

**PROFESSIONAL SURVEY PROJECT II  
MUNICIPAL ROAD / CONSOLIDATION  
N. BOUNDARY 31,32,33,34-14-9 W2 Mer**

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## **CHAPTER 1 INTRODUCTION**

The purpose of this project is to test my ability to apply the knowledge I have gained from my articling experiences throughout the last two years. The project was completed under the supervision of Roger L. Morrow, Saskatchewan Land Surveyor, Commission No. 227. This field portion of this survey was performed between the dates of July 11<sup>th</sup>, 2006 and June 26<sup>th</sup>, 2007.

This project has been selected to cover the following criteria:

- The primary systems of survey in Saskatchewan and the survey evidence common to these systems.
- The sources of information for survey research in Saskatchewan.

### **1.1 Background Information**

This survey project is a municipal road survey in the Rural Municipality of Chester. It is a little over 4 miles in length and is located on a correction line. The area is abundant in old road diversion plans, witness monuments and many, many sloughs.

Registered Plan No. 77R26454 is a reference survey which was carried out on the same portion of road in 1972. It is believed that this reference survey was originally intended to be a new road survey but for one reason or another, these plans fell through. This could be for financial reasons, landowner issues as well as many other reasons.

In January of 1973, there was a portion of this road widening expropriated from the landowner of the southwest quarter of section 4-15-9. At this point, the Rural

Municipality of Chester still had intentions of having a new road survey completed throughout this area. This expropriated portion of the reference survey would not have to be included in this project as this area has already had title transferred to the Rural Municipality. This was done in 1973 by Registered Plan No. 73R50913 which was prepared in accordance with The Municipal Expropriation Act.

Additional instructions given by Information Services Corporation (ISC) were to abandon Registered Plans AO5523 and A2367 and consolidate these areas back into their respective quarter sections. These plans are road diversion plans prepared and registered in the early 1900s.

Expectations included problems in monumenting a couple of corners due to sloughs being so abundant in this area. As mentioned earlier, this reference survey which theoretically widens the road allowance, very possibly was intended to be a new road survey and failed to be carried out in that regard. It was expected that this road has already been somewhat widened and ditched which may pose a problem in finding primary evidence.

## **CHAPTER 2 PLANNING**

The first step in planning a survey project is to establish the nature of the project and determine the results desired from the survey. To break this down further one would ascertain the accuracy requirements, location of existing control, examine site through air photos and such, select the equipment and procedures needed to ensure desired results, and decide on the final presentation.

The purpose and scope of this particular survey project was to basically retrace Registered Plan No. 77R26454. There will be re-establishment for any lost monuments needed for the purposes of this survey, restore any monuments which may be deteriorated, establish reference monuments to protect the position of section corner, quarter section corner and road monuments, and finally consolidate road diversions not being used back into their respective quarters.

### **2.1 Research**

Thorough research on behalf of a surveyor, allows the surveyor to determine an accurate historical development of the project area. Having an accurate understanding of the area will minimize the number of surprises to face throughout the course of the survey.

There are many research tools which are readily available to the surveyor today. The main source of information available to the Saskatchewan Land Surveyors is the Land Surveys Directory. Topographic maps and aerial photographs will allow the surveyor to attain a picture of the area. In this case, Google Earth was used to take a

closer look at the area and see exactly the areas which may be hard to monument due to the abundance of sloughs in the area. Google Earth shows excellent detail in this area.

### **2.1.1 Searches**

Searches within the Land Surveys Directory can be requested electronically through the Information Services Corporation (ISC) website. The scope of this project covers a large area due to the survey being performed on a correction line, essentially doubling the amount of information to be gathered.

Initially, an application within the ISC website called “Display Map” was used to get a picture of the sections included of the area. This map is a snapshot of all registered or approved plans within the quarter section searched at that time. This would be used as a base map to check. The Display Map application will only show plans which have taken area out of the quarter. For example, Registered Plan No. 77R26454 is a reference survey which has no area affiliated with it and so would not show up on the Display Map. This plan could only be searched by a Corner Legal Land Description (LLD).

The Corner LLD search is the most thorough of all the searches. Every plan is connected to at least one corner and therefore every plan should in search results provided you have included all the corners pertaining to the survey.

As mentioned earlier, this road is located on a correction line. Therefore, posting is to be carried out on both sides of the road. Monuments for all quarter sections adjacent to the right of way have to be found, established or re-established depending on the location. In order for this to be done, all plans connected to these corners must be attained in order to properly establish or re-establish as need be.

### **2.1.2 Search Results**

Submitting the above mentioned search parameters would result in a long list of survey plans. Types of plans included in this lists would be road plans, road diversion plans (many abandoned), two pipeline right of way plans, and of course the existing reference survey. In some cases, the plans downloaded were of poor quality and a rescan request would be made through ISC to obtain a clearer image. This mainly occurred with the older road diversion plans.

## **2.2 Equipment Used**

This project area is a large area involving long lines. RTK GPS is the equipment of choice for precisely this type of project. More specifically, a system comprised of Trimble 5700 Base Receiver and a Trimble 5800 Rover Receiver was used. The base antenna was a Zephyr Geodetic and the data collector was a Trimble TSCe.

### **2.2.1 Accuracies**

The horizontal accuracy of both systems, according to Trimble is approximately 10mm. It is important to remember, however, that this accuracy is subject to anomalies such as multipath, obstructions, satellite geometry and atmospheric conditions. Fortunately, this project was in open prairie, primarily free of obstructions and open to a wide array of satellites at any time. I find the accuracies Trimble state in their publications are very optimistic. In practice, we use these systems on a daily basis and on average, find their accuracies to be closer to 15-20mm. This accuracy comfortably satisfies any tolerances established by the Land Surveys Act.



### 2.2.2 Redundancy

Redundancy in RTK survey procedures has been a survey practice issue since the new survey technique made its way into the industry. The standard procedure to create redundancy in collected data is the technique of observation/forced loss of lock/re-observation. Some surveyors require a minimum time separation between observations of 20 to 30 minutes. The idea being, that there would be sufficient movement in the satellite constellation and changes in environmental conditions to ensure a truly independent resolution of the integer ambiguities for two solutions.

In this project, the accepted procedure of observation/forced loss of lock/re-observation, without time separation was used. To ensure the data collected was reliable a number of 'quality control' checks were carried out. In the field, initialization times would be observed. If initialization took a while to come to fruition, it was felt that it may be an incorrect initialization and so loss of lock would be forced once again. Also, a close eye was kept on RMS values and DOP values. If either fluctuated (or spiked) no measurements would be taken until the values dropped and stabilized. The satellite geometry could be viewed at any time by viewing a map of satellite positions within the data collector.

Throughout the survey project, the data controller had tolerance settings which would warn you if any of these values started to fluctuate. Also, the re-observations were to agree with the initial observation by 1 cm horizontally and 1.5cm vertically. If this was not the case, the monument would be observed once again or until there was agreement which satisfied these tolerances.

## **CHAPTER 3 PROCEDURES**

Included in the procedures is how the survey was set up, how monuments were occupied, and of course how each situation was dealt with. The setup remains relatively standard over the course of different types of surveys. The situations which challenge you, however, will differ with every type of survey performed. This section addresses how the survey was setup and the different scenarios which unfolded. It will also address equipment and systems used for all areas of the project from field work to drafting.

### **3.1 Survey Setup**

Upon arrival to the project area, the first step in beginning the survey is to select the highest point to set up the base receiver. Due to the large area this survey covered, it was also important to find a high point in a central area of the survey. In this case, our base point was established along the east boundary of Section 5-15-9 W2 Mer. A spike was set in the ground and the base receiver was centered and leveled over this random point. This survey was performed in real time, so a radio antenna is also set up at this location to transfer the data from the reference or base station to the rover.

#### **3.1.1 Coordinate System**

A local coordinate system was used on this project. Once the road monument near the SE 2-15-9 was observed, false values were applied to it (calibration). These false values are as follows: Northing: 0.000, Easting: 0.000. There were no Control

Survey Monuments within 0.8 kilometers and so this job was only calibrated horizontally. Elevations were not required for the purposes of this survey project.

### **3.2 Data Collection**

The first step taken in this project was to occupy all monuments necessary to build the quarter sections adjacent to the road. In many cases the primary monuments along the road were lost but most road monuments were found. The majority of quarter section corners were found as well.

At this point, those monuments which were not found easily could have their position calculated using the information collected from those monuments which were found. Once the position was calculated, the position could be staked out using the RTK equipment. Many digs were carried out at these positions and if the monument was declared as lost, they would be then re-established as needed.

Once the necessary information was collected, reference monuments were established to reference monuments or positions of those monuments prior to any construction.

There were a number of corners which posed a challenge in re-establishment. A second trip was scheduled to Estevan in a few weeks and so it was decided to take the information gathered at this point back to Maple Creek. There we could download the data and work with it in AutoCad.

On the second trip back to the area, construction had begun. This was a surprise and so immediately work was focused on finding any left over monuments or evidence thereof in the areas construction had not yet reached. It was a nice surprise, however, to

see that the sloughs had dried up quite a bit and so monuments which may have been under water, could now be occupied.

Once the work was completed ahead of the construction, it was time to finish up the work left behind. One lucky break was that the construction was basically building up the road and so most monuments were buried deep but not disturbed.

A third trip to the area was needed to make some minor adjustments to monuments and to occupy a pipeline monument which was overlooked. Finally, a fourth trip was made to search for evidence of various abandoned road diversions which governed section corners.

This survey did not prove to be very straight forward. Many lessons were learned throughout the project. Obstructions were eminent. Some of these lessons are highlighted in the following subsections.

### **3.2.1 Eastern limit of Municipal Road**

There was disagreement at the eastern limit of this new road. This is most likely due to the intersection of three separate plans at this area (See Figure 3.1 below). The majority of the monuments involved in the intersection were found bent. The bent monument was exposed to the point where the bend became apparent. At this point the monument was rotated to loosen it and then pulled from the ground. A clear and solid 'downhole' could then be recognized and the monument was straightened and restored.

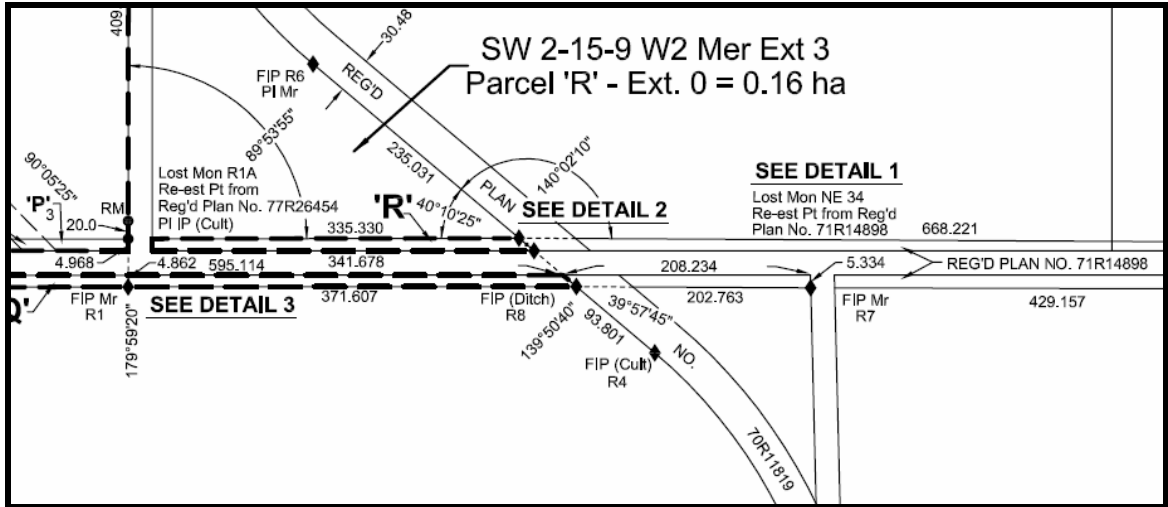


Figure 3.1: Portion of the Plan of Survey for this project.

The overall distance between R6 and R4 along Registered Plan 70R11819 agreed with previous measurements. When R8 and R8A were found to be very close to this line, a confidence grew in this line. The major disagreement was found between R8 and R4. The measured distance was 93.801, however the plan distance taken from Registered Plan No. 70R11819 was 93.601. All measured angles in very close agreement with the plan. It seemed that over the years, this distance between R8 and R4 was avoided. The only time this distance was measured was on the original plan. This 0.2 m disagreement is probably why it was always avoided.

### 3.2.2 Obstructions

Through the course of this survey, there were many corners which would have to be established due to existing sloughs in the area. The Manual of Instructions for the Guidance of Surveyors states that “where it is impossible or impracticable to establish a monument on the new road right of way limit opposite a section or quarter section corner due to a slough or marsh or other such obstruction, a monument shall be established on

the new right of way limit on either side of the obstruction and a connection shown to the section or quarter section line. The reference monument may be omitted.”

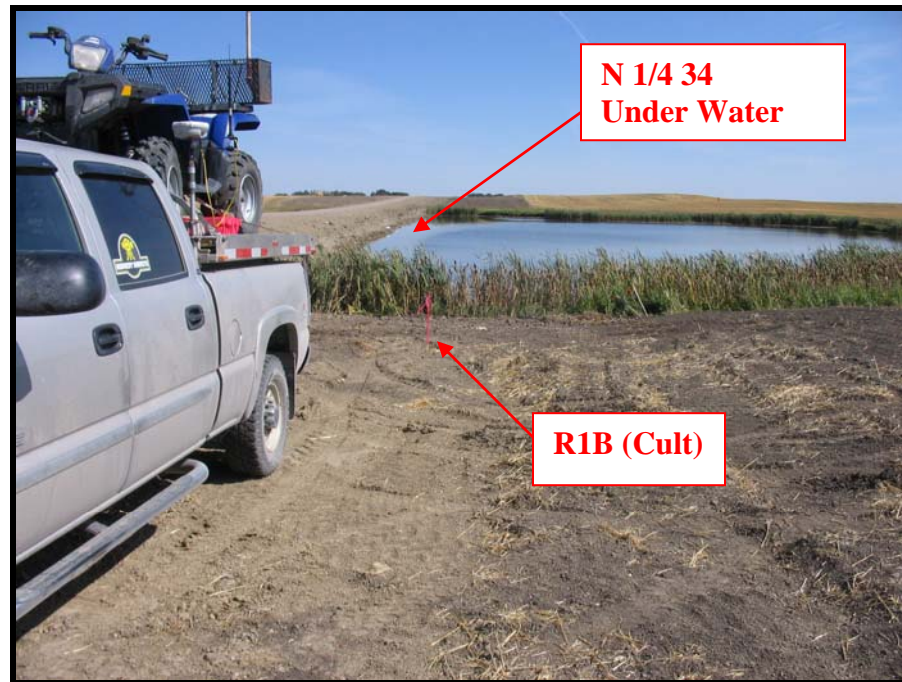


Figure 3.2: Picture of the N 1/4 34-14-9 W2 Mer

The established position of the north quarter section corner was under water (See Figure 3.2 above). This corner had been witnessed in previous years but was declared lost in Registered Plan No. 77R26454. Therefore in this case, R1B was established 110.000 meters west of the N ¼ 34 and on the right of way limit. It was then connected to the established position of the quarter corner.

A similar scenario was found at the NE 33-14-9, and the SE 5-15-9. Both of these corners were also witnessed at one point in time, but the witness monument has been declared as lost. At the NE 33, a road monument R3C was placed on the west side of the slough. At the SE 5, there was a found monument (R10) 40.146 west of the corner. This seemed sufficient.

### 3.2.3 Road Diversions

As mentioned earlier, there were two road diversion plans which were to be abandoned and the area consolidated back into the quarters. It was recommended in the Surveyor's Report that a third and fourth plan should also be abandoned and consolidated back to the quarter as these road diversions are no longer being used.

The Manual of Instructions states that "where a previously surveyed road right of way, in a quarter section, is to be entirely abandoned in favor of a new road right of way survey, the previously surveyed road right of way does not have to be retraced unless it is required for re-establishment purposes." In the following three examples you will see that these road diversion surveys were directly connected to primary corners.

Registered Plan No. AO5523 (See Figure 3.3 below) is an old road diversion located in the northwest corner of Section 34. This is one of the diversions referred to in the job request from ISC. The portion of the road diversion located in the NW ¼ 34 was abandoned in 1971 and superseded by the reference survey plan (77R26454). However this abandonment is not mentioned on the ISC plan report and still shows up on the Display Map application.

In 1972, the reference (road) survey was being carried out. At this time a new diversion was surveyed around this pond which followed a similar but not identical route as did the portion of Registered Plan No. AO5523 located in the NW ¼ 34. Oddly enough, this plan was not shown nor mentioned on the reference survey plan. In fact, many road diversions were not mentioned on this plan.

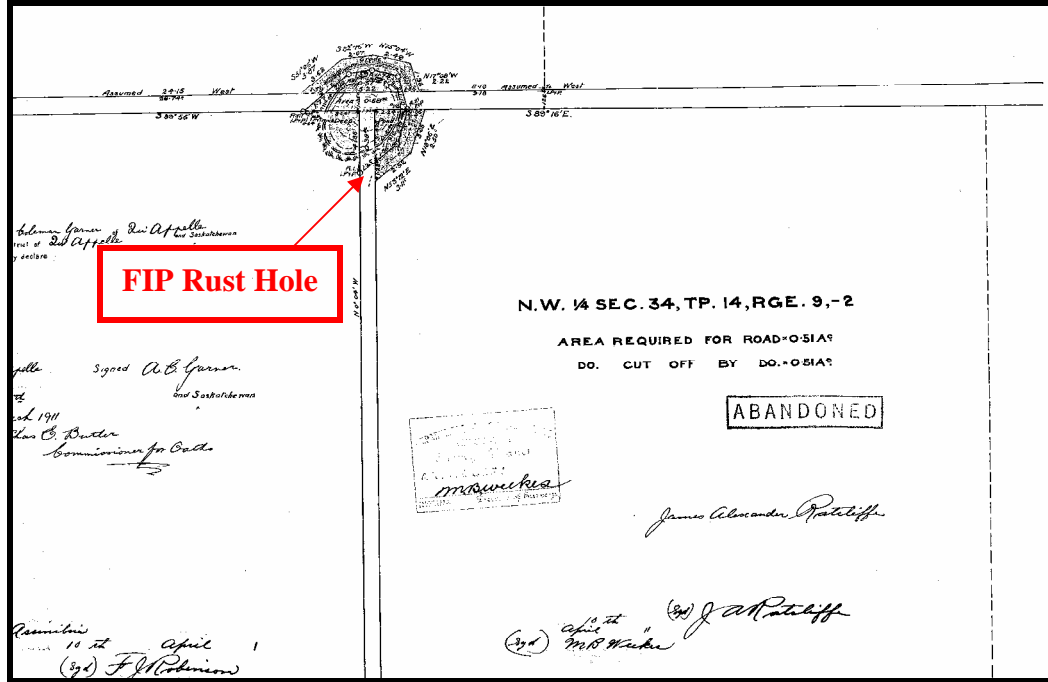


Figure 3.3: Portion of Registered Plan No. AO5523

Initially it was decided to re-establish the position of the NE corner of Section 33 according to the most recent plan which was the reference survey. Since this time, that decision has been questioned. The fact that the original road diversion is not mentioned on this plan presents an uneasy feeling. In order to be sure of the position of the NE 33, one must go beyond the reference survey plan and search for any evidence of the original road diversion. A proper search for evidence was carried out and resulted in the finding of an IP rust hole which belonged to R1 of Registered Plan No. AO5523 (See Figure 3.4 below). This was a great finding as this monument directly governed the position of the NE 33.





**Figure 3.4: IP Rust Hole found for R1, Registered Plan No. AO5523**

In order to confirm this position, more searches were done. All other monuments on this plan were declared as lost. However, an FIP was discovered further south on another road diversion, namely, Registered Plan No. AV3436. Once this FIP was connected to the east boundary of section 33, the resulting measurements would confirm the position of the rust hole. This plan is one the road diversion plans which is being recommended for abandonment as it is no longer being used.

The second road diversion to be abandoned is located in the SE  $\frac{1}{4}$  3-15-9. It is Registered Plan No.A2367 (See Figure 3.5 below). This plan is important in that it is connected to the established position of the N  $\frac{1}{4}$  34 and the associated witness monument. Over the years, the position of this quarter corner was maintained by using this plan in re-establishment. Today, the road monuments from A2367 are lost and so a direct connection cannot be made. Registered Plan No. 70R11819 is now a key plan in re-establishing the quarter corner. The reference survey plan (Registered Plan No.77R26454) uses both the above mentioned plans in re-establishing this corner as did this survey project.

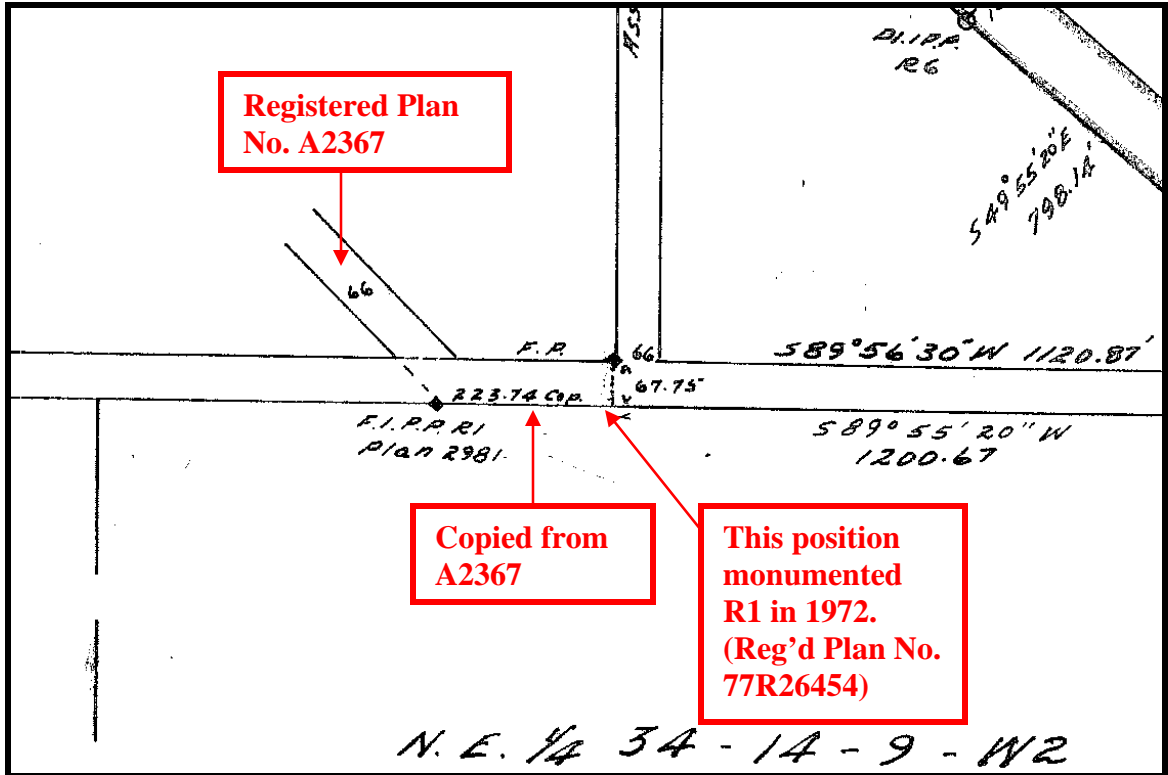


Figure 3.5: Portion of Registered Plan No. 70R11819

The fourth road diversion to be abandoned is Registered Plan No. H577. This plan is connected to both the SE corner of Section 1-15-10 and the NE corner of 36-14-10. A Road Plan registered in 1974 also connects to both corners. Since this time the section corners have been declared as lost and plans in this area establish the corners based on the information of these two preceding plans.

In all the above four cases, the diversions are no longer in use and roads have been constructed straight through the sloughs which were at one time a significant obstacle to go around. Today, there is absolutely no physical hint of these diversions on the land. One would never know they existed.

There was a need for further investigation into road diversions which have been abandoned for years. These diversions have been ignored over the years in re-establishment of section corners. For this reason, it was decided to search for any

evidence of the monuments on these plans and use this information to confirm the current positions of section corners.

Registered Plan Nos. C182 and J591 proved to be key plans in re-establishment of a few sections corners. Each monument shown on these plans were calculated and then staked out. While searching for evidence of R4 along the east boundary of Section 32, a fence post hole was found. Next, moving east to R3, a dig was done which uncovered an old fence post butt. The distance between the centers of both pieces of evidence was found to be only 0.011m longer than the distance shown on Registered Plan No. J591. Also, the bearing found between the two was only 5" off the bearing shown on the plan. It was decided that what may have happened years ago is that the survey pins were found by the farmer, pulled out, and replaced with the fence posts. For this reason, this evidence was accepted as the positions of both R4 and R3.

At this time, the NE corner of section 32 could be re-established by connecting the evidence found at R3 and the FP(1967) at the E1/4 32 and extending this line 2.5 chains as shown on Registered Plan No. C182. The movement in the position of this corner was significant. It would be moved 5.6 m west from the position established using Registered Plan No. 77R26454.

These positions of monuments R4 and R3 were also used to establish the position of R1 from Registered Plan No. J591. Once this point was established, it was connected to the recently re-established NE 32 and extended 1.08 chains to establish R1 from Registered Plan No. C182. This position was established using Registered Plan No. J591, the N1/4 33 could then be established using Registered Plan No. C182.

Registered Plan No. C182 runs along the north boundary of section 32. Although all the monuments along the road allowance were lost, there were a couple of key finds to help re-establish the SE 5 and the N1/4 32. First, FIP R8 was found a little bent but was straightened. Next, an IP hole was found while scraping for evidence of R7. The distance between the two was within 5 cm. These two positions provided a starting point by which to re-establish both the N1/4 32 and the SE5. Plan angles and distances were used from Registered Plan C182 from line connecting the two.

First, a point was established for R9 located on the along the road allowance. A connection would then be made between the re-established position of the NE32 and the established position of R9. This line would then be extended 14.945 chains as per Registered Plan No. C182.

Although exhaustive searches were done for any monuments related to this plan in Sections 4 and 5, no more evidence was found. Using FIP R8 as a starting point, distances and bearings were taken from Registered Plan No. C182 to re-establish the position of R11 located on the eastern boundary of Section 5. The eastern section boundary is then established by connecting this position of R11 to the FP (1967) at the E1/4 Section 5. The difference in this line and the section boundary line established on Registered Plan No. 68R19365 was in the area of .500m. This plan was studied and found to be incorrect. Registered Plan No. C182 was not considered at all in re-establishment of any of the section corners. In fact, Mr. Zeldenrust (SLS) seemed to accept evidence at every corner and PI IP. The field notes were obtained for this survey and all corners were monumented based on fence lines. It was decided to throw this plan out for re-establishment purposes. As a result, any monuments found along the east

boundary of the SE1/4 of Section 5 would have to be moved +/- .500m. This would include R1 and the SPC pipeline monument.

Now that the established position of the SE 5 has been founded correctly, the quarter corner monuments to the east and west must be moved to their proper position. In each case the section half miles are evenly proportioned and on a straight line. An obstacle would arise when visiting the S1/4 of Section 4 which had been accessible last fall. At this time it was not able to be removed and corrected as it was deeply submerged in water. Therefore, an established point was shown on the plan and a tie to the monument. Once water levels are low, the monument will be then corrected.

Evidence sketches were done to highlight the areas where evidence was found and accepted. These sketches gave a detailed description of evidence, as well as any measurements taken to confirm the position of the evidence. Two sketches were done, one for the NE 32 and the other for the NE33. A copy can be found in the appendices.

### **3.2.4 Intermediate Monuments**

Registered Plan No. 77R26454 was done in the early 70's. At this time, when performing a road survey, it was required to place intermediate monuments. Today, intermediate monuments are no longer necessary. For the purposes of this project, any intermediate monuments found were connected to the survey. If an intermediate monument was lost, it was only re-established if it marked a deflection point. These procedures were in accordance with the Manual of Instructions for the Guidance of Surveyors.

### 3.2.5 Reference Monuments

The reference monument governs the position of the primary monument, unless of course the original monument is found, in which case the original monument governs. A reference monument may also govern the position of a road monument. The reference distance is usually established at 20 meters. There were a couple of instances throughout the course of this project where this distance had to be increased due to the presence of a slough.

One example was at the south quarter of section 4 (See Figure 3.6 below). In this case the quarter corner monument was found. The road monument could not be occupied as it was under deep water. The reference monument was established 70 meters from the established position of the road monument. The quarter line was a surveyed line and therefore the reference monument was established and monumented on this line.



Figure 3.6: "A Bridge of Lath" to reach the iron post at the S 1/4 4-15-9 W2 Mer

The south quarter of section 6 was also found. A road monument could also be established and a monument planted. This was the end of the road. Beyond this road monument was a large pond and so if a reference monument was to be established it would be at least 100 meters away. A call was made to ISC and permission was given to omit the reference monument at this corner.

The more standard procedures were used along section boundaries. In the majority of cases, the road monument was found. If surveying on the north side of the road, the quarter section corner to the north would then be found and occupied. A reference monument would then be established on the line formed between these two monuments at a reference distance of 20 meters from the road monument. The same procedure would be used when surveying on the south side of the road, whereby you would find the quarter section corner to the south.

In the case where there was a pipeline intersection monument on this line, it would also be occupied to confirm the boundary. If the intersection monument was off line, it was noted. This was the case along the east boundary of Section 5-15-9. Along the east boundary of 32-14-9, the monument was found disturbed and had to be restored. In this case, the closest pipeline monuments along the right of way were found on either side. Also, the road monument to the north and the quarter section corner monument to the south were also found. A four point intersection was calculated using the information gathered and the position of the disturbed monument was then established. At this time, the iron post itself was straightened out and restored at this position.

A couple of section boundaries were harder to establish than others. It took quite a while to find the witness monument along the east boundary of 1-15-10 (See Figure 3.7 below).



**Figure 3.7: Occupying the Witness Monument near NE 1-15-10 W2 Mer**

Originally, this witness was a mound and trench. In 1971, J.P. Scott (SLS) found this witness monument of a mound and trench and planted an iron post accordingly. Unfortunately, Mr. Scott's plan only connects to the witness monument with an angle and not a distance. At this point, it was decided to use township distance to calculate an estimated distance to the monument and look for remnants of a trench. The distance measured to a corner fence post which seemed appropriate. Long grass in the area was stamped down in hopes of walking into a trench or seeing a mound. This was to no avail. There was much wire and iron fence braces making the metal detector somewhat useless. A section corner was estimated using field lines in the area and 2.5 chains were paced



south, this would also find us at the corner post. Once it was decided to branch from the corner post we found the iron post six meters south.

The second section boundary which was at one point impossible to find was the east quarter of section 33. Surprisingly enough, a deep slough was found to be in the same area the monument was calculated to be. Fortunately, the second trip to the area was in early September and the slough had dried up enough to find and occupy the monument (See Figure 3.8 below).

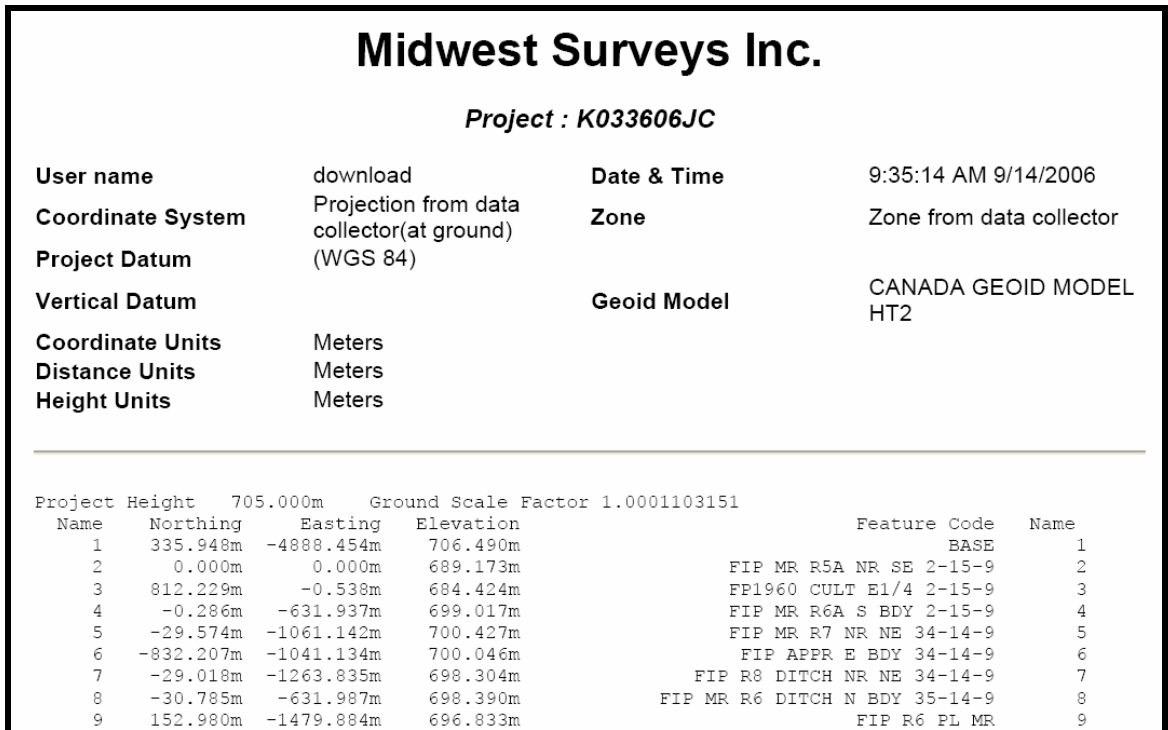


**Figure 3.8: Occupying the monument at the E 1/4 33-14-9 W2 Mer**

### **3.3 Data Processing**

After each trip to the project area, all data would be downloaded from the data collector to the computer. Once the data is downloaded, it is imported into Trimble Geomatics Office. All vectors are processed and through Trimble's quality control capabilities, red flags are automatically displayed on screen to visually alert the user to

the presence of out-of tolerance data. Once everything is checked and in order, a report listing all the data included in the project is generated (See Figure 3.9). The next step is to export the data into AutoCad where all the calculating will be done. We use the export function to export the file as a .dxf (AutoCad) file.



**Figure 3.9: Trimble Geomatics Office GPS Report**

### 3.4 Calculating

As mentioned previously, all calculating was done in AutoCad. Throughout the process of building the sections, distances and angles are checked with plans to ensure there are no significant discrepancies. Intent of the plans is held as much as possible. For instance, if a straight line, even split has been held across a section boundary, this intent would be held as long as my GPS observation for the quarter section corner is within 2-3cm. Closures are run throughout all line work that is built. The following

tolerances found in the Manual of Instructions for the Guidance of Surveyors were satisfied:

- Non-closures within the Surveyor's own measurements shall not exceed the greater of 1:10,000 or 0.020 metres.
- Non-closures with the Surveyor's own measurements combined with the measurements of previous surveys shall not exceed the greater of 1:5,000 or 0.020 metres.

In the Land Surveys Act Regulations there are standards of accuracy associated with the year the survey was done. The Act states the following tolerances:

- for a survey performed in 1950 or earlier, the accuracy factor is 1,500;
- for a survey performed between 1951 and 1975, the accuracy factor is 2,500; and
- for a survey performed in 1976 or later, the accuracy factor is 5,000.

There were a number of discrepancies between measured distances in the field work carried out for this project and the measurements shown on previous plans. In these instances every effort was made to investigate where and why this discrepancy exists. In some situations, the surveying was done in the late 60s and early 70s. There was usually a trend in that that distances would systematically shorter than those shown on plans. Their proportion of total distance would also match the originally intended proportions. This can be explained by the time at which the original survey was done, and the limiting factors involved with the equipment used for distance measurement. Any disagreement found throughout the course of the survey was addressed in the Surveyor's Report.

Once all line work has been built and the closures have been carried out, the intersections are checked. The corresponding GPS point should be very close to the calculated intersection of a pipeline right of way and the respective 'new' section boundary. In addition to checking the placement of the intersection monuments, the measurements relating them to their original position must be determined.

Another great check used when calculating sections was to see if the road widening matched that on Registered Plan No. 77R26454 once the area is built. If the widening was within two centimeters, the original widening was held to maintain consistency. If the discrepancy was more than two centimeters, the measured widening was shown on the plan.

### **3.5 Drafting**

The calculated file is first copied into another drawing file to use as a foundation for drawing the plan. At this point, only the sections, the road survey, and a surveyed portion of the pipelines are drawn.

Information added to the drawing includes all rights of way, their associated plan numbers, widths, section evidence and annotations, section descriptions (section, township, range, meridian), etc. With the implementation of the Land Surveys Regulations, ISC (Information Services Corporation) distributed a document to provide directions on plan preparation called "General Requirements for the Preparation of Plans". This document provides an instrument by which all survey plans submitted are to uphold certain drafting standards. Examples of standards set out in this documentation

are minimum text sizes, a maximum plan length and width, border size, acceptable scales, etc.

Drafting was a challenge in that the project area is very busy with measurements being shown on both sides of the road. Also, there were thirteen details along with one enlargement used to clarify the eastern limit of the road. The scale used was 1:5000, and to include all the information at this scale was definitely a task in itself.

There were a number of items required to be shown on this road plan. For instance, when surveying adjacent to a correction line, you must connect the two survey limits at each end of the survey and at least once every mile. This connection is comprised of both an angular and linear measurement. Many of the details in the survey plan show these connections.

This road survey is part of the 2006 Municipal Road program. In April of 2006, the Manager of the Municipal Road Program sent out a document specifying any program requirements. This document explained that Municipalities require area calculations for new area acquisitions so they can compensate land owners for land purchased. Included in the document was an example as to the breakdown between the previous and additional area purchased area. A generic example to follow is show below in Figure 3.10.

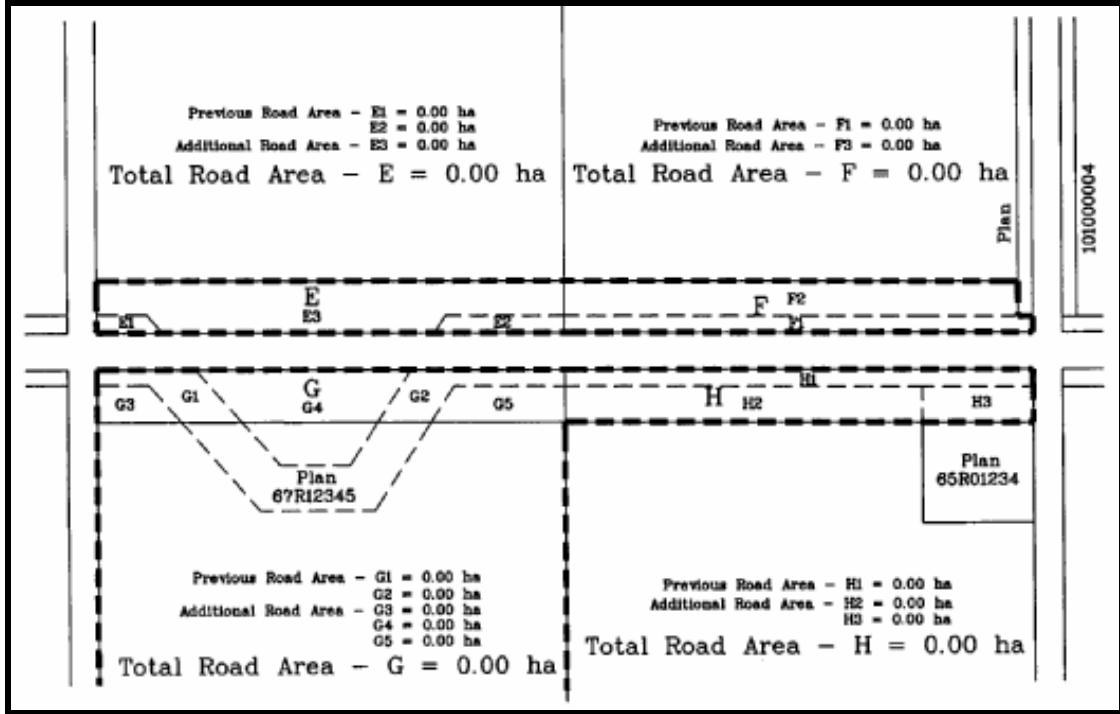



Figure 3.10: Sketch included in document regarding 2006 Municipal Road Program.

## **CHAPTER 4 RESULTS**

In the end, the desired result is to attain plan approval by ISC. Once the plan is submitted to ISC, an acknowledgement is sent back to the Land Surveyor. The plan is then placed in a queue to be checked. All plans submitted to ISC are numbered as they are submitted. It could be months before it is assigned to a plan examiner.

The Plan Examiner will conduct a thorough check over the plan to make sure it is in compliance with all appropriate Acts and the associated Regulations. If the plan is done in accordance to the Acts and the Plan Examiner is satisfied, he or she will send a Transform Approval Certificate (TAC) to the manager of the Municipal Road Program. If there are corrections to be made or further field work to be done, the Plan Examiner will send a memorandum to the Land Surveyor specifying exactly what needs to be done in order to gain approval.

	<b>Controller of Surveys Office</b>	<b>Memoranda On Examination of Plan</b>
	<b>Request Number:</b> 107094779 <b>Your Request File Number:</b> 700487 <b>Plan Number:</b> 101906456 <b>Your File Number:</b> K-0336-08 <b>Prepared By:</b> Roger MORROW	February 08, 2007
<b>Memoranda on Examination for Plan of:</b> N31,32,33,34-14-9-2 & NNE pt 36-14-10-2		
The above Plan has been reviewed to ensure compliance with the Land Surveys Act and Regulations. Please review and amend the Plan where necessary, complete the portion of the memoranda, sign and date the memoranda and return with the Plan.		
<b>Remarks</b>	<b>Surveyor's Reply</b>	
1) Please re-submit your plan. It's fuzzy and difficult to read. In future please use text at 2.5 mm height in this font and a thinner line weight. In this case the 2mm does not reproduce very well. Also you can move the text away from the road allowance to prevent the crowding of information. I am sending a plan under separate cover to serve as an example. The plan will be examined upon the re-submission.	I submitted this plan in pdf format. When I print the pdf , it comes out quite clear. I believe the problem occurs when your office converts the pdf image to a tif image. I have generated a tif image of the plan. I printed it and it appears to be legible. Hopefully you can work with this one.	

**Figure 4.1: Portion of ISC Memorandum**

The Land Surveyor will then carry out any tasks the Plan Examiner specifies in order to gain plan approval. These tasks may be changing text sizes, adding an angle, or they may be tasks which require more field work. The Memoranda has two columns. One column is a numbered list of the Plan Examiner’s remarks. The other column is for the Surveyor’s reply to the remarks (See Figure 4.1 above).

Once all the remarks have been addressed, the Land Surveyor will then proceed to do a Plan Re-Submission. The re-submission is done in the same way as the initial submission. A more detailed description of how the submission process works is found in the following subsections. Also, there is a copy of all the documents included in the packets are found in the Appendices.



This process will repeat itself until the plan is in compliance with the Acts and Regulations. Once the Plan Examiner is satisfied he or she will then send a Request Approval Notice to the manager of the Municipal Road Program. As far as the surveyor is concerned “no news is good news”.

#### **4.1 ISC Submission**

As mentioned earlier this project was done under the 2006 Municipal Road Program. Therefore the initial digital submission was submitted to the Manager of the Municipal Road Program. At that point his/her office would process the attached invoice, complete the Plan Processing Packet Cover Page, and forward the documentation to ISC via E-Business Services (EBS).

The Returns of the Survey submitted to the Manager of the Municipal Road Program included the following documents:

- Plan Processing Request
- Begin Attachment Sheet
- Surveyor’s Certificate
- Surveyor’s Report
- Plan of Survey
- Field Notes
- Cover letter (not included in request count)
- Bill for Services (not included in request count)

The first two documents are forms which are downloaded from the ISC website. The plan processing request page asks for plan information such as how many plans and

support documents being submitted. It also determines exactly what the request entails. The begin attachment page requires no information and acts as a separator page for attachments.

Every plan of survey must include a Surveyor's Certificate. According to the Land Surveys Regulations this is to certify three things:

- The date the survey was performed.
- The survey represented by the plan of survey was made in accordance with the Land Surveys Act and Regulations.
- The plan is correct and true to the best of the Surveyor's knowledge and belief.

The certificate must also include the signature of the Surveyor, the date the certificate was signed and the location where the certificate was signed and the surveyor's seal.

The Surveyor's Report is an opportunity for the Surveyor to provide an explanation for any unusual circumstances encountered or any non-closures with previous survey plans. The Manual of Instructions for the Guidance of Surveyors states:

“The plan of survey shall be accompanied by a Surveyor's Report. The report shall contain all information that may be pertinent to the plan of survey and shall describe any unusual survey procedures or survey evidence used in the re-establishment of monuments.”

When submitting a report on a municipal road, the report should indicate if the plan measurements were obtained by GPS. It should also indicate when the survey was performed in relation to the construction (before/after/during). This provides ISC with some insight as to the monuments destroyed by construction.

The cover letter is simply a letter from the land surveyor to the Controller describing the plan he wishes to be examined for approval. It is important to affix a job number on all support documentation.

The Bill for Services submitted to ISC should include contract, job and file number. ISC also asks that the measurements charged for be either highlighted on a copy of field notes or the plan of survey or supply an itemized listing with the invoice showing which ties are being charged. For the purposes of this project, the latter was chosen. This listing was shown directly on the invoice. Once the listing was completed, the chainage could be then added up and multiplied by the standard rate of ISC. The breakdown for this project is found in the table below.

	Total Distance (km)	ISC Rate / km	Total (\$)
Correction Line Chainage	6.91	662.00	4574.42
Tie Line Chainage	15.11	373.00	5636.03

To have a closer look at any of this documentation which was submitted to ISC, including the Plan of Survey please refer to the Appendices.

## **CHAPTER 5 CONCLUSIONS & RECOMENDATIONS**

This project was by far, the most difficult of the three projects submitted. The advantage of a more complex project is the knowledge and experience you gain in completing it. There were many lessons learned while surveying this municipal road. The fact that this road was located on a correction line, as well as the road diversions, the obstructions, the consolidation factor all brought forth a new lesson to be learned.

Registered Plan No. 77R26454 was a poor one in that the surveyor did not provide clear descriptions as to how a corner was re-established. There were many road diversions overlooked which had direct connections to primary evidence. I can appreciate that in those years, searches for plans were much more tedious than today. All searches were manual and plans could be missed. I am not sure at this time if that is why Mr. Boss failed to include road diversion information but I am in the process of finding out.

The Manual of Instructions for the Guidance to Surveyors was by my side throughout this project. The instructions are very clear as to what to do in every circumstance. Many large holes were dug in the hopes of finding evidence and in some crucial cases the evidence needed was found. Alleluia!

Drafting was pain staking. A road widening on a correction line has double the measurements to be included. ISC was not happy with the initial submission of the plan in that the plan examiner did not find it to be clear. The plan was submitted as a .pdf file and once received it was scanned and made into a .tiff file. Clarity was sacrificed in this process. Eventually our firm found a program which could successfully generate a .tiff file directly from AutoCad and this was submitted once again. It was also a

recommendation that all numbers and descriptions on the plan have their font changed from 'Arial' to 'Simplex'. This recommendation is being sent throughout our firm's Saskatchewan offices so they will not encounter the same problems in their own submissions.

It is also recommended that all Land Surveyors keep attuned to any developments in the field of surveying. More specifically, to those emails and ISC briefing papers sent to all those affected. This project is an example of this.

This municipal road was one sent to our firm as a job request just like any other. Once it was known that there was an existing reference survey on this road which held a widening of 30.48m, the personnel at ISC were notified. The instructions were to go ahead on the surveying of the road and basically retrace the widening set by the reference survey.

It was only after much of the field work was complete that an ISC briefing paper was brought to my attention. This document describes a process called "Re-approving plans for title creation". Essentially titles can be raised to any previously approved plan or portions thereof without the requirements of a survey certificate, certifying that the monuments exist in their proper positions.

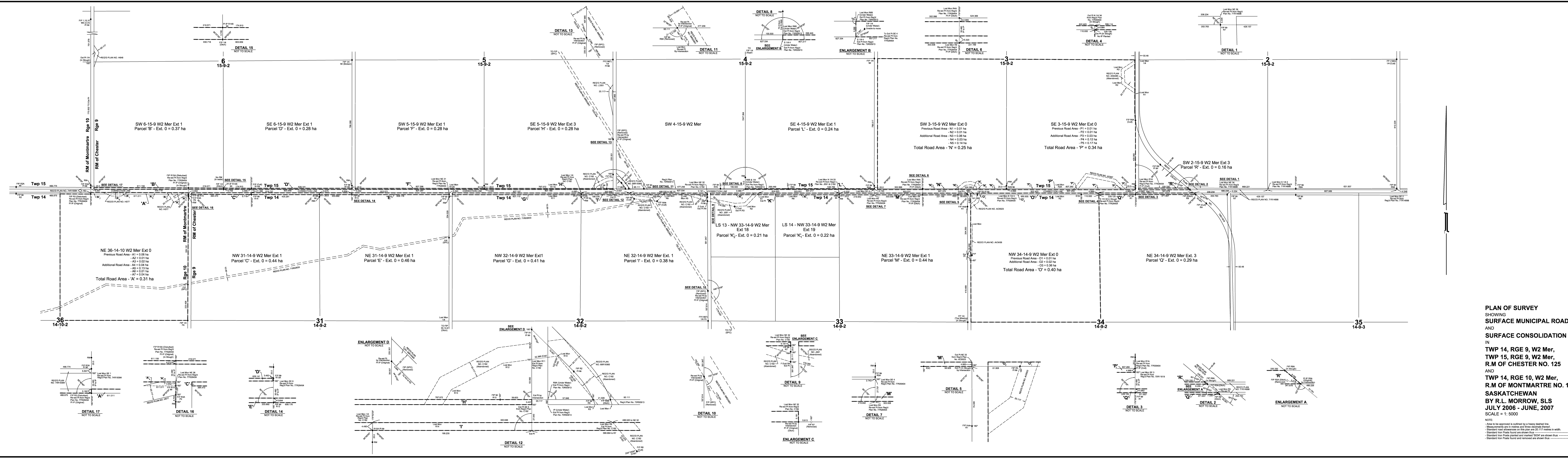
Simply put, there was no need of any field work for the purposes of this project. This could have been done 'in house' at ISC had all involved been up to date on their ISC Briefing Papers. This was a heavy hit to say the least.

As mentioned earlier this project was a challenging one and many lessons were learned. At this time, I am starting the resubmission process for this plan. I completely understand the importance in going that 'extra mile' in searches for any evidence. The

result is a survey plan which you can stand behind and have confidence in. In years to come, surveyors may retrace my work and know that due diligence was carried out. The re-establishment of section corners are done properly and are as close to their original position as I can possibly achieve.

## REFERENCES

- Davies, Raymond E., Francis S. Foote, James M. Anderson and Edward M. Mikhail (1981). *Surveying Theory and Practice*. 6th ed., McGraw-Hill, USA.
- Jess, Bernie (2006). "RTK and Measurement Closures". *SLSA Corner Post*, Vol. XXVII, No. 1., pp 196-197.
- The Land Surveys Act (2000) and Land Surveys Regulations (2000)
- The Manual of Instructions for the Guidance of Surveyors, prepared by SaskGeomatics Division, under authority of the Land Surveys Act. (1999)
- Jensen, Al. Manager Municipal Road Program (ISC). "2006 Municipal Road Program – Program Requirements". Memo dated April 25, 2006 to Roger Morrow.



**PLAN OF SURVEY**  
 SHOWING  
**SURFACE MUNICIPAL ROAD**  
 AND  
**SURFACE CONSOLIDATION**  
 IN  
**TWP 14, RGE 9, W2 Mer,**  
**TWP 15, RGE 9, W2 Mer,**  
**R.M OF CHESTER NO. 125**  
 AND  
**TWP 14, RGE 10, W2 Mer,**  
**R.M OF MONTMARTRE NO. 126**  
**SASKATCHEWAN**  
**BY R.L. MORROW, SLS**  
**JULY 2006 - JUNE, 2007**  
 SCALE = 1: 5000

NOTE:  
 - Area to be approved is outlined by a heavy dashed line.  
 - Measurements are in metres and three decimals thereof.  
 - Standard north-south references on this plan are 20.117 metres in width.  
 - Standard Iron Posts found are shown as follows: .  
 - Standard Iron Posts planted and marked 'SOM' are shown as follows: .  
 - Standard Iron Posts found and removed are shown thus:

