

# MEMO



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**Date:** January 28, 2009  
**To:** Dennis Owsley  
**From:** Mike McVay  
**cc:** Sean Vincent and Rick Raymond  
**Subject:** Evaluation North Ada County historical water level trends

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## Introduction

Per your request, I have reviewed the water level data for 16 wells located in the North Ada County investigation area. The data were reviewed to assess similarities and differences that may indicate gross system behavior.

## IDWR Review

The water level data available were collected over different time-frames and varying collection schedules. Therefore, it was necessary to filter the data and select a common evaluation time-span. The following steps were taken to prepare the data for analyses.

1. Depth-to-water measurements were converted to water level elevations using the land surface datum values listed in the "well-log" database. Elevation accuracy is reported to be +/- 11 feet in well-log. Wells used in this review are presented in Table 1.
2. The data was filtered for yearly spring measurements in each well. Spring measurements were defined as those taken between 03/01 and 05/31 of each year. All attempts were made to choose the most similar date for each year; with preference given to the earliest date in the spring range.
3. The data period 1996 – 2003 was chosen for comparison. Due to data constraints, wells 04N01E10ACB2, 04N01E03DAD1, 04N02W06CDD1, and 05N01E26DCD1 were evaluated for the period 1996 – 2002; and well 05N03W12CCA1 was evaluated for the period 1996 – 2004. This general period allowed the comparative analyses of 16 wells.
4. Water level data from all wells were plotted on the same X-Y scale for visual comparison.

5. Linear trends of the spring water level data were developed using the linear function option in Grapher<sup>®</sup>, and were plotted with the data.
6. Well logs were reviewed to determine if each well was located in the upper undifferentiated sediments (Undifferentiated), the Pierce Gulch sands (Pierce Gulch), Terteling Springs mudstones (Terteling Springs), or shallow water table system (Shallow). These classifications were based on well location and production zone depth, geologic material inventoried in the driller's logs, and comparison with nearby wells that were identified by HLI.
7. Well locations were plotted in ArcMap to give spatial reference (Figure 1).

Table 1. Wells included in water level data review.

Well	Trend Slope	Average Spring WL	Geology ID	Area ID
04N01E-03DAD1	-0.171	2639.6	Undiff	NAda
04N01E-10ACB2	-0.175	2568.7	PG	NAda
04N01E-11BBB1	-0.279	2581.8	Undiff	NAda
04N01W-13AACC1	-0.262	2535	PG	NAda
04N01W-17BBDB1	-0.155	2471.3	Undiff	NAda
04N02W-06CDD1	-0.246	2423.2	PG	NAda
05N01W-36ABB1	-0.489	2540.4	PG	NAda
05N02W-22CAD1	-0.121	2425.8	PG	NAda
05N03W-12CCA1	-0.331	2427.8	PG	NAda
05N03W-15DDC1	-0.449	2440.9	Undiff	NAda
05N01E-34DBB1	-0.23	2648.8	Tert	NAda
04N02W-07AAC1	0.093	2391.3	Shallow	NAda
04N01W-17BBDC1	-0.242	2510.9	PG	NAda
<sup>1</sup> 05N01E-26DCD1	0.093	2738.14	Tert	Dry Creek
<sup>1</sup> 05N01E-35ACA1	0.631	2748.3	Tert	Dry Creek
<sup>1</sup> 05N01E-36AAB1	0.015	2761.1	UNK	Dry Creek
<sup>2,3</sup> 05N01E-32DBD1	-1.179	2578	PG	NAda

<sup>1</sup> Water level data suggest that wells in the Dry Creek area are completed in a different aquifer system than other North Ada wells. These wells were not included in the average trend estimation.

<sup>2</sup> No spring water level data is available for well 05N01E32DBD1 and this well was not included in the average trend estimations.

<sup>3</sup> Fall water level data for years 1996 - 2004 were used for well 05N01E32DBD1.



## Conclusions

The variable length of data records and sporadic data collection intervals did not allow a statistically rigorous data evaluation. However, grouping wells based on trend value, production zone, and visual inspection led to the following conclusions:

1. Grouping wells based on trend values leads to two conclusions;
  - a. Wells in the Dry Creek area plot together.
  - b. There is no serial water level trend present that allows the identification of undifferentiated well completions versus Pierce Gulch completions.
2. Grouping wells based on visual inspection of gross water level behavior leads to three conclusions;
  - a. Wells in the Dry Creek area plot together.
  - b. There is no serial water level behavior present that allows the identification of undifferentiated well completions versus Pierce Gulch completions.
  - c. Many non-Dry Creek wells (except 04N02W07AAC1) appear to display generally similar gross water level behavior; regardless of designation as Pierce Gulch or Undifferentiated.
  - d. Well 04N02W07AAC1 displays a different gross behavior than all other wells. This is the only well designated as “Shallow” based on a 42 feet depth.
3. All wells classified as undifferentiated or Pierce Gulch display negative water level trends that range from -0.21 ft/year to -0.49 ft/year, with an average trend of -0.27 ft/year.

05N01E-36AAB1

fit results *Unk. in Dry Creek*

Fit 1: Linear

Equation  $Y = 0.1047619048 * X + 2551.603571$

Number of data points used = 8

Average X = 1999.5

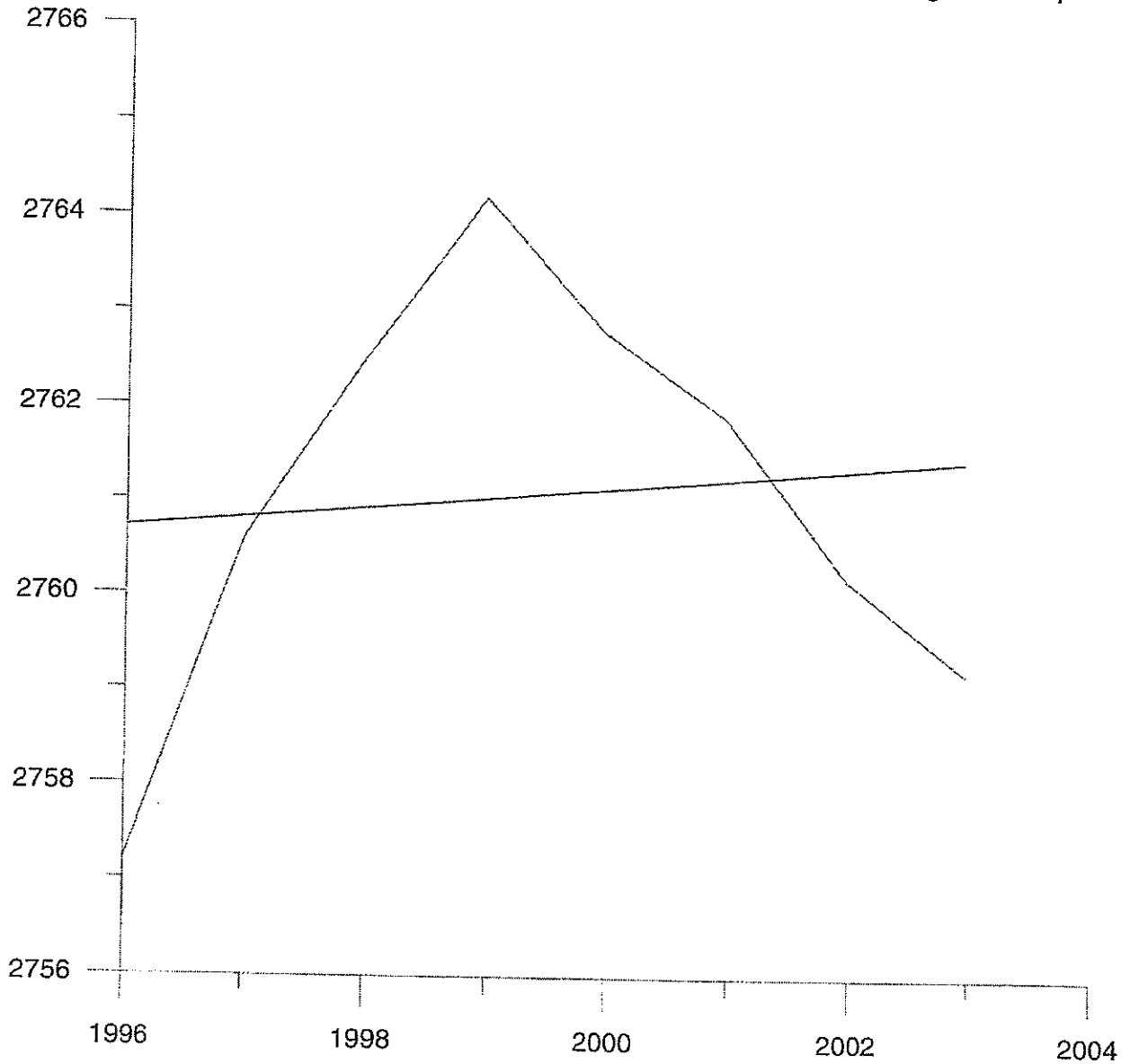
Average Y = 2761.08

Residual sum of squares = 34.514

Regression sum of squares = 0.460952

Coef of determination, R-squared = 0.0131795

Residual mean square,  $\sigma^2_{\text{hat}}$  = 5.75234



Fit Results

*Tert*

05N01E-35ACA1

Fit 1: Linear

Equation  $Y = 0.630952381 * X + 1486.685714$

Number of data points used = 8

Average X = 1999.5

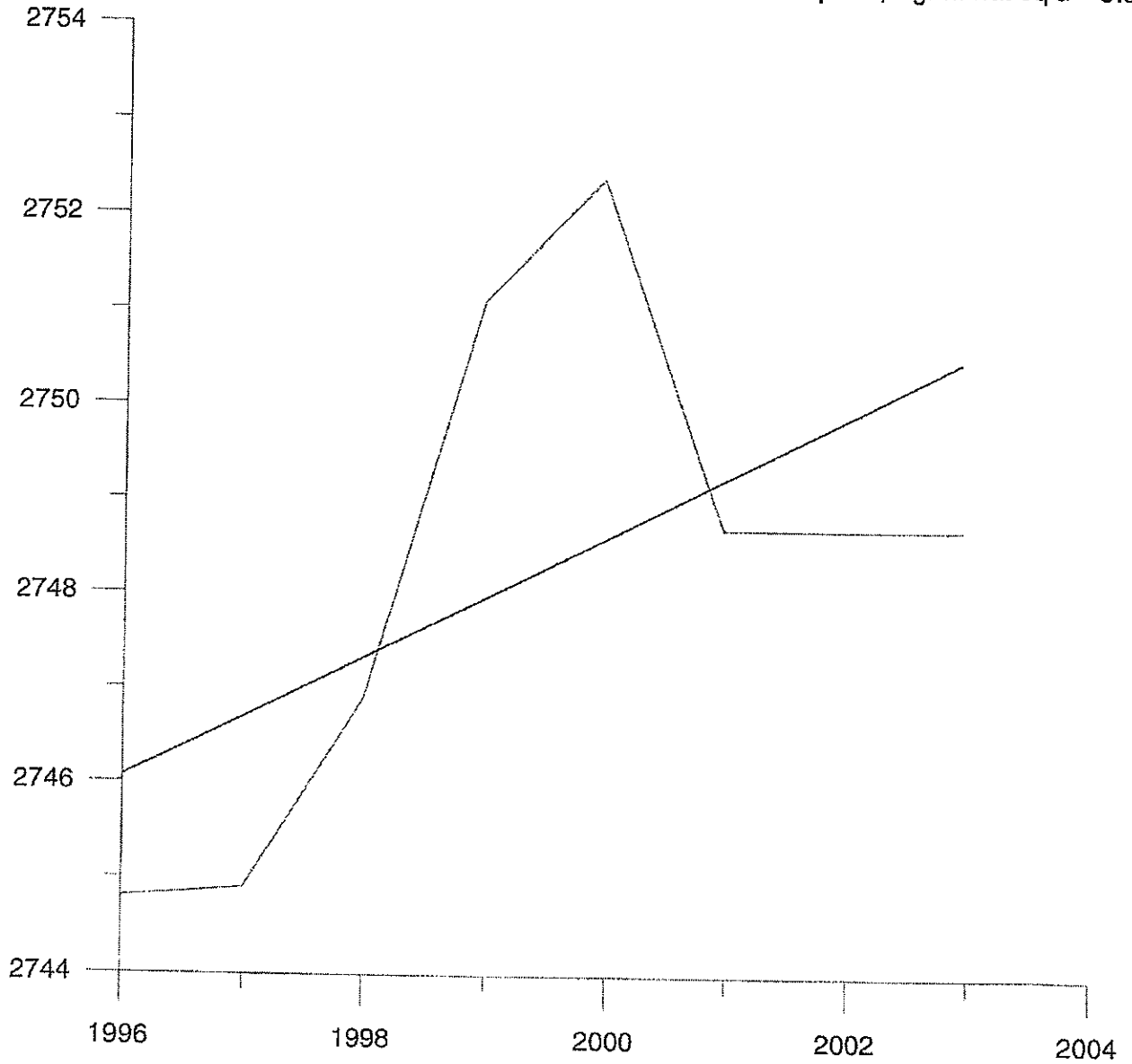
Average Y = 2748.28

Residual sum of squares = 34.1748

Regression sum of squares = 16.7202

Coef of determination, R-squared = 0.328524

Residual mean square,  $\sigma\text{-hat-sq'd} = 5.69579$

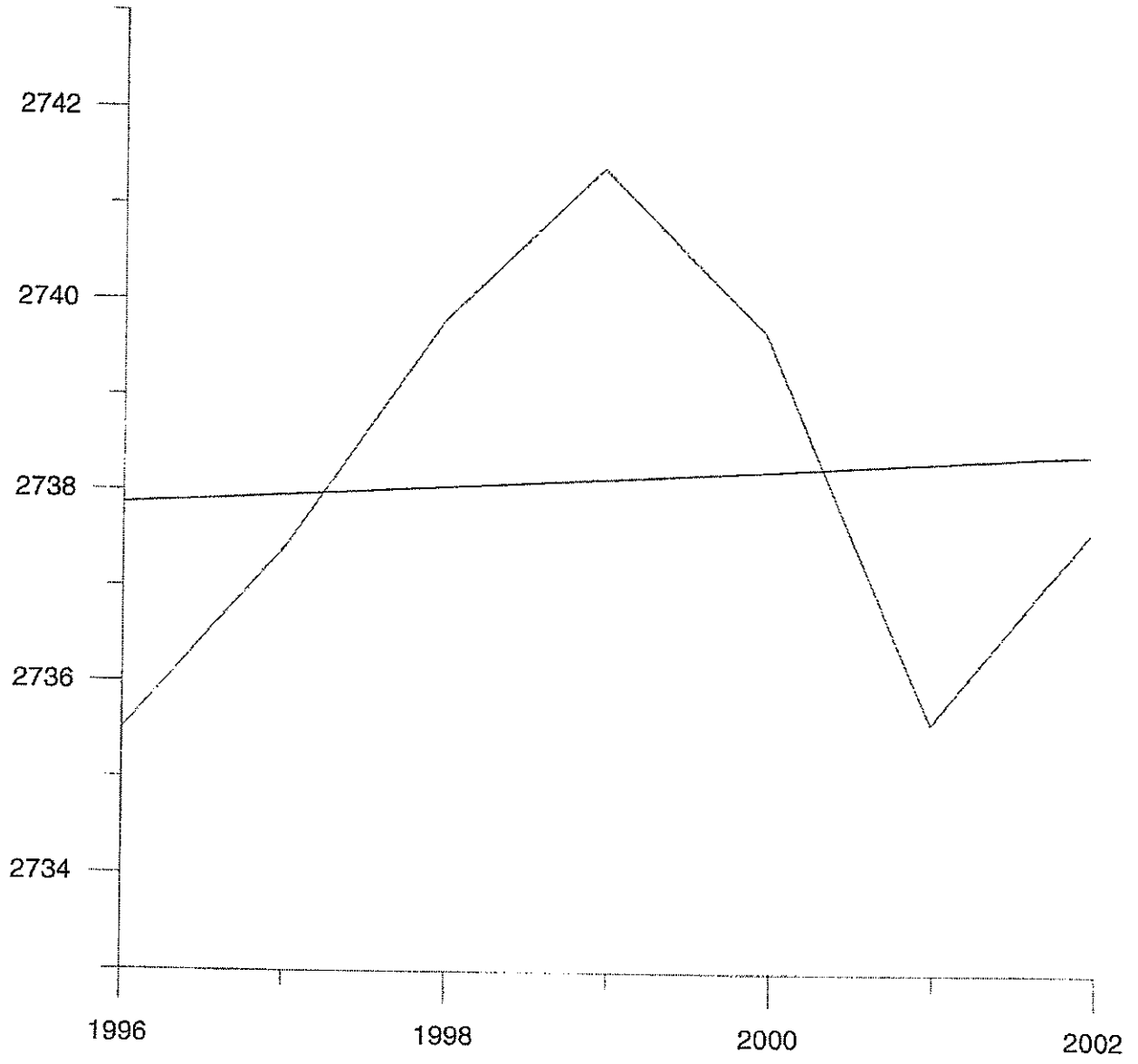


05N01E-26DCD1

Fit Results

*Tertely*

Fit 1: Linear  
Equation  $Y = 0.09285714286 * X + 2552.521429$   
Number of data points used = 7  
Average X = 1999  
Average Y = 2738.14  
Residual sum of squares = 29.8357  
Regression sum of squares = 0.241429  
Coef of determination, R-squared = 0.00802698  
Residual mean square, sigma-hat-sq'd = 5.96714



05N01E-34DBB1

Fit Results

*Undiff maybe  
test  
↳ no log*

Fit 1: Linear

Equation  $Y = -0.2297619048 * X + 3108.246429$

Number of data points used = 8

Average X = 1999.5

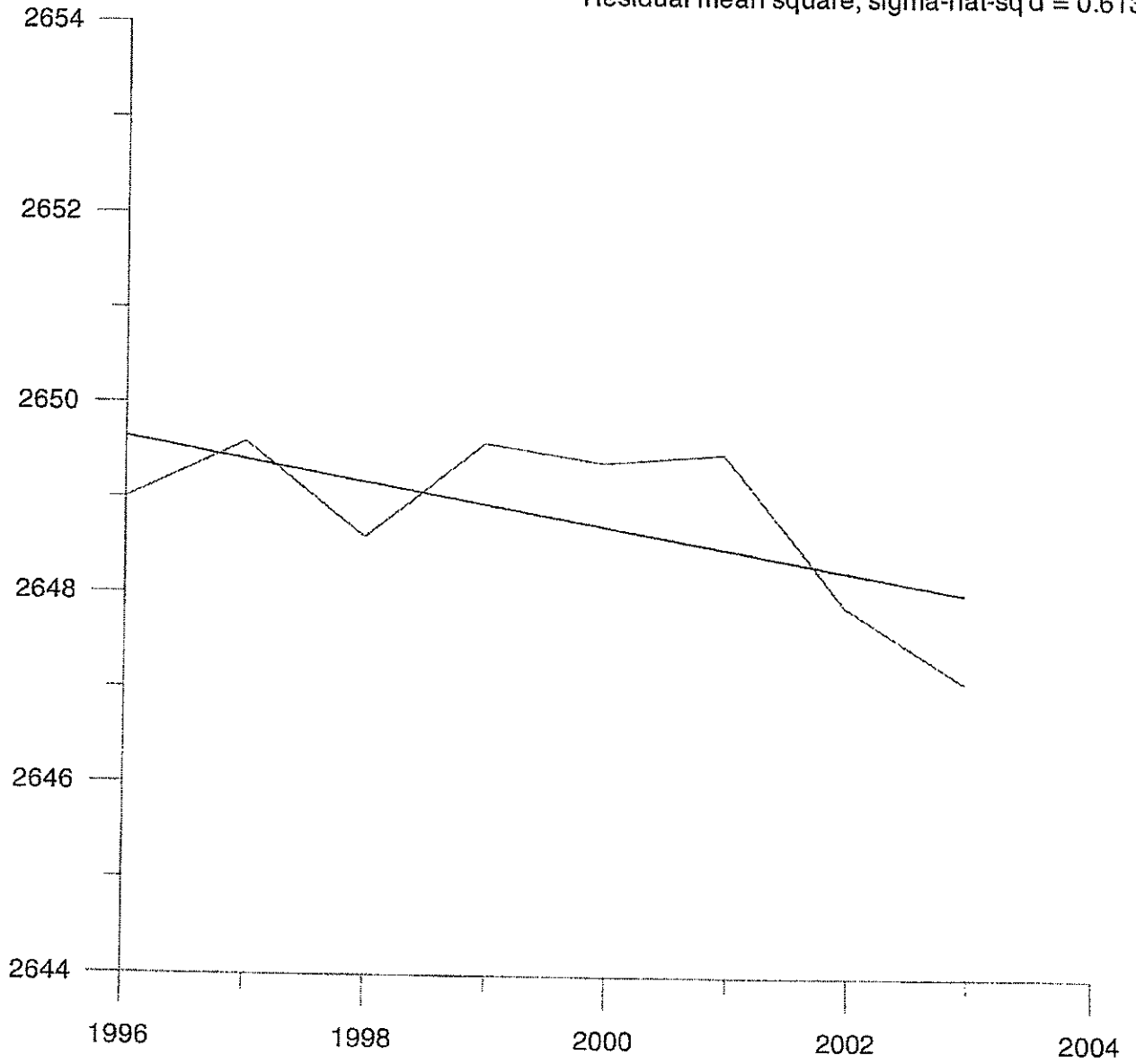
Average Y = 2648.84

Residual sum of squares = 3.68155

Regression sum of squares = 2.2172

Coef of determination, R-squared = 0.375877

Residual mean square, sigma-hat-sq'd = 0.613591



Fit Results

PG

04N01W-13AACC1

Fit 1: Linear

Equation  $Y = -0.2617647059 * X + 3058.529412$

Number of data points used = 6

Average X = 2000

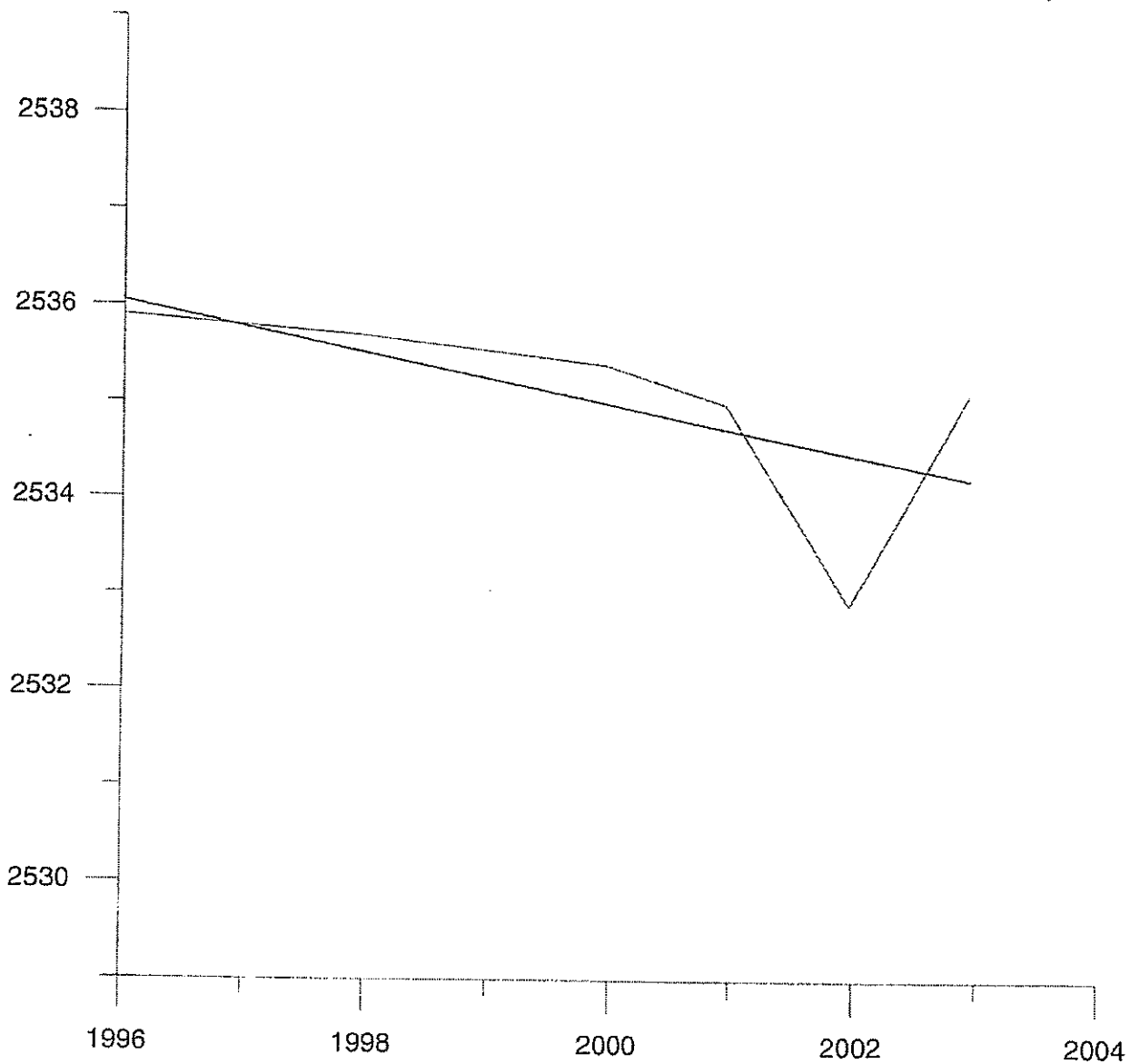
Average Y = 2535

Residual sum of squares = 3.55029

Regression sum of squares = 2.32971

Coef of determination, R-squared = 0.396208

Residual mean square,  $\sigma^2$  = 0.88757.



Fit Results

Undiff

04N01W-17BBDB1

Fit 1: Linear

Equation  $Y = -0.155 * X + 2781.318571$

Number of data points used = 7

Average X = 2000

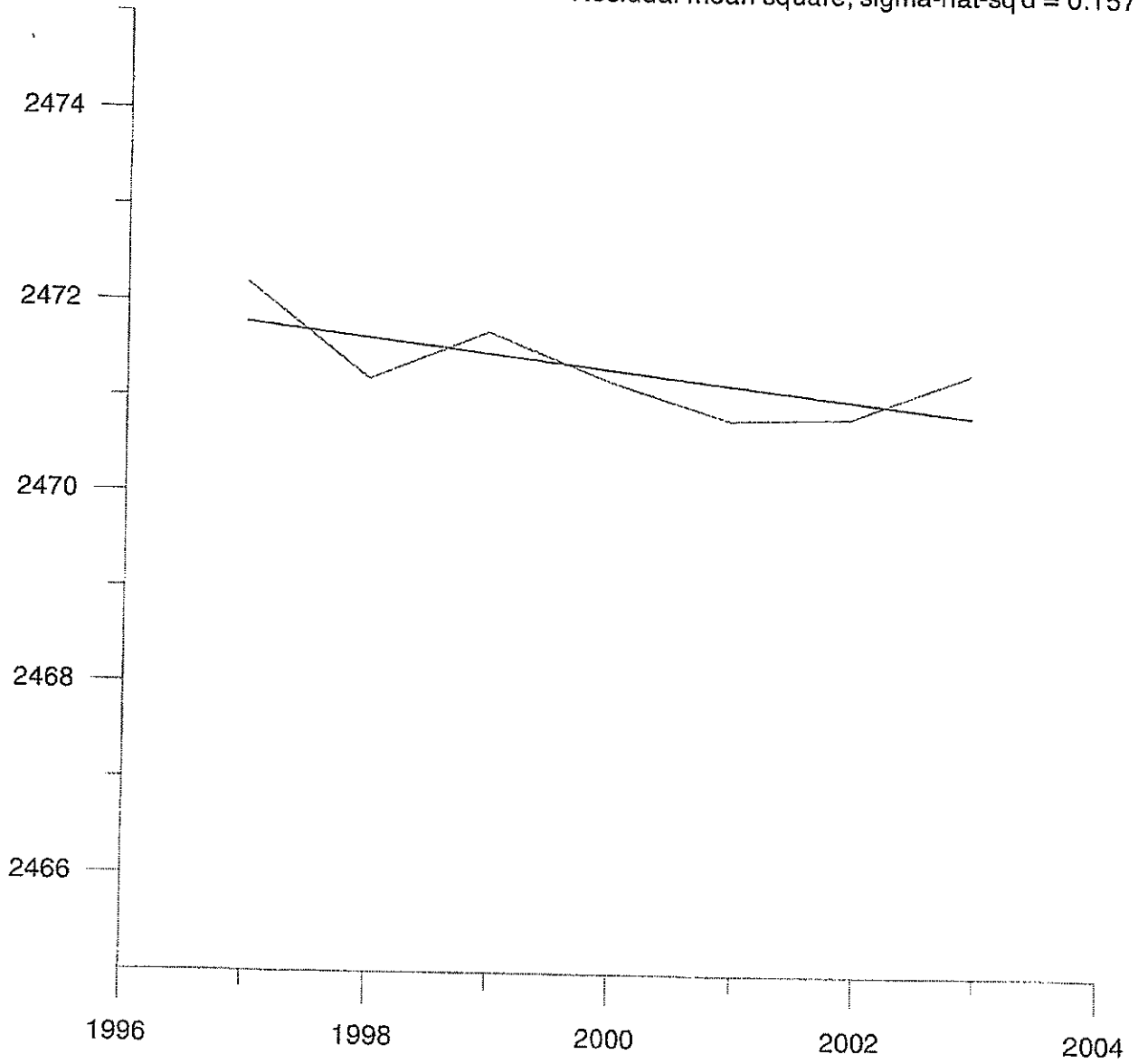
Average Y = 2471.32

Residual sum of squares = 0.785786

Regression sum of squares = 0.6727

Coef of determination, R-squared = 0.461232

Residual mean square, sigma-hat-sq'd = 0.157157



Fit Results

PG7

04N01W-17BBDC1

Fit 1: Linear

Equation  $Y = -0.2422131147 * X + 2995.161475$

Number of data points used = 7

Average X = 1999.14

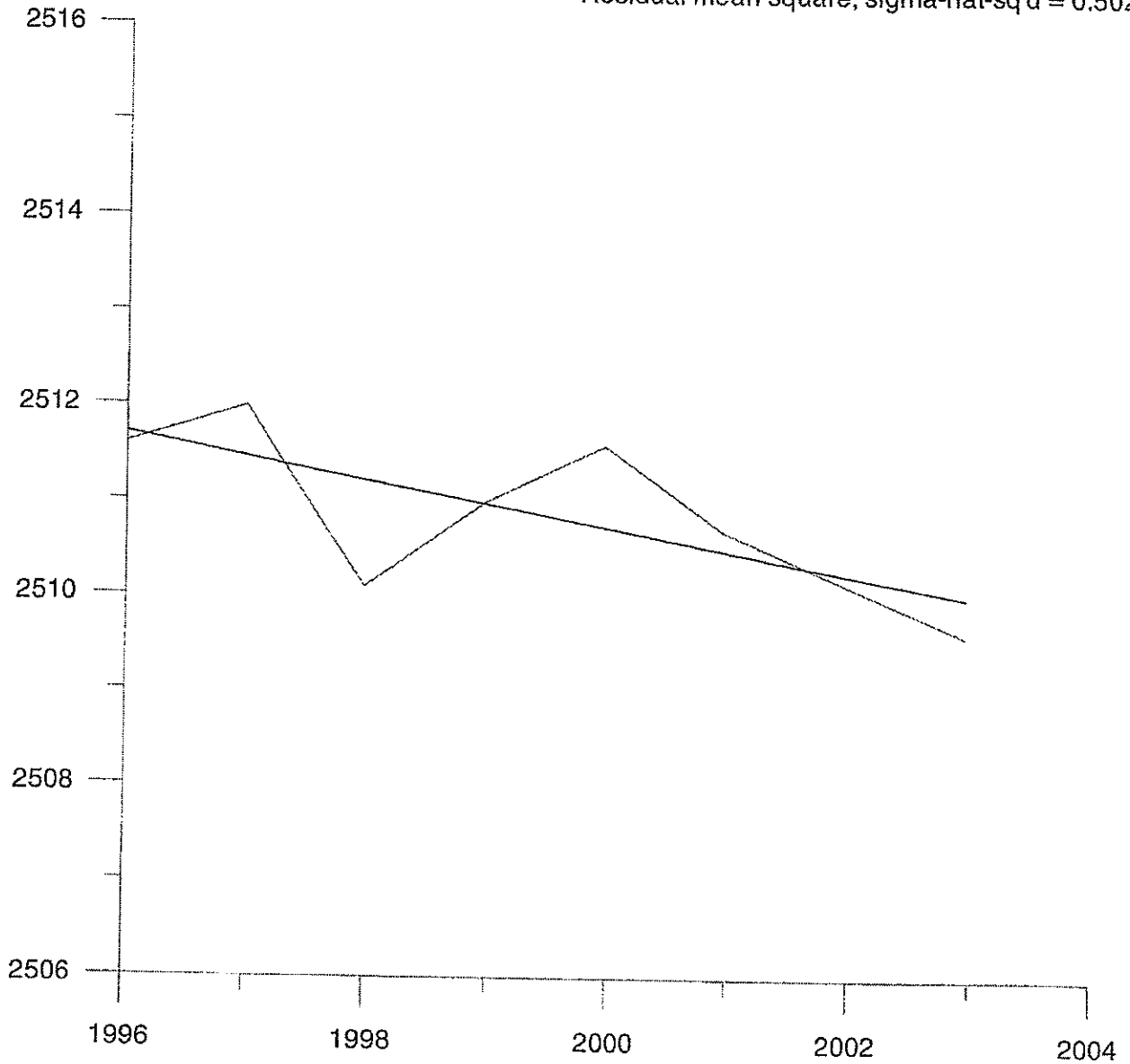
Average Y = 2510.94

Residual sum of squares = 2.51217

Regression sum of squares = 2.04497

Coef of determination, R-squared = 0.44874

Residual mean square,  $\sigma\text{-hat-sq'd} = 0.502434$



04N01E-03DAD1

Fit Results

*Und fit*

Fit 1: Linear

Equation  $Y = -0.1714285714 * X + 2982.271429$

Number of data points used = 7

Average X = 1999

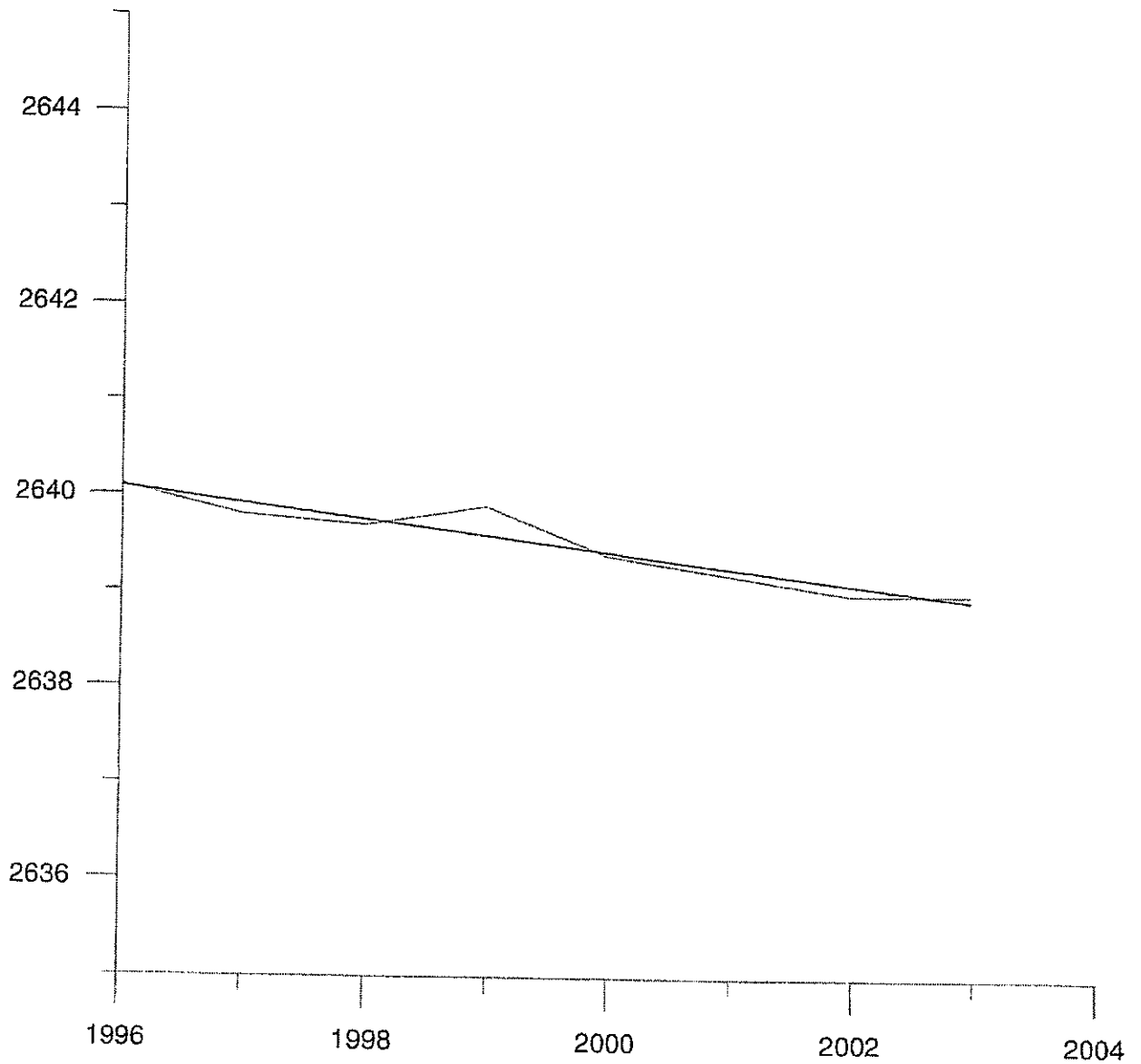
Average Y = 2639.59

Residual sum of squares = 0.125714

Regression sum of squares = 0.822857

Coef of determination, R-squared = 0.86747

Residual mean square, sigma-hat-sq'd = 0.0251429



04N01E-10ACB2

PG

Fit 1: Linear

Equation  $Y = -0.1753731344 * X + 2919.30597$

Number of data points used = 5

Average X = 1999.2

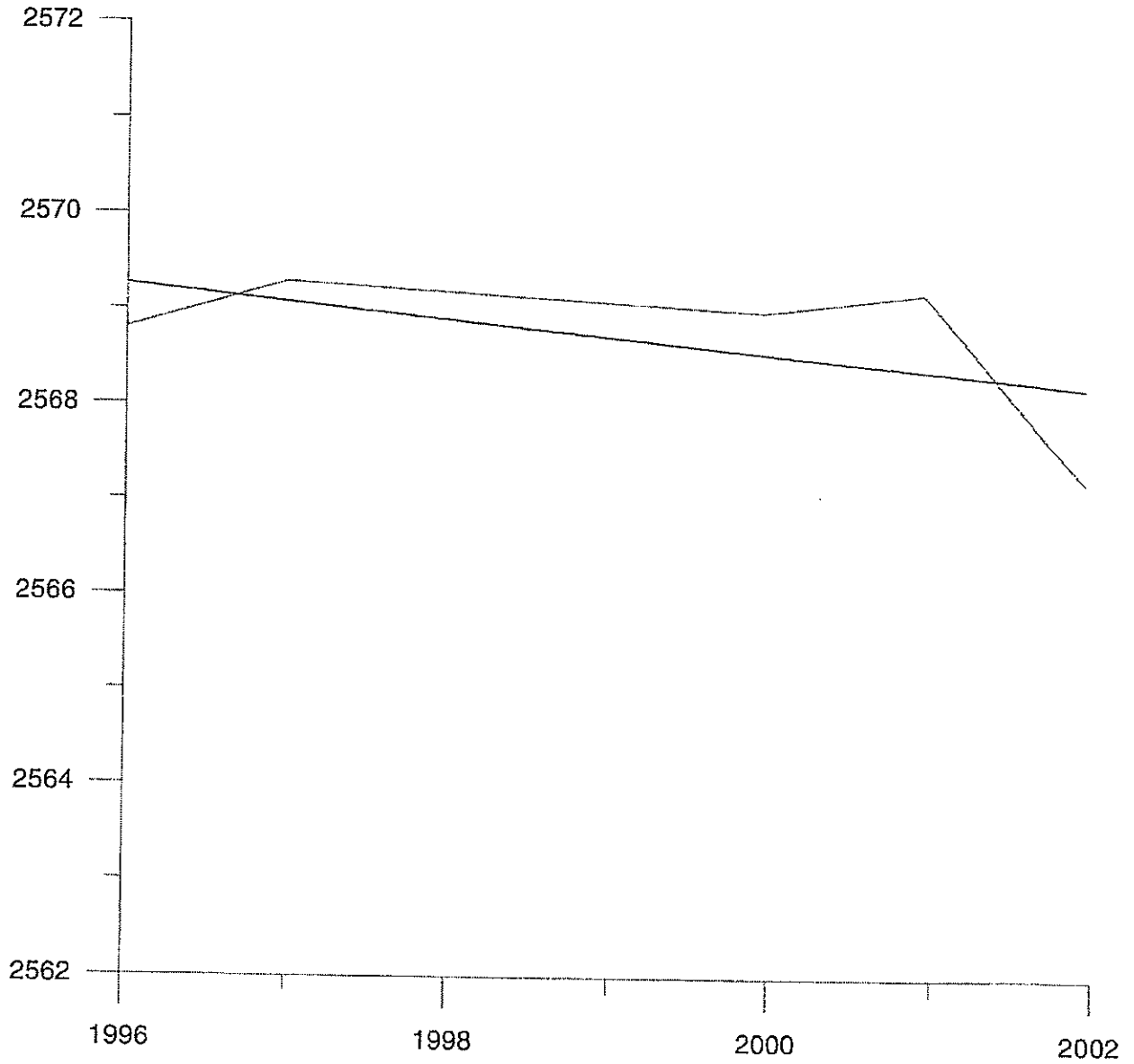
Average Y = 2568.7

Residual sum of squares = 2.13575

Regression sum of squares = 0.824254

Coef of determination, R-squared = 0.278464

Residual mean square,  $\sigma\text{-hat-sq'd} = 0.711915$



Fit Results

*Undiff*

04N01E-11BBB1

Fit 1: Linear

Equation  $Y = -0.2785714286 * X + 3138.753571$

Number of data points used = 8

Average X = 1999.5

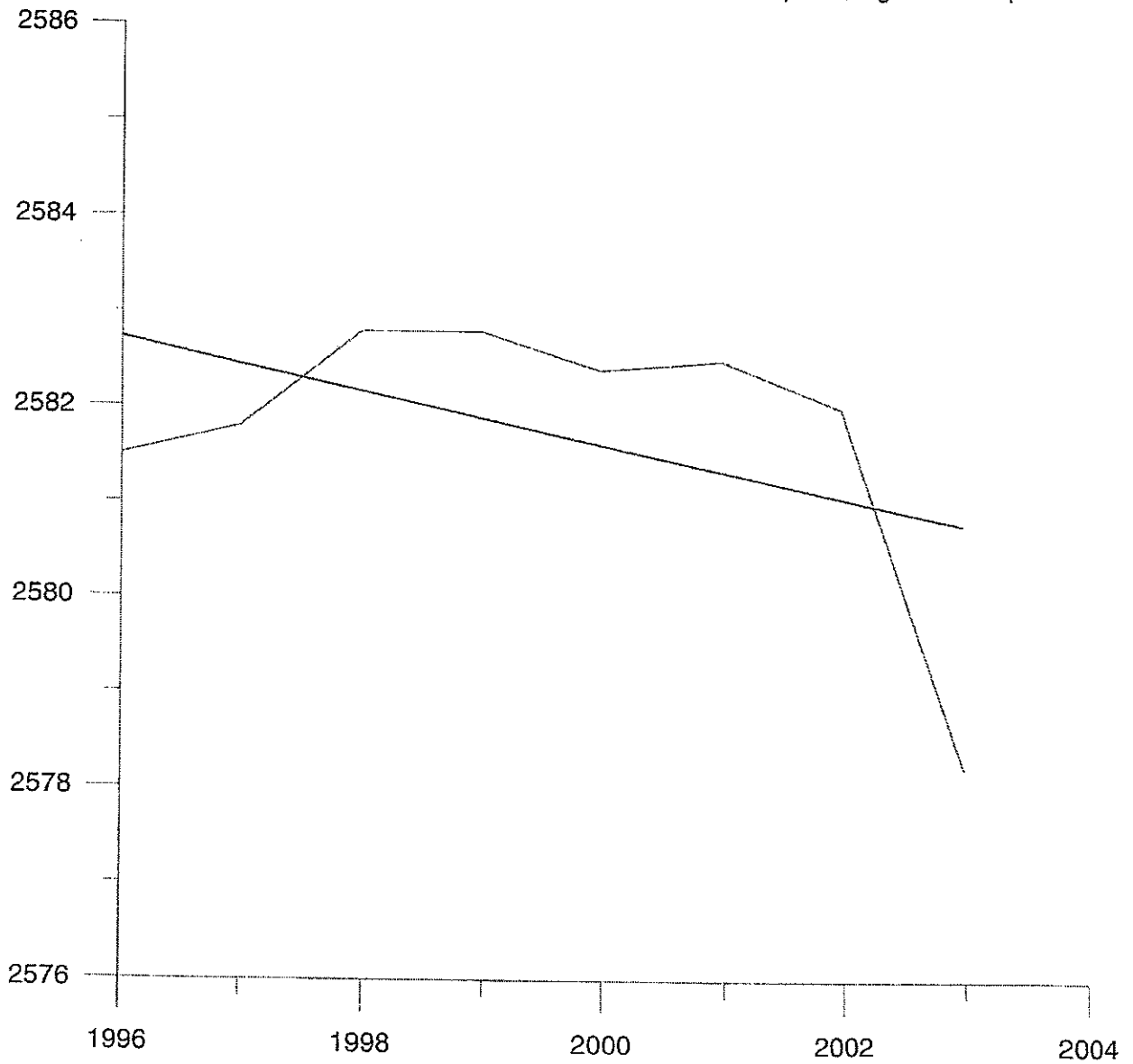
Average Y = 2581.75

Residual sum of squares = 12.6607

Regression sum of squares = 3.25929

Coef of determination, R-squared = 0.204729

Residual mean square,  $\sigma\text{-hat-sq'd} = 2.11012$

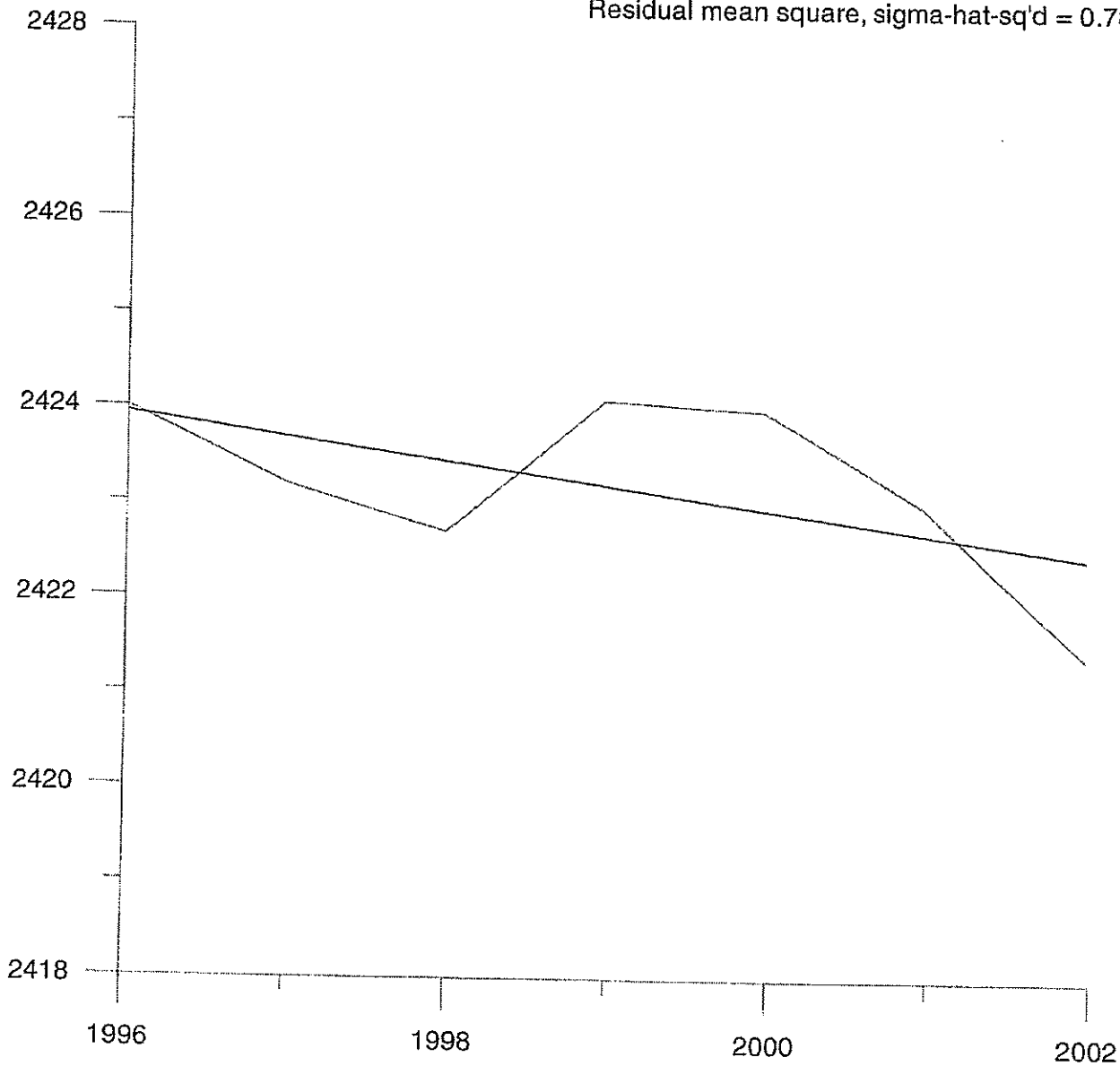


Fit Results

P6

04N02W-06CDD1

Fit 1: Linear  
Equation  $Y = -0.2464285714 * X + 2915.810714$   
Number of data points used = 7  
Average X = 1999  
Average Y = 2423.2  
Residual sum of squares = 3.91964  
Regression sum of squares = 1.70036  
Coef of determination, R-squared = 0.302555  
Residual mean square, sigma-hat-sq'd = 0.783929



fit results

P6

05N01W-36ABB1

Fit 1: Linear

$$\text{Equation } Y = -0.4892857143 * X + 3518.739286$$

Number of data points used = 8

Average X = 1999.5

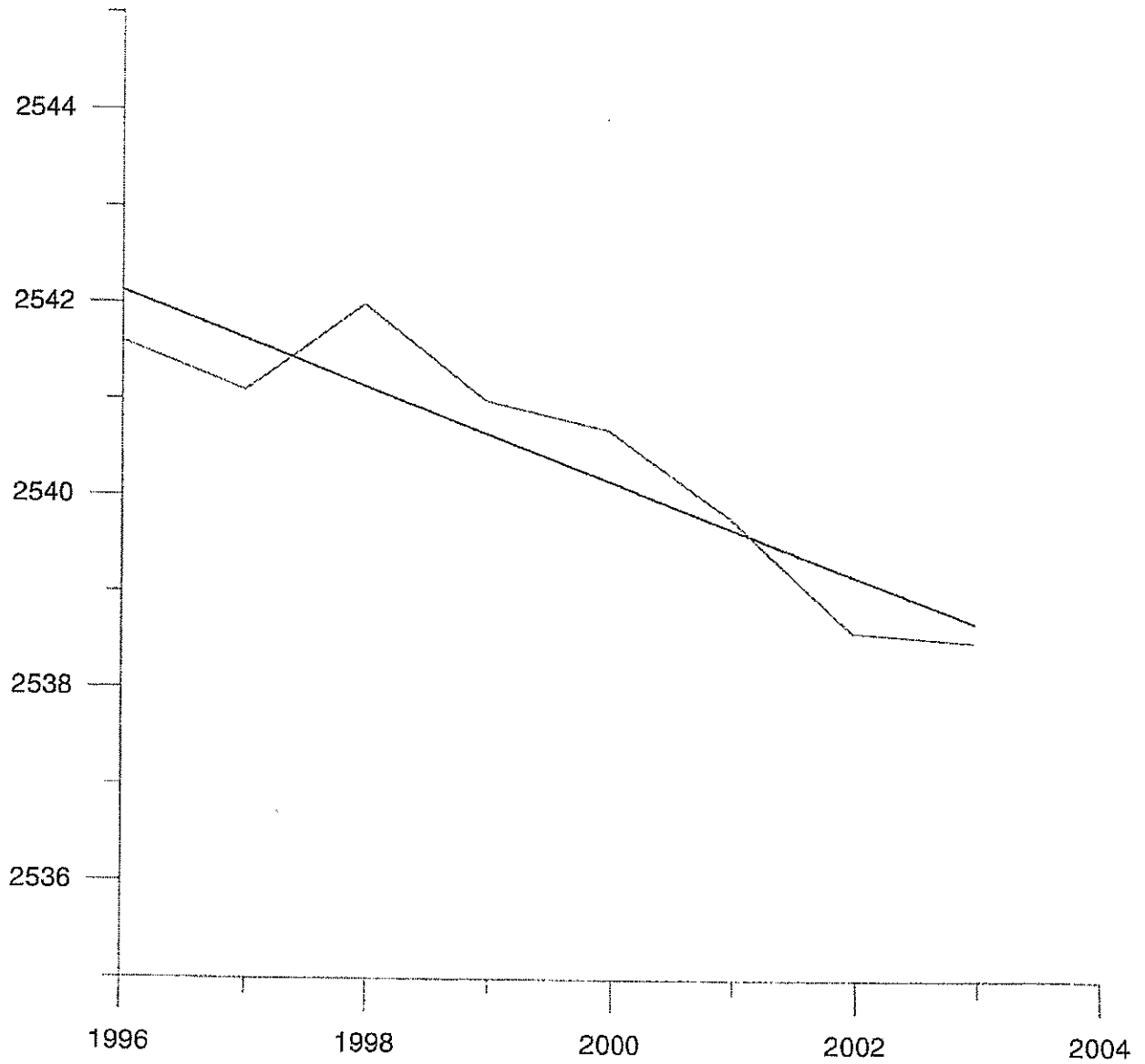
Average Y = 2540.41

Residual sum of squares = 2.09393

Regression sum of squares = 10.0548

Coef of determination, R-squared = 0.827642

Residual mean square, sigma-hat-sq'd = 0.348988



Fit Results

PG

05N02W-22CAD1

Fit 1: Linear

Equation  $Y = -0.1214285714 * X + 2668.596429$

Number of data points used = 8

Average X = 1999.5

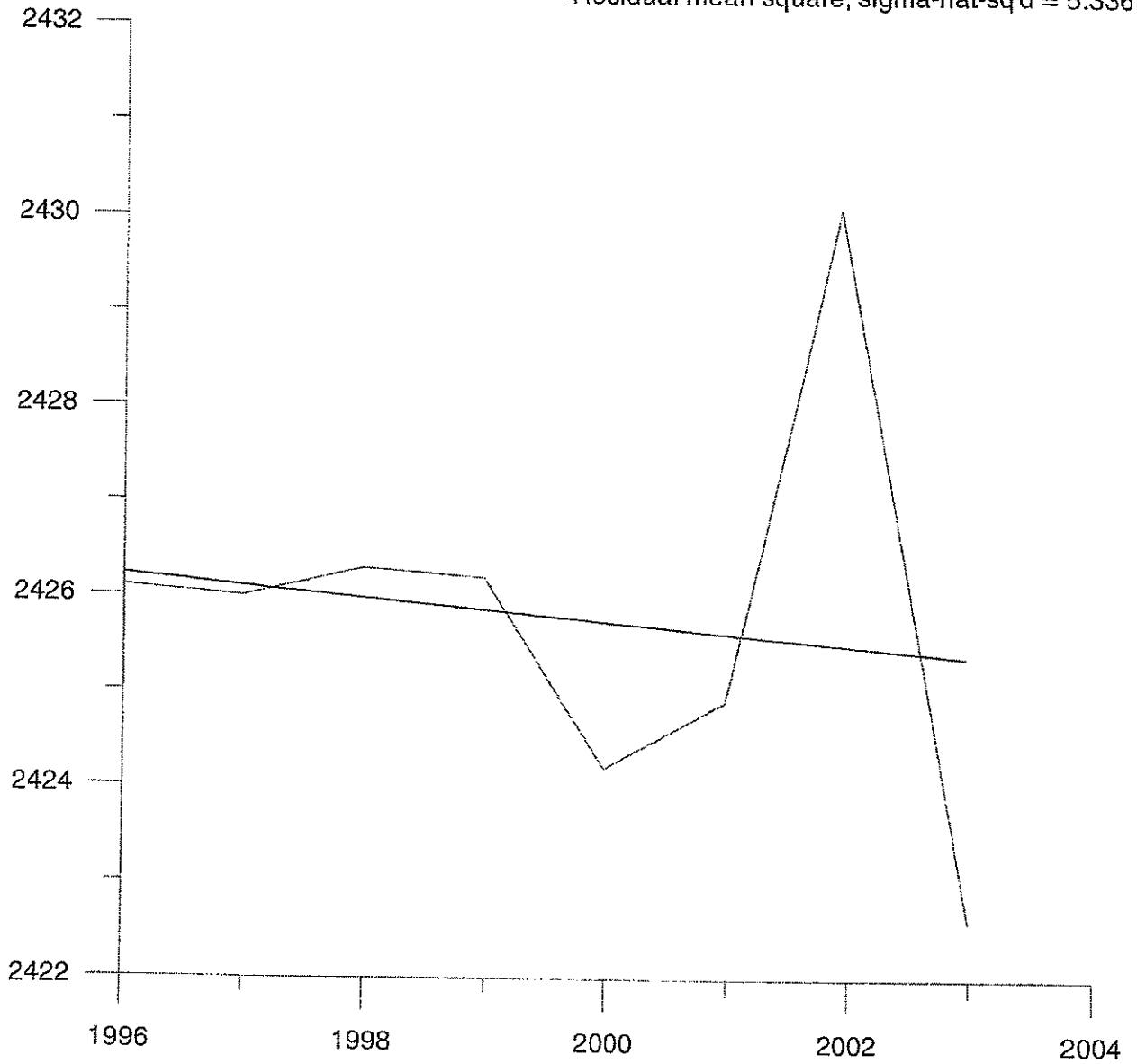
Average Y = 2425.8

Residual sum of squares = 32.0207

Regression sum of squares = 0.619286

Coef of determination, R-squared = 0.0189732

Residual mean square, sigma-hat-sq'd = 5.33679



Fit Results

PG

05N03W-12CCA1

Fit 1: Linear

Equation  $Y = -0.3314285714 * X + 3090.491429$

Number of data points used = 4

Average X = 1999.5

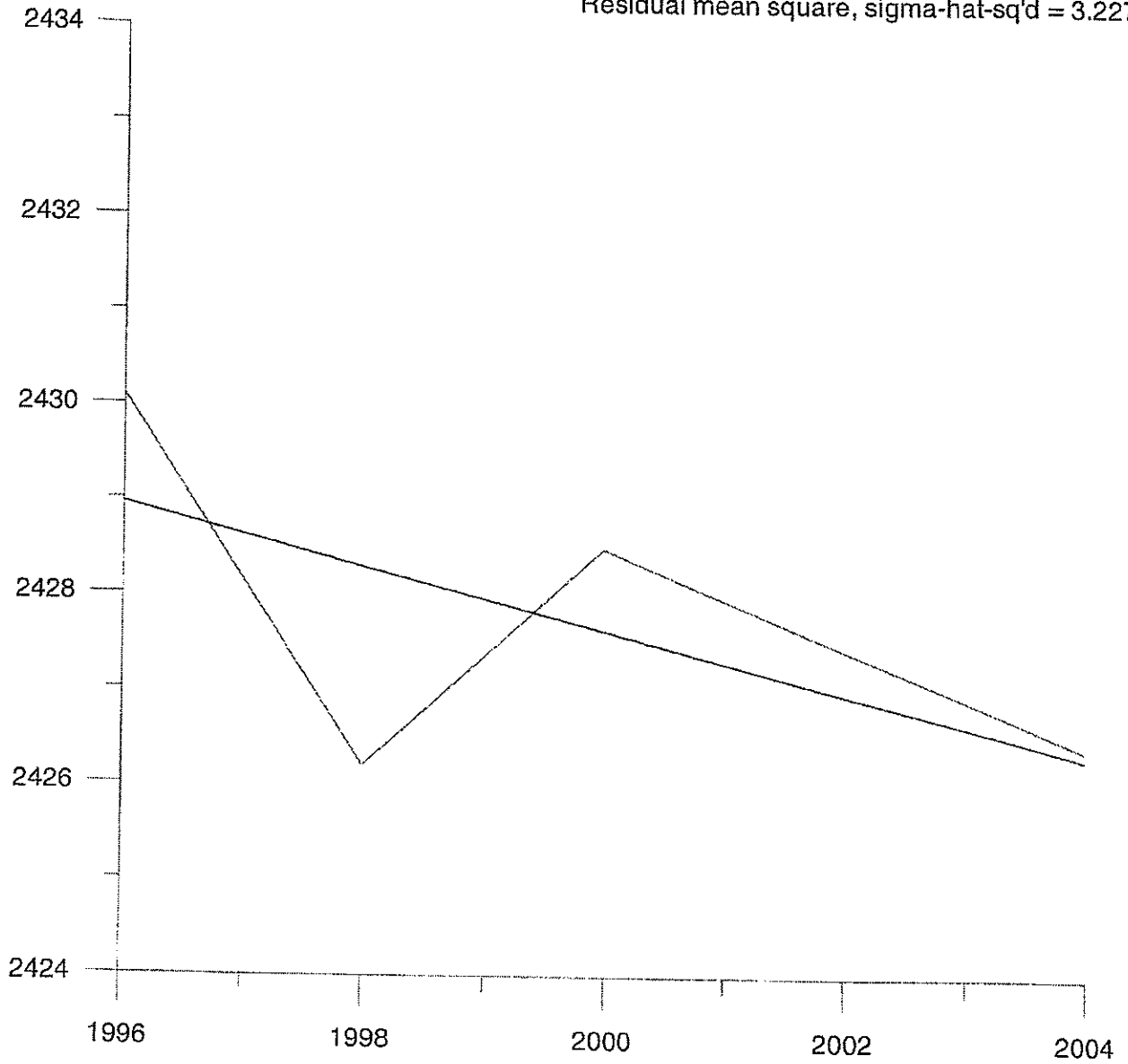
Average Y = 2427.8

Residual sum of squares = 6.45543

Regression sum of squares = 3.84457

Coef of determination, R-squared = 0.373259

Residual mean square, sigma-hat-sq'd = 3.22771



Fit Results

Undiff

05N03W-15DDC1

Fit 1: Linear

Equation  $Y = -0.4488095238 * X + 3338.332143$

Number of data points used = 8

Average X = 1999.5

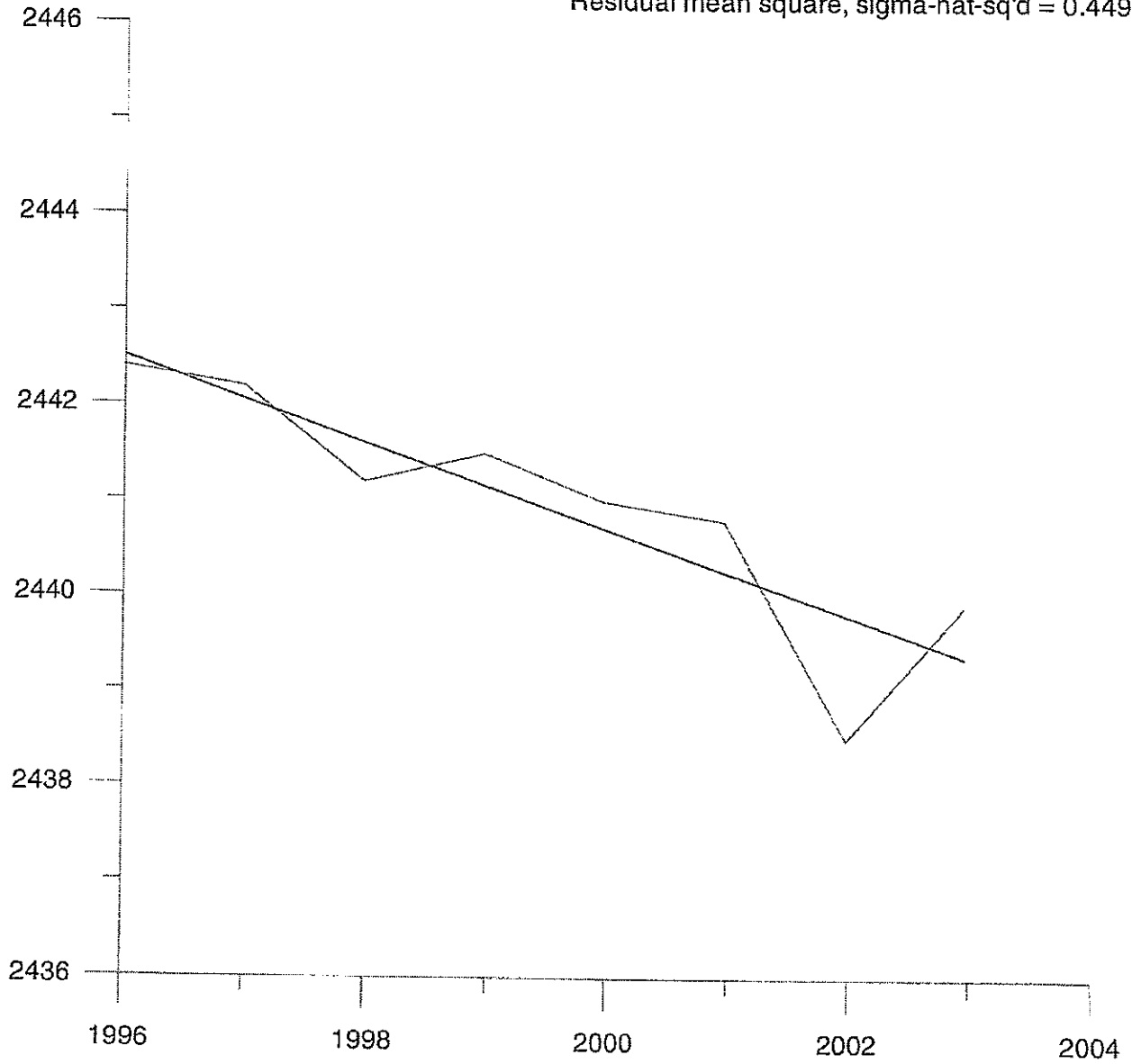
Average Y = 2440.94

Residual sum of squares = 2.69869

Regression sum of squares = 8.46006

Coef of determination, R-squared = 0.758155

Residual mean square,  $\sigma\text{-hat-sq'd} = 0.449782$



FIT RESULTS

Unit

04N02W-07AAC1

Fit 1: Linear

Equation  $Y = 0.09285714286 * X + 2205.582143$

Number of data points used = 8

Average X = 1999.5

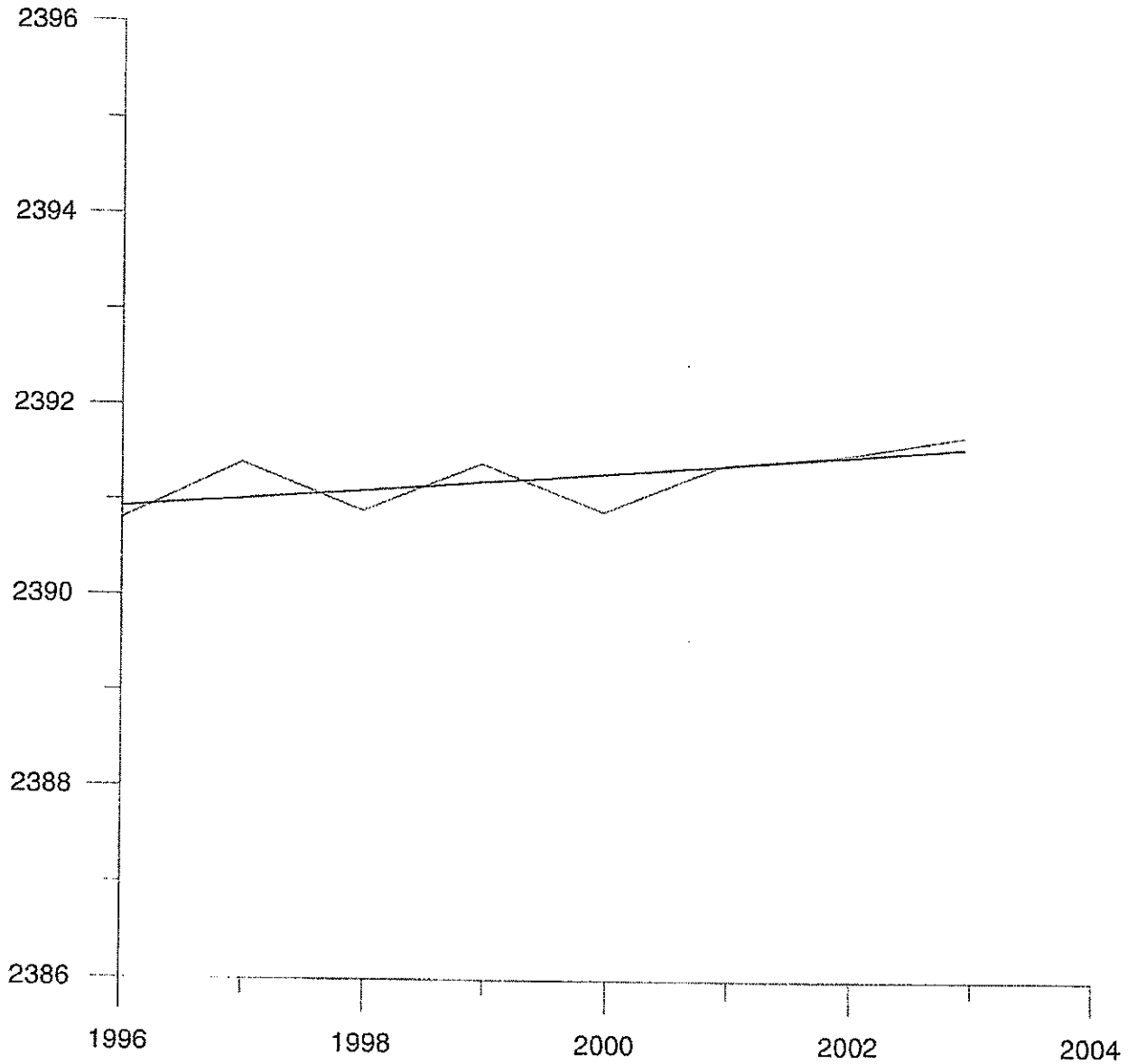
Average Y = 2391.25

Residual sum of squares = 0.417857

Regression sum of squares = 0.362143

Coef of determination, R-squared = 0.464286

Residual mean square, sigma-hat-sq'd = 0.0696429



05N01E-32DBD1  
Fall

Fit Results

*Und. H*

Fit 1: Linear

$$\text{Equation } Y = -1.179197995 * X + 4935.916291$$

Number of data points used = 8

Average X = 1999.63

Average Y = 2577.96

Residual sum of squares = 8.54717

Regression sum of squares = 69.3516

Coef of determination, R-squared = 0.890278

Residual mean square, sigma-hat-sq'd = 1.42453

