Vendor Mailing List
Prepare Draft Procurement Synopsis
Review Acquisition Plan with Customer
Obtain Leads Approval/ Signture on Procurement Synopsis
Prepare New Start Coordination Meeting Memo
Review Contract Administration Plan with Customer
Prepare Acquisition Planning (Milestone) Chart
Obtain Component Listing of GFP from Requiring Customer
Prepare New Start Coordination Meeting Memo
Review Draft DD Form 254 with Customer
Complete Acquisition Planning (Milestone) Chart
Complete New Start Coordination Meeting Memo
Update Procurement Nondisclosure Documentation

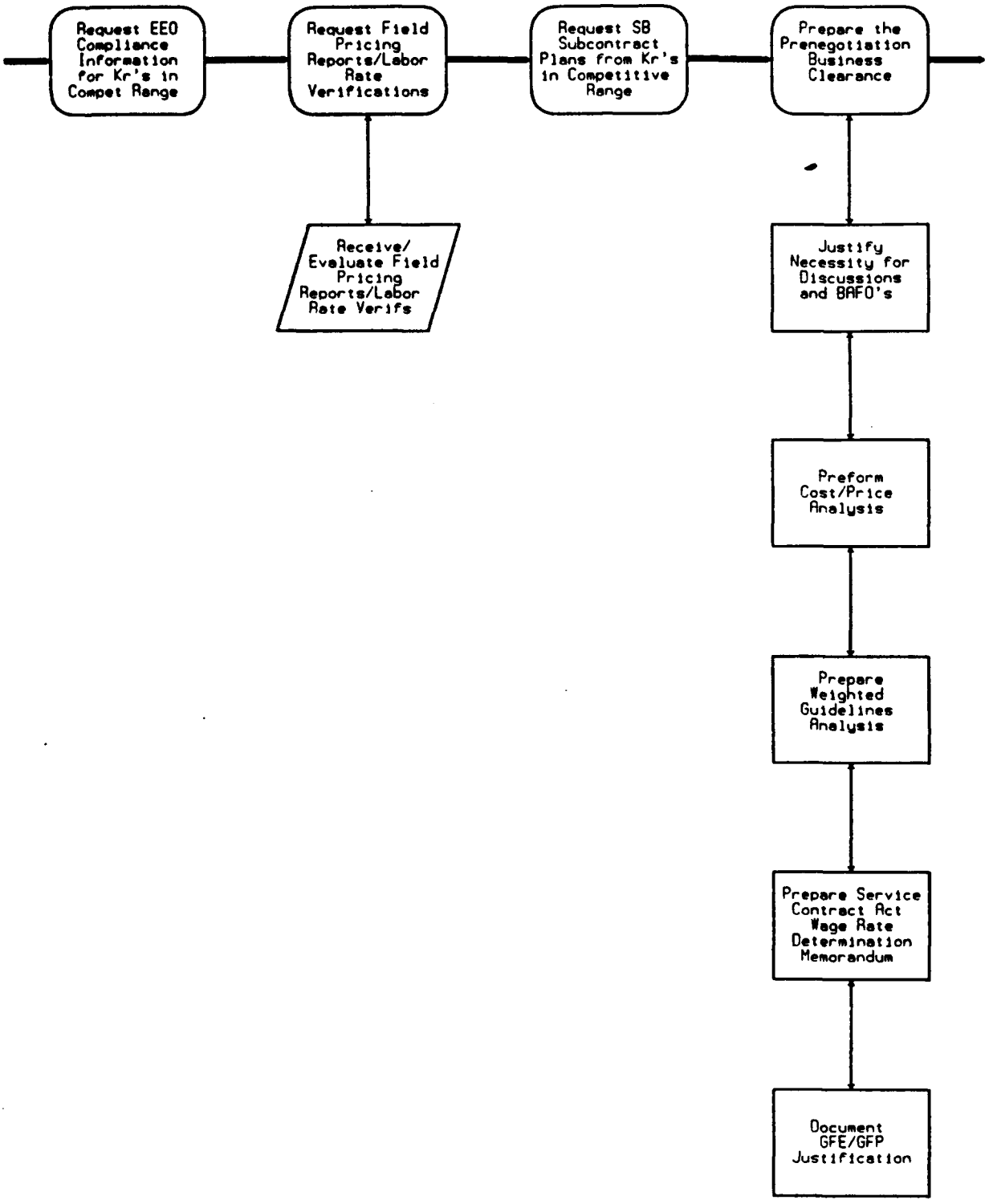

Request/Review Specimen DD Form 254 from Information Security
Prepare Solicitation
Send Rough Draft of Solicitation Package to Lead for Review
Is Solic Acceptable to Lead ?
Yes
No
Prepare D&F for Contract Type
Prepare Justif for Soliciting Compet Prop in Lieu of Sealed Bids Memorandum
Prepare D&F for Inclusion of Options
Prepare D&F for Retention of Contract Administration
Prepare GFE/GFP Justification Memo
Prepare Wage Rate Determination Memo
Discuss Solicitation Problems with Lead
Make Appropriate Edits to Solicitation
Complete Service Contract Questionnaire
Incorporate Specimen DD Form 254
Complete Government Furnished Property Certification

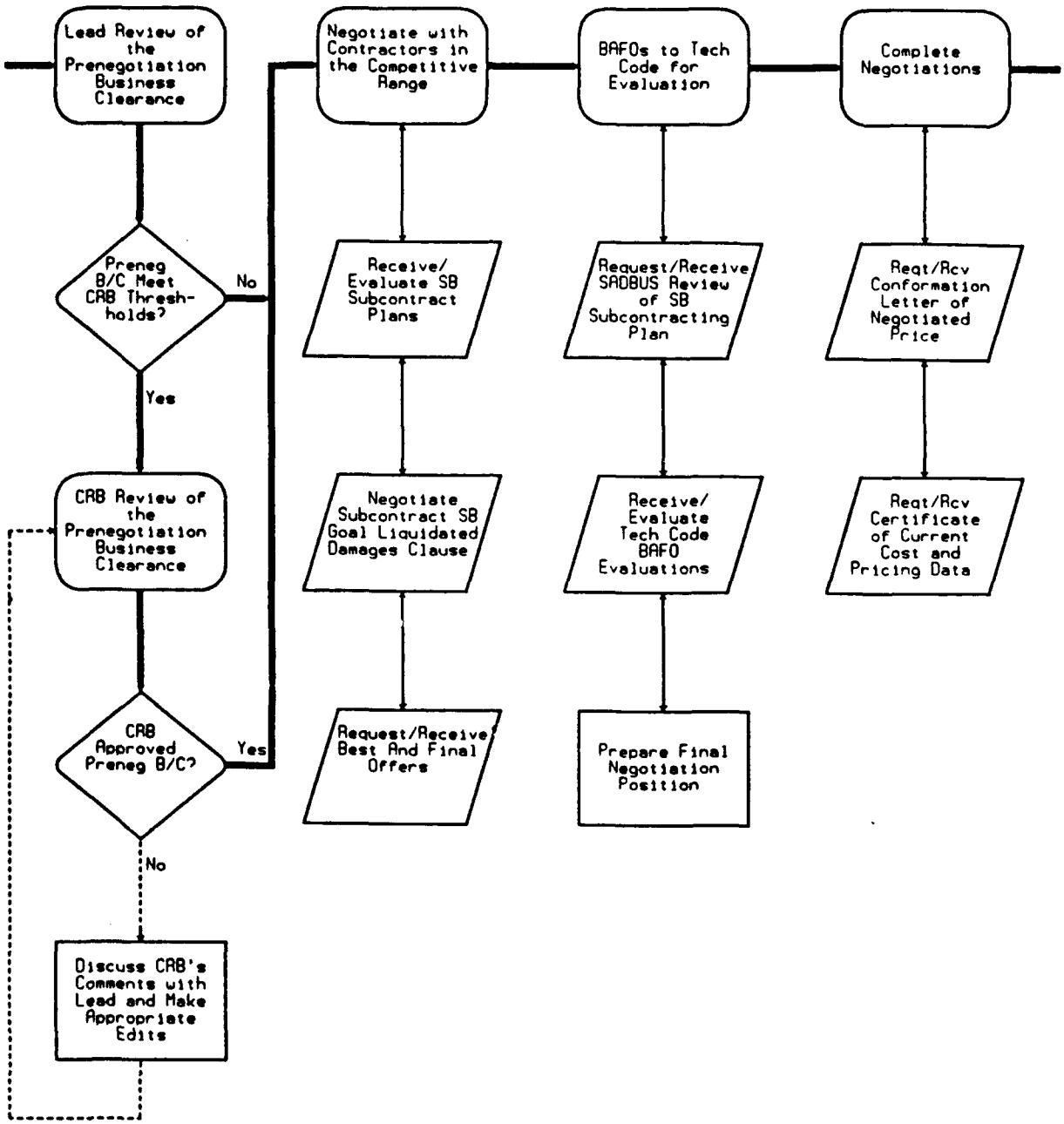

Send Rough Draft of Solicitation to Clerk for Typing
CS Receives/ Reviews Typed Solicitation
Send Solicitation to Customer for Review

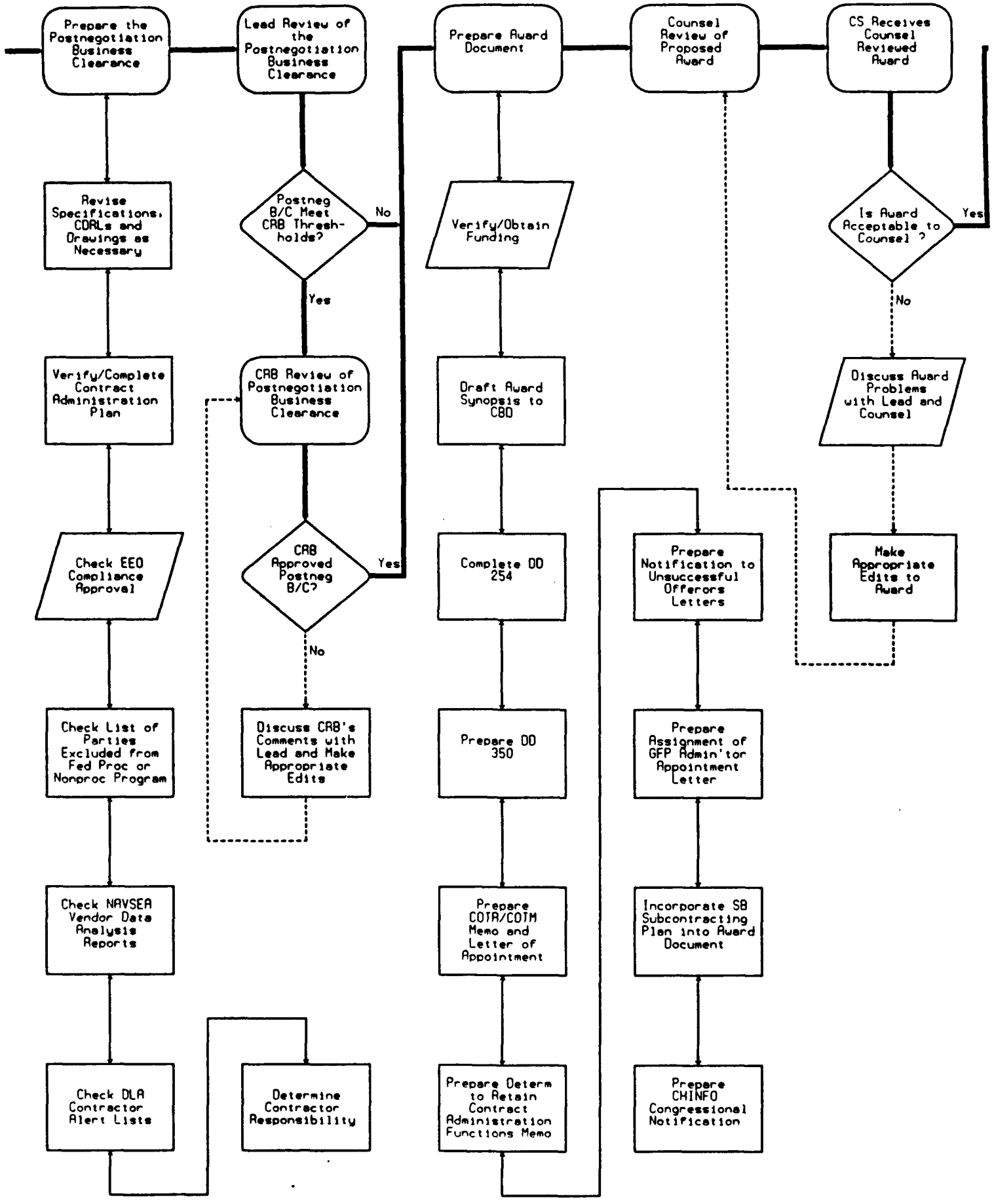

CS Receives Customer Revieued Solicitation
Send Solicitation Package to Counsel for Review
CS Receives Counsel Revieued Solicitation
Issue Solicitation
Receive Proposals
Is Solic Acceptable to Customer ?
Yes
No
Attach All D&F Documents for Counsel Signature
Is Solic Acceptable to Counsel ?
Yes
No
Attach GFE/GFP List
Discuss Solicitation Problems with Customer
Discuss Solicitation Problems with Counsel
Consider Other Attachments (DD254, SF 1411/1412, CDRL/DID)
Make Appropriate Edits to Solicitation
Make Appropriate Edits to Solicitation

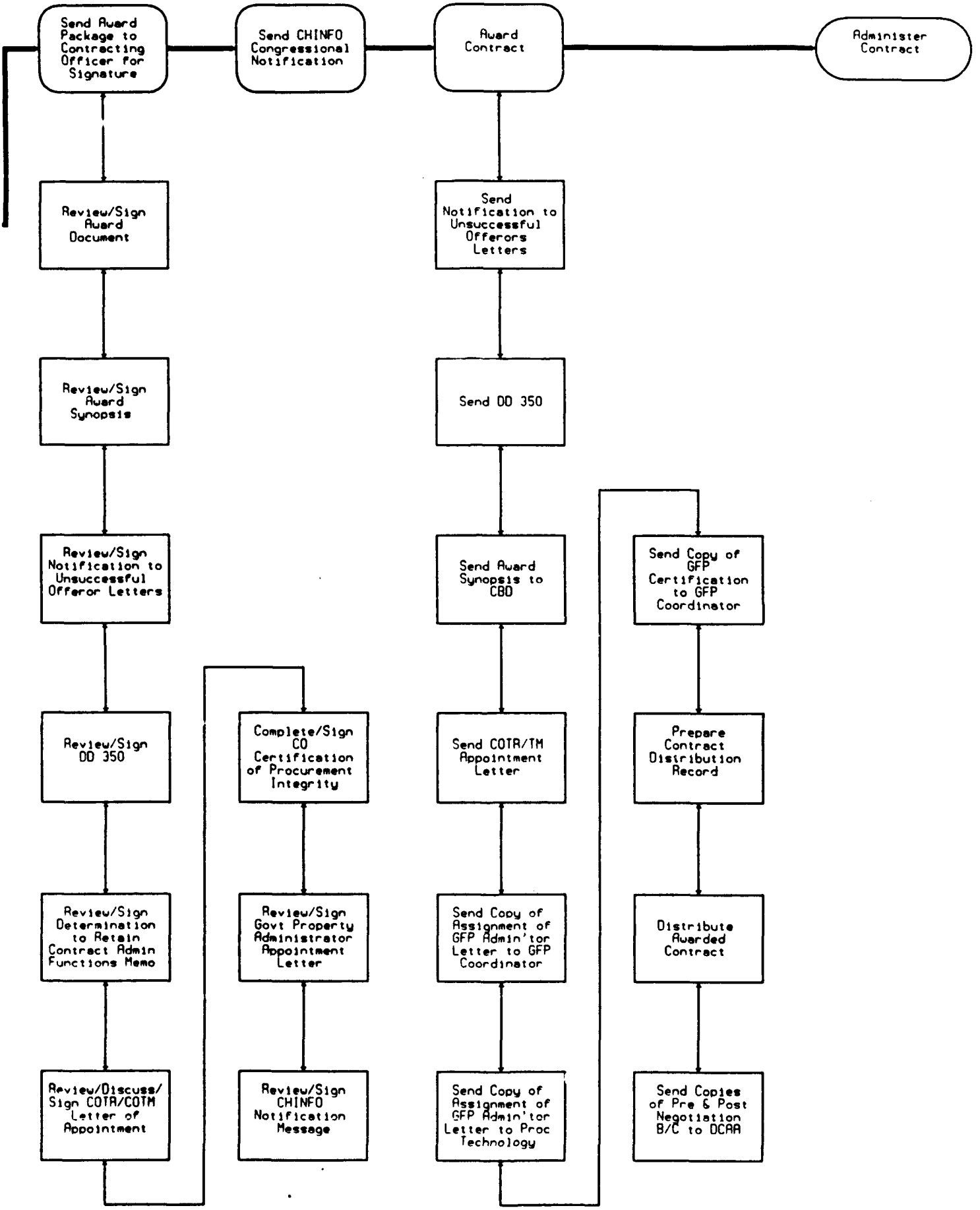
E PROCUREMENT FLOWCHART




Request EEO Compliance Information for Kr's in Compet Range
Request Field Pricing Reports/Labor Rate Verifications
Request SB Subcontract Plans from Kr's in Competitive Range
Prepare the Prenegotiation Business Clearance
Receive/ Evaluate Field Pricing Reports/Labor Rate Verifs
Justify Necessity for Discussions and BAFO's
Preform Cost/Price Analysis
Prepare Weighted Guidelines Analysis
Prepare Service Contract Act Wage Rate Determination Memorandum
Document GFE/GFP Justification


Lead Review of the Prenegotiation Business Clearance
Preneg B/C Meet CRB Thresh-holds?
No
Yes
CRB Review of the Prenegotiation Business Clearance
CRB Approved Preneg B/C?
Yes
No
Discuss CRB's Comments with Lead and Make Appropriate Edits
Negotiate with Contractors in the Competitive Range
Receive/ Evaluate SB Subcontract Plans
Negotiate Subcontract SB Goal Liquidated Damages Clause
Request/Receive Best And Final Offers
BAFOs to Tech Code for Evaluation
Request/Receive SADBUS Review of SB Subcontracting Plan
Receive/ Evaluate Tech Code BAFO Evaluations
Prepare Final Negotiation Position
Complete Negotiations
Reqt/Rcv Conformation Letter of Negotiated Price
Reqt/Rcv Certificate of Current Cost and Pricing Data


Prepare the Postnegotiation Business Clearance
Lead Review of the Postnegotiation Business Clearance
Prepare Award Document
Counsel Review of Proposed Award
CS Receives Counsel Reviewed Award
Revise Specifications, CDRLs and Drawings as Necessary
Postneg B/C Meet CAB Thresh-holds?
No
Yes
Verify/Obtain Funding
Is Award Acceptable to Counsel ?
Yes
No
Verify/Complete Contract Administration Plan
CAB Review of Postnegotiation Business Clearance
Draft Award Synopsis to CBD
Discuss Award Problems with Lead and Counsel
Check EEO Compliance Approval
CAB Approved Postneg B/C?
Yes
No
Complete DD 254
Prepare Notification to Unsuccessful Offerors Letters
Make Appropriate Edits to Award
Check List of Parties Excluded from Fed Proc or Nonproc Program
Discuss CAB's Comments with Lead and Make Appropriate Edits
Prepare DD 350
Prepare Assignment of GFP Admin'tor Appointment Letter
Check NAVSEA Vendor Data Analysis Reports
Prepare COTR/COTM Memo and Letter of Appointment
Incorporate SB Subcontracting Plan into Award Document
Check DLA Contractor Alert Lists
Determine Contractor Responsibility
Prepare Determ to Retain Contract Administration Functions Memo
Prepare CHINFO Congressional Notification


Send Award Package to Contracting Officer for Signature
Send CHINFO Congressional Notification
Award Contract
Administer Contract
Review/Sign Award Document
Review/Sign Award Synopsis
Review/Sign Notification to Unsuccessful Offeror Letters
Review/Sign DD 350
Review/Sign Determination to Retain Contract Admin Functions Memo
Review/Discuss/ Sign COTR/COTM Letter of Appointment
Complete/Sign CO Certification of Procurement Integrity
Review/Sign Govt Property Administrator Appointment Letter
Review/Sign CHINFO Notification Message
Send Notification to Unsuccessful Offerors Letters
Send DD 350
Send Award Synopsis to CBD
Send COTR/TM Appointment Letter
Send Copy of Assignment of GFP Admin'tor Letter to GFP Coordinator
Send Copy of Assignment of GFP Admin'tor Letter to Proc Technology
Send Copy of GFP Certification to GFP Coordinator
Prepare Contract Disiribution Record
Distribute Awarded Contract
Send Copies of Pre & Post Negotiation B/C to DCAA

APPENDIX E: COMPLEXITY POINT STRUCTURE

P/O NO:N60530-9_____ AMOUNT:$_____

SIMPLIFIED PURCHASE COMPLEXITY POINT STRUCTURE

1. POINTS	ALL INCOMING ACTIONS
1	

2. POINTS	ADDITIONAL CONSIDERATIONS
1	Written RFQ
1	Sole Source
2	R & D
2	N T E
1	Attachments\Exhibits
1	Written Amemdments
2	Unauthorized Commitment

3. POINTS	COMPLETION OF WORKSHEET/PRICING MEMO

CANCELLATIONS: Credit will be given for ALL points accumulated at the time of cancellation

4. POINTS	AWARD PROCESS
1	Each 5 line items (Award CLINS
1	Less than 2500
3	2501 - 10 K
4	10,001 - 25 K
2	More than 25 K (GSA)

NOTE: If an "F" code & commodity code starts with "70" then exclude from Simplified Purchase - goes to Major Contracts

5. POINTS	MODIFICATIONS
4	Claim
2	Bilateral
1	Unilateral/Admin

TOTAL POINTS: _____

FILE NAME:SMFINAL.WK1 REVISED 4/20/92

CONTRACT NO:N60530-9__-_____ AMOUNT:$_____

MAJOR CONTRACTS COMPLEXITY POINT STRUCTURE - PRE AWARD RECEIPT/REVIEW OF A R P

1. DOLLAR VALUE	
POINTS:	
100	UNDER 500 K
150	501 K - 1 M
300	1 M - 10 M
400	10,001 M - 50 M
500	OVER 50 M
100	SBIR (All phases-Incl. $$)
SBIR MAX = 100 PTS. + ADMIN.	
2. TYPES OF CONTRACTS	
POINTS:	
25	ALL C O S T TYPES
50	R & D - FIXED PRICE ONLY
15	ADPE Requiring Life Cycle or Desirable Options
25	CLASSIFIED MATERIALS
3. PRE RFP PROCESS (Fixed Price)	
POINTS: J & A	
25	UNDER $1 M
35	$1M+ - $10 M
50	OVER $10 M
25	PREPROPOSAL CONFERENCE
**********	
25	DISTRIBUTION TO 15 OR MORE VENDORS (MAILING LIST)
70% OF POINTS TO HERE FOR EACH 2ND OR ADDTL AWARD FOR MULTIPLE AWARDS (EX: BAA OR DEVELOPMENT. SPLITS AND SBIRS ARE NOT INCLUDED)	
4. POST RFP & FIRST BUS CL. (EXCLUDES SBIRS)	
POINTS:	
100	GREATEST VALUE (SOURCE SEL)
10	AMENDMENTS (EACH)
25	PROTESTS
50	TURNIP FACTOR (EG:KR W/O APPR. RATES,ACCTG SYSTEM, PREV GOVT OR COST TYPE CONTRACT)

5. NEGOTIATIONS	
POINTS:	
10	AMENDMENTS (EACH)
15	FACE-TO-FACE
# IN COMPETITIVE RANGE:	
25	1 KR WITHOUT J & A
25	MORE THAN 3 OFFERORS (NO SBIRS)
25	PROTEST
6. POST BUSINESS CLEARANCE	
5	WRITE IT
5	PRE-AWARD SURVEY
25	PROTEST
7. A W A R D	
POINTS:	
25	PROTEST
5	SPLIT AWARD (EACH)
ADJUSTMENTS (PLUS/MINUS)	
	$$ THRESHOLD CHANGE
	TYPE OF CONTRACT CHANGE
RETURNS/CANCELLATIONS: (PERCENTAGE OF POINTS ACCUMULATED)	
AFTER #3	30% CREDIT ONCE RFP IS COMPLETED
AFTER #4	45% CREDIT
AFTER #5	60% CREDIT
AFTER #6	90% CREDIT

DEFINITION:
PROTEST = TO GAO/GSBCA/DISTRICT COURT. MULTIPLE OFFEROR PROTESTS AT THE SAME STAGE (ANY STAGE OF PROCESS) = 25 POINT TOTAL

NOTE: POINTS ABOVE THE *** LINE WILL BE AWARDED UPON RECEIPT OF THE ARP FOR PROCUREMENT

FILE NAME:REVCSPTS.WK1 T O T A L : _____ REVISED: 4/20/92

CONTRACT NO:N60530-9__-_____ AWD AMT:$_____

MAJOR CONTRACTS COMPLEXITY POINT STRUCTURE - ADMINISTRATION

B A S I C A D M I N I S T R A T I O N	
1. TYPES OF CONTRACTS	
POINTS:	
25	FP (OTHER THAN R&D) (INCL. T&M)
35	COST (ALL TYPES)
50	R & D - FIXED PRICE (NOT SBIRS)
2. CUM CONTRACT DOLLAR VALUE	
POINTS:	
0	UNDER $25K
25	>$25K TO <$10M
200	10M TO <50M
450	OVER $50 M

FILE NAME: BASICADM.WK1 T O T A L : _____ REVISED: 4/13/92

CONTRACT NO:N60530-9__-_____ P000____ AMOUNT: $_____

MAJOR CONTRACTS COMPLEXITY POINT STRUCTURE - ADMINISTRATION

- M O D I F I C A T I O N S - N E W P R O C U R E M E N T

1. TYPE OF CONTRACT	
POINTS:	
25	ALL C O S T TYPES
50	R & D - FIXED PRICE ONLY (NOT SBIRs)
15	ADPE Requiring Life Cycle or Desirable Options

2. DOLLAR VALUE	
POINTS:	
100	UNDER 500 K
150	501 K - 1 M
200	1 M - 10 M
300	10,001 M - 50 M
400	OVER 50 M

3. J & A	
POINTS:	
25	UNDER $1 M
35	$1M+ - $10 M
50	OVER $10 M

___ TOTAL

X .70 ADJ

___ ADJUSTED VALUE

FILE NAME: MODNEWPR.WK1 T O T A L : _____ REVISED: 4/20/92

.TRACT NO: N60530-9__-_____ P000_____ AMOUNT: $_____

MAJOR CONTRACTS COMPLEXITY POINT STRUCTURE - ADMINISTRATION
M O D I F I C A T I O N S - O T H E R

1. POINTS	SIMPLE - MISCELLANEOUS
5	ADMINISTRATIVE
5	INCREMENTAL FUNDING
5	AUTHORIZE PHASES

2. POINTS	MODERATELY COMPLEX
10 EACH	AUTH PHASES W/MINOR CHANGES
	CLARIFICATIONS
	CHANGES IN CLAUSES
	CHANGE IN DELIVERY SCHEDULE WITHOUT CONSIDERATION
	TERMINATION NOTICES
	GFP/STOP WORK
	EXERCISE OPTIONS W/O SF 98
	CHANGE ORDER (UNDEFINITIZED CONTRACT ACTIONS)

3. POINTS	COMPLEX MISCELLANEOUS
15 EACH	EXTENSIVE CHANGES IN SOW
	EXTENSIVE CHANGES IN CLINS
	CHANGE IN DELIVERY SCHEDULE W/CONSIDERATION
	OPTION WITH SF 98

4. POINTS	DISPUTES
50	DISPUTES (K/O FINAL DECISION)
50	APPEALS TO ASBCA OR FEDERAL COURT

5. POINTS	OVERRUNS
50	UNDER 500K
100	OVER 500K

6. POINTS	DEFINITIZATION OR SETTLEMENT OF VARIOUS CONTRACT ACTIONS:
...	CHANGES
...	UNDEFINITIZED CONTRACT ACTIONS
...	TERMINATIONS
70	UNDER $500 K
105	501 K - 1 M
140	1 M - 10 M
210	10,001 M - 50 M
280	OVER 50 M

.E NAME: MODOTHER.WK1 T O T A L : _____ REVISED: 4/20/92

CONTRACT NO:N60530-9__-_____ D/O #:_____ AMOUNT: $_____

MAJOR CONTRACTS COMPLEXITY POINT STRUCTURE - DELIVERY ORDERS

RECEIPT/REVIEW OF D/O

1. TYPES OF CONTRACT	
POINTS:	
	FIXED PRICE:
5	PRICED IN CONTRACT
100	NEGOTIATED FOR IND. D/O (NOT PRICED ON CONTRACT)
	COST REIMBURSABLE:
10	UNILATERAL (UNDER $25K)
10	FPRA EXISTS - NO DISCUSSIONS
50	FPRA EXISTS+ DISCUSSIONS
100	NO FPRA
	T & M:
5	JUST ISSUE D/O
10	ACCEPT PROPOSAL-NO DISCUSSION
50	NEGOTIATE D/O

2. C R B ISSUES	
5	SUBCONTRACT (ANALYSIS REQ)
5	WRITE BUS. CL.

3. A W A R D	
0	AWARD OF D/O

****
//////////

D/O M O D I F I C A T I O N S

1. DESCRIPTION	
POINTS	
5	ADMINISTRATIVE/UNILATERAL
25	CHANGE ORDERS/ UCAs
*	DEFINITIZE UNDEFINITIZED CONTRACT ACTIONS (UCA)

2. DELIVERY/P O P	
POINTS	
*	EXTEND DELIVERY OR PERIOD OF PERFORMANCE
15	DELIVERY/P O P CHANGES WITH CONSIDERATION
10	DELIVERY/P O P CHANGES WITHOUT CONSIDERATION

* SEE "TYPE OF CONTRACT" (BLOCK 1)

DO_FINAL.WK1 TOTAL POINTS: _____ REVISED: 4/20/92

FILE NAME:OPTPOINT REVISED: 4/20/92

W I T

COMPARISON OF POINTS ASSIGNED TO SMALL AND LARGE PURCHASE ACTIONS

WE LOWERED OUR EXPECTATIONS FOR THE SIMPLEST SMALL PURCHASE BUY FROM 1700 BUYS TO 800 PER YEAR AND LEFT THE SIMPLEST MAJOR CONTRACT EXPECTATION AT 10 NEW CONTRACTS AWARDS PLUS THEIR BASIC ADMINISTRATION PER YEAR. USING THE NUMBERING SYSTEM THIS GIVES A "STANDARD" OF 1600 "POINTS" PER YEAR USING THE FOLLOWING:

SIMPLIFIED PURCHASE:

BASIC PTS	OLD	FACTOR	NEW
<2500	10	10	1
2500-10K	25	10	3
10K-25K	30	10	4
G S A	15	10	2
R F Q	10	10	1
S/S	10	10	1
R & D	20	10	2
N T E	15	10	2
ATT/EXH	10	10	1
AMENDS	10	10	1
UNAUTH. COM COMMITMENTS	20	10	2
AWARD	10	10	1

AMENDMENTS ARE THE SAME FOR BOTH SIMPLIFIED PURCHASE AND MAJOR CONTRACTS

MAJOR CONTRACTS:

BASIC PTS	OLD	FACTOR	NEW
S B I R	20	5	100
<500K	20	5	100
500K-1M	30	5	150
1M-10M	60	5	300
10M-50M	80	5	400
>50M	100	5	500
ALL COST + T&M	5	5	25
R&D F/P	10	5	50
ADPE(REQ. LIFE CYCLE)	3	5	15
CLASSIFIED	5	5	25
J & A <1M	5	5	25
1M-10M	7	5	35
>10M	10	5	50
PRE-PROPOSAL CONF.	5	5	25
DIST.>15 VEN	5	5	25
AMENDS	2	5	10
PROTESTS	5	5	25
SPLIT AWARD (EACH)	1	5	5
TURNIP FACTOR	10	5	50
FACE TO FACE	3	5	15
1 KR W/O J&A	5	5	25
MORE THAN 3 KRS	5	5	25
POST B/CL	1	5	5
PRE-AWD SURVEY	1	5	5

Based on a recommendation from Sandy Scharn-Stevens, Blaine prepared the following for discussion:

REVISED POINT STRUCTURES DISCUSSED AT 4/20/92 MEETING...

SIMPLIFIED PURCHASE:

BASIC	POINTS
<2500	1
2500-10K	3
10K-25K	4
G S A	2
R F Q	1
S/S	1
R & D	2
N T E	2
ATT/EXH	1
AMENDS	1
UNAUTHORIZED COMMITMENTS	2
AWARD	1

MODIFICATIONS:

CLAIMS	4
BILATERAL	2
UNILATERAL	1

MAJOR CONTRACTS:

BASIC	POINTS	OLD	NEW
S B I R (MAX + ADMIN)		100	100
<500K		100	100
500K-1M		150	150
1M-10M		300	200
10M-50M		400	300
>50M		500	400
ALL COST + T&M		25	25
R&D F/P		50	50
ADPE(REQ. LIFE CYCLE)		15	15
GREATEST VALUE (SOURCE SELECTION)			100
CLASSIFIED		25	25
J & A <1M		25	25
1M-10M		35	35
>10M		50	50
PRE-PROPOSAL CONFERENCE		25	25
DISTR. > 15 VENDORS		25	25
AMENDS		10	10
PROTESTS		25	25
SPLIT AWARDS (EACH)		0	5
TURNIP FACTOR		50	50
FACE TO FACE		15	15
1 KR W/O J&A		25	25
MORE THAN 3 KRS		25	25
POST B/CL		5	5
PRE-AWD SURVEY		5	5

CHANGE: ADDED "GREATEST VALUE SOURCE SELECTION" WITH A VALUE OF 100 POINTS. CHANGED THE POINTS FOR $1 MILLION AND MORE BY SUBTRACTING OUT 100 POINTS FROM THOSE WHO ARE AWARDED ON A GO/NO-GO BASIS.

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