Committee Reports 6B
CITY COUNCIL
CITY OF CAMBRIDGE

~~January 30, 1995~~
February 27, 1995

INTRODUCED BY CITY MANAGER ROBERT W. HEALY

AN ORDER CONCERNING APPROPRIATIONS FOR THE FISCAL YEAR BEGINNING JULY 1, 1994

ORDERED: That in addition to sums previously appropriated by the City Council for the fiscal period 1994-95 the following sum is hereby appropriated in the Public Investment Fund the City of Cambridge:

FUNCTION	DEPARTMENT OR PROGRAM	SALARY & WAGES	OTHER ORDINARY MAINTENANCE	TRAVEL & TRAINING	EXTRAORDINARY EXPENDITURES	APPROPRIATIONS
General Government	Finance				$1,150,000	$1,150,000.00

BE IT FURTHER ORDERED: That the above appropriation in the Public Investment Fund to be financed by estimated revenues drawn from the following sources:

FINANCING PLAN	REVENUE
Retained Earnings/Water Fund	$350,000
Fund Balance/Parking Fund	200,000
Free Cash	600,000

In City Council February 27, 1995.
Adopted by a yea and nay vote:-
Yeas 9; Nays 0;Absent 0.
Attest:-D. Margaret Drury, City Clerk.
A true copy; D. Margaret Drury
ATTEST:-
D. Margaret Drury
City Clerk

Committee Report #6A
CITY COUNCIL
CITY OF CAMBRIDGE

~~January 30, 1995~~
February 27, 1995

INTRODUCED BY CITY MANAGER ROBERT W. HEALY

AN ORDER CONCERNING AN APPROPRIATION FOR THE FISCAL YEAR BEGINNING JULY 1, 1994

ORDERED: That the following transfer be made from the Public Investment Fund of the City of Cambridge:

FROM	AMOUNT	TO	AMOUNT
Public Works Department Extraordinary Expenditures	$350,000.00	Finance Department Extraordinary Expenditures	$350,000.00

REASON (S) To cover a portion of the cost of the GIS.

In City Council February 27, 1995.
Adopted by a yea and nay vote:-
Yeas 9; Nays 0; Absent 0.
Attest:- D. Margaret Drury, City Clerk

A true copy; D. Margaret Drury

ATTEST:-

D. Margaret Drury
City Clerk

C. C. 108

City of Cambridge

MASSACHUSETTS

In City Council 2/27 1995

Comm Dev # 6 B. Appropriation for GIS

YEA	NAY	ABSENT	PRESENT	
✓				Ms. Kathleen L. Born
✓				Mr. Francis H. Duehay
✓				Mr. Anthony Galluccio
✓				Mr. Jonathan S. Myers
✓				Mrs. Sheila T. Russell
✓				Mr. Michael A. Sullivan
✓				Mr. Timothy J. Toomey, Jr.
✓				Ms. Katherine Triantafillou
✓				Mayor Kenneth E. Reeves
9	0	0	0	

MJ m Bowe w/9

RF 0/9

7.

CITY OF CAMBRIDGE
CAMBRIDGE, MASSACHUSETTS 02139

TEL 349-4300
FAX 349-4307

EXECUTIVE DEPARTMENT
ROBERT W. HEALY
City Manager

RICHARD C. ROSSI
Deputy City Manager

January 30, 1995

To the Honorable, the City Council:

Recommendation:

Authorize the use of $1,500,000 for the purpose of installing a citywide Geographic Information System (GIS) and network infrastructure. Funds for GIS shall be made available from the following sources:

$ 350,000	transferred from Public Works Sewer Capital
$ 350,000	Water Fund available balance
$ 200,000	Parking Fund available balance
$ 600,000	Free Cash

Sufficient operating funds to support GIS installation will be incorporated in my FY96 budget submitted to the City Council.

Background and Introduction:

In 1993, the City retained Plangraphics, Inc., a firm providing geographic information systems consulting and implementation services, to (1) make a complete survey of the City's current mapping installations, (2) ascertain, on a department by department basis potential GIS users within the City and what their needs will be, and (3) put in place an implementation plan for installation and maintenance of a citywide Geographic Information System.

The Consultant's found the City's current map resources and mapping capabilities to be extremely limited, inefficient and inaccessible for any but very specialized uses. The Assessors' maps are hand drafted with pen and ink on linen. There are two sets. One is at the Public Works Department where the City Engineer updates them based upon deed information which the Assessors provide the Engineer. The second set is at City Hall in the Assessing Department. From time to time, an Engineer comes to City Hall and either draws any changes on the City Hall set or brings over a

mylar copy of the Engineer's map which includes updates. None of these maps utilize a common sheet format, are consistent in terms of features, or are of the same accuracy. The technology is that of the nineteenth century and can on occasion lead to inaccurate information and consequent errors.

Similarly, other departments have evolved maps for their own purposes. There are no common base maps. Mapped information in one department cannot be conveniently related to that in another.

The water department has its facilities maps maintained by a service agency at an annual cost of $20,000 to $30,000.

As part of the implementation plan, Plangraphics worked with the City's GIS Steering Committee to write two Requests for Proposal for Geographic Information System. The first, which has been published and to which two bids have been received, was for GIS hardware and software. The second, projected to be published early in February, is for aerial photography, development of base maps from that photography, and conversion of the City Assessors' property data base and the Public Works Department's facilities information to a format which can be fitted onto the base maps.

Additionally, and in conjunction with the Computer Aided Dispatch (CAD) project currently underway, installation is required of a fiber optics network to connect fourteen buildings; this network is necessary both to the Emergency Communications system and the GIS data base, and will facilitate departments' access to the City Hall computer facility and the Internet.

The Product.

The product of the Citywide GIS project will be a GIS database consisting of a planimetric base map with property and public facilities information registered to it. The planimetric base map is created from aerial photographs. Selected visible features and facilities on the Cambridge photographs will referenced to the Massachusetts State Plane Coordinate System. Onto this base map, there can be attached any number of data "layers". One of these will be the street network. The Assessors' maps will be digitized and then adjusted to the base map to become the property data layer. There will be several layers of facilities data such as the water system, sanitary sewer and storm drainage systems and the traffic signal system. Other layers will include zoning districts, flood plains, neighborhood boundaries, wards and precincts, etc. It will be possible to view, print, measure, study and analyze these data layers at any selected scale or level of detail. Maps can display a single data layer or can present combinations of elements from several data layers.

Once the GIS base map and data layers are in place, customized programs and menus will be developed to support database development and the quality control process. Additional programs will be developed to tailor the user interface, to provide ready

access to data, to interface the map data with other existing non-graphic databases and to perform analysis on the data. The menus, programs, and products that perform these functions are termed applications.

Benefits of GIS Implementation.

Over twenty City Departments will benefit from the use of GIS applications, with the key departments being Public Works, Community Development, Assessing, Water and Public Safety. GIS can be viewed as **a new element of City infrastructure**. The City's leaders and service providers will be able to locationally identify areas of problems and opportunities, and to study needs more comprehensively than ever before. Further, by implementing GIS on this citywide basis, and in conjunction with the computer network infrastructure installation, information flow among departments will be direct and efficiently performed as has never been possible before. This will make possible the elimination of redundant data bases and duplicated efforts and activities.

Listed on the following pages are examples of the capabilities which key City departments will enjoy as a result of GIS implementation and application development. These should be viewed as only the beginning of the improved services, communications, and products which will accrue to the City, its citizens, taxpayers, and clients as a result of citywide GIS implementation.

All Departments:

- Standard City Base Maps
- Simple and convenient exchange of mapped data and geographically coded data among departments
- Instant availability of updated information/data to all departments
- Thematic mapping for public/city council information and presentations, and an overall improved quality of presentation materials
- Easy generation of targeted mailing lists to notify residents of pending projects, permit procedures, or meetings
- Address matching/incident mapping to combine data from a number of source departments, giving the ability to combine, analyze and map all address-based information
- Maintenance of boundary data such as assessing districts, zoning districts, planning areas
- Convenient mapping of property and facilities

inspection routes

Assessing Department:

- Modern Assessors' property maps and simplified map maintenance procedures
- Spatial analysis for district definitions and adjustments
- Gradient valuation functions (e.g., how close to heavy traffic, factory, park) to improve the quality of assessments
- Abutter lists and mailing labels for Zoning Petition and Special Permit notifications, as well as for assessing functions
- Tools to assist taxpayers, such as mapping of sale properties and the printing of assessing data on maps
- One-stop service for appraisers who must now visit three to five departments

Public Works:

- Consolidation of utility information on one map, resulting in quicker location of utility lines for construction as well as emergency troubleshooting, and overall greatly improved problem solving efforts
- Improved response to customer map requests and reduced staff time needed for research
- Savings in consulting costs as in-house staff takes on sewer and street design
- Enhanced Pavement Management System which will visually show roads, sidewalks, and pedestrian ramps in need of repair and, alternatively, produce maps identifying the most accessible routes throughout the City
- More efficient routing for garbage collection, recycling collection, snow removal, etc.
- Improved capabilities for planning changes to City right-of-way such as intersection reconfiguration
- Greatly improved presentations at public meetings with GIS developed visuals

- With the elimination of the need for manual drafting, quick creation of maps for small projects, field visits, resident inquiries, etc.

Community Development:

- Greatly expanded opportunities for community participation in rezoning and planning issues, as citizens will be able to examine different zoning scenarios with planners and get a quick view of the impacts of new proposals on density, development potential and particular owners

- Improved community participation simply as a result of enhanced notification procedures

- A new ability to package information on the City's population, housing, or open space resources to respond to information requests from entrepreneurs composing their business plans and assessing market potential

- Ability to respond more effectively to the loss of rent control by locating sites to create affordable housing; assess populations in need by location

- Quicker and less expensive updating of zoning and street maps

- Speedier and simplified site selection projects, e.g., supermarkets, homeless shelters and other facilities, new schools or affordable housing; replacing the current requirements for exhaustive manual data collection, consulting a maze of paper maps, files and partially computerized data

Water Department:

- In-house facility map maintenance (currently contracted)

- Map water leak patterns to target specific mains for checking

- Develop water facilities management system

- Develop and maintain an inventory of hydrants, valves, meters, and backflow prevention devices in the City

Emergency Communications:

- Interface of GIS with CAD system to automatically see locations of incidents and manage responses

better

- Maintenance of E911 Street Files for use by NYNEX's 911 database group (now done manually)
- Plotting of real-time locations of ambulances to determine their availability and estimated time of response to life-threatening emergencies
- Study 911 incidents and response patterns
- Map based hazardous condition and response system (with Fire and Emergency Management Departments)

Police:

- Mapping of crimes and accidents for patrol, community watch groups, victim assistance projects and community policing studies (now done manually)
- Maintenance of sector, RA, route, neighborhood policing, and other boundaries
- Produce maps for ad-hoc studies required by the Council and state and federal funding sources

Fire:

- Maintenance of hydrant map books for use in all apparatus
- Preplan and Fire Protection maps of major occupancies (hotels, complexes, shopping malls, schools, labs, etc.) showing shutoffs, alarms, etc.
- Fire incidence mapping for arson investigation, fire prevention and deployment studies
- Maintenance of map-based hazardous conditions and response system (with the 911 Center and Emergency Management)

Emergency Management:

- Major Incident map display system for the Emergency Operations Center (for disaster, major snowstorm, hazardous materials, or hurricane event)

Electrical:

- Maintenance of maps of fire alarm circuits, cables, and boxes
- Plotting and management of locations of street

lights to assist in speedy repair

- Preparation and management of data and telephone network layouts (both fiber and in-building cable circuits and locations)

In sum, there will be an unprecedented efficiency imparted to all operations and projects involving locational identification and analysis. City departments will have the ability to produce products and offer services currently not being performed or not being performed adequately or efficiently. Overall depth and quality of analytical work should improve dramatically.

Project Organization and Staffing.

The project has proceeded thus far under the direction of the GIS Steering Committee which receives advice from the GIS user Committee. The Steering Committee consists of a representative from the City Manager's office, the Finance Director, Community Development Director, the City Engineer, and the MIS and Assessing Directors. The committee is chaired by the MIS director. The user committee consists of department heads or their designees from the twenty-two departments which will ultimately have access to the Citywide GIS.

As the project progresses through acquisition and installation, the organizational model will be a "Distributed-Coordinated" approach. With this type of organization, the Steering Committee will perform overall coordination and oversight. The MIS Department will assume the primary responsibilities for system management and database administration, and take the lead role in application development. User departments will focus on database quality control and data maintenance, and will also do department-specific application development. It is felt this type of organization will ensure an extensive level of interaction and standardization while minimizing duplication and redundancy. After installation of the capital funded project, maintenance and personnel costs will be spread among the user departments.

The Steering Committee is presently in the final interview stage of selection of the GIS project. This person will take charge of the GIS implementation, reporting to the Steering Committee. This employee's direct supervisor will be the Steering Committee chair, who is also the City's MIS Director.

The City Engineer is in the process of hiring a CAD (Computer Assisted Drafting) technician, who will also be heavily involved in the GIS project.

Plangraphics has identified two other GIS positions that should be filled prior to the initiation of data conversion for street networks, Assessors' maps, and facilities data. These positions will be responsible for database conversion, quality control and maintenance, and for application development. These positions will report to the GIS project manager.

Project Implementation: Work Plan and Schedule.

Since April, Plangraphics has worked with the Citywide GIS Steering Committee to put in place the implementation plan and schedule for GIS installation. There is a four stage implementation plan, which can be roughly summarized as follows:

Phase I, Acquisition - begin 4/94 complete 4/95:

- Issue RFP's, select vendors, secure GIS funding for the following:
  - aerial photography for base map development
  - GIS Hardware and Software
  - Development of base maps from the aerial photographs
  - Development of database from Assessors' maps and facility maps (water, storm and sanitary sewer) which will be made available on the Citywide GIS
- Hire GIS project manager and GIS specialist/applications developer

Phase II, Installation - begin 2/95 complete 9/95:

- Under the direction of the GIS project manager, the selected vendors and in-house GIS staff (GIS specialist and CAD technician) will complete the following:
  - GIS hardware and software installation
  - Creation of base maps and corresponding database
  - Data conversion and database quality control
  - Development of core applications

Phase III, System Implementation within Primary User Departments - begin 9/95 complete 1/97:

- Applications development and staff training in MIS, Community Development, Assessing, and Public Works Departments
- Expand GIS applications to Water Department

Phase IV, Primary User Departments Are Fully Functional and Expansion Begins to Other Departments - begin 1/97:

- Add data layers to GIS to accommodate other departments with GIS needs
- Convert these other departments' data bases for use in GIS applications
- Develop applications for the added departments

Phase IV is the point at which GIS is fully operational and is funded by the operating budgets of several departments, as described in the section on project organization and staffing.

Project Costs.

To date, the City has committed $118,500 to the GIS project. $100,500 has already been paid from the FY94 Capital Fund and from the Public Works Department operating budget. It is my recommendation that the City Council allocate $1,500,000 in capital funds to proceed with the project.

Project funding is presented in detail below:

Final Phase of Plangraphics Contract $ 18,000

Hardware/Software

Phase II Installation:

item	quantity	cost/unit	total cost
Server/workstation	1	$ 30,000	$ 30,000
Mapping/analysis workstation	3	30,000	90,000
Storage			5,000
Digitizer	2	8,000	16,000
Raster plotter	2	15,000	30,000
Laser printer	1	2,000	2,000
GIS software	4	10,000	40,000
RDMS	1	20,000	20,000
Network hardware/software			26,000
Installation overhead			40,000
Training			25,000
			$ 324,000

Phase III Installation:

item	quantity	cost/unit	total cost
Server	1	$ 45,000	$ 45,000
Query workstation	4	5,000	20,000
Raster plotter	1	10,000	10,000
Laser printer	1	2,000	2,000
Maintenance			40,000
			$ 117,000

TOTAL Hardware/Software: $ 441,000

Base Maps and Database

Phase II Installation:

item	total cost
Photography	$ 8,000
Base map development	95,000
Assessors' map data conversion	180,000
Sewer facilities conversion	25,000
Storm drainage facilities data conversion	25,000
Water facilities conversion	35,000
Administrative	5,000
Consultant support	20,000
Primary user application development and training	100,000
	$ 493,000

Phase III Installation:

Expand application development	$ 50,000
Consultant support	20,000
	$ 70,000

TOTAL Base Maps and Database	$ 563,000
Vendor database maintenance during Phase III	$ 20,000
Vendor software maintenance during Phase III	$ 76,000
Consultant Support	$ 125,000

Network Infrastructure

Laying fiber in the streets	$ 100,000
Wiring each building internally	$ 85,000
Data communications equipment	$ 40,000
Special network management devices	$ 129,000
Less: Emergency Communications funding	($ 22,000)
Less: City Hall re-wiring funds	($ 75,000)
TOTAL Network Infrastructure Costs	$ 257,000

TOTAL CAPITAL FUNDING COSTS: **$1,500,000**

I strongly recommend the authorization of these funds for this project.

Very truly yours,

Robert W. Healy
City Manager

Attachment

C. C. 106

City of Cambridge

MASSACHUSETTS

In City Council 2/27 1995

#6A Committee Transfer of Funds for FY15.

YEA	NAY	ABSENT	PRESENT	
✓				Ms. Kathleen L. Born
✓				Mr. Francis H. Duehay
✓				Mr. Anthony Galluccio
✓				Mr. Jonathan S. Myers
✓				Mrs. Sheila T. Russell
✓				Mr. Michael A. Sullivan
✓				Mr. Timothy J. Toomey, Jr.
✓				Ms. Katherine Triantafillou
✓				Mayor Kenneth E. Reeves
9	0	0	0	

MS on Duty

City of Cambridge

The Finance Committee held a public meeting on February 9, 1995 beginning at 5:40 pm in the Ackermann Room for the purpose of receiving a report on the Citywide Geographic Information System (GIS).

Present at the hearing were Councillor Michael A. Sullivan, Chair of the Committee, Councillor Francis H. Duehay, Councillor Jonathan S. Myers, Vice Mayor Sheila T. Russell, Councillor Timothy J. Toomey, Jr., Councillor Anthony Galluccio, and City Clerk D. Margaret Drury. Also present were James Maloney, Assistant City Manager for Finance; Valerie Roman, Director of Management Information Systems; Sally Powers, Director of Assessors Department; Lisa Peterson, Assistant to the City Manager; George Fosque, Emergency Communications Director; Ann Daughaday, City Engineer; Peter Helwig, Director of Revaluation; and Randy Wilson, Community Development Department.

Councillor Sullivan convened the hearing and explained the purpose. James Maloney introduced the members of the City Administration present. He then described the geographic information systems project, which will produce a GIS database consisting of a planimetric base map with property and public facilities information registered to it. Onto this base map, there can be attached any number of data "layers". One of these will be the street network. The Assessors' maps will be digitized and then adjusted to the base map to become the property data layer. There will be several layers of facilities data such as the water system. Other layers will include zoning districts, wards and precincts, etc.

Mr. Maloney noted the project cost. There is a $1.2 million cost for the GIS system, and then an addition of $260,000 for the "inner loop" network to connect fourteen city buildings by fiber optic cable. He also noted that several maps generated by the city of Newton though its GIS system are available for display.

Councillor Duehay asked whether the Election Commission can use the system. Mr. Maloney answered that it will be able to do so. Peter Helwig added that any address-based piece of information can be tied to the system. Then Lisa Peterson demonstrated a map used by the city of Newton to map school information.

Mr. Maloney stated that the next piece of the project is an aerial flyover that must happen after the snow but before trees have leaves.

In response to a question from Vice Mayor Russell, George Fosque said that when a 911 call comes in, the dot will be lit up and displayed on the map.

Councillor Duehay then asked about terminals in police cruisers.

George Fosque stated that these will be available in Cambridge and will be tied into the GIS system.

Valerie Roman said that the technology can handle routing tasks, such as trash collection and snow removal routes.

Randy Wilson said that it could be used for projects such as supermarkets routing.

Councillor Duehay asked how long the system implementation will take.

Ms. Roman said that GIS takes a significant amount of time to fully implement. The flyover and hardware and software installed will be done this spring. Then there will be two to three years of data entry. Emergency 911 and assessor maps will happen more quickly.

Sally Powers said that the most time consuming piece will be the data conversion.

Councillor Duehay asked about the implementation schedule.

Ms. Roman said that the primary user departments, DPW, CDD, and Assessors, will be done by January 1997.

Vice Mayor Russell asked whether this system would eliminate jobs. Ms. Roman said that the benefit is not cost savings by removing jobs; it is added services. She does not expect any job reduction on account of this system.

Mr. Maloney said that there will be additional operating costs for staff. There will be one new staff position initially and then up to three new staff will be needed in the next two years.

Councillor Sullivan asked if Newton does a crime statistics map. George Fosque replied that it does not.

Councillor Duehay asked whether GIS can be tied into cable. Councillor Myers said that it could. Valerie Roman added that once the data is there, there can be access through cable T.V. and the Internet.

Councillor Duehay asked if the library is represented in the workgroup.

Ms. Roman said that it is and described the initial survey of all city departments to determine the GIS needs of each department.

Councillor Duehay noted that there are a substantial number of toxic sites in Cambridge. That information is kept by the State Department of Environmental Protection (DEP), but DEP is not doing a good job of evaluating these sites. He asked whether GIS could be useful in this regard.

Councillor Sullivan observed that Newton's comprehensive open space map appears to demonstrate that such information can be mapped in Cambridge. Ms. Roman agreed that this was so.

Mr. Maloney added that cost savings can perhaps occur in the area of consulting costs, such as the fire study. However, the main advantage of this system is increased services rather than cost savings.

Councilor Sullivan asked if the system could be expandable. Valerie Roman assured him that it would be.

Mr. Maloney noted that the DEC system chosen by the city eight years ago was selected to be expandable.

Vice Mayor Russell stated that she is or the Emergency Planning Committee and asked if this system would be helpful. Valerie Roman said that emergency escape routes could be produced by GIS.

Vice Mayor Russell asked what would happen if there are power outages in a emergency. George Fosque explained the generator backup for emergency communications. Non-critical applications would wait until repowering.

Councillor Duehay asked with regard to quality control how the city will ensure that the data is accurate and updated.

Valerie Roman responded that meeting the staffing requirements are critical to this issue. There will be a quality control check in Public Works. She also explained that a Steering Committee has been set up. Its membership is comprised of representatives of all of the major GIS user departments. She is the chair of the steering committee. The plan is to hire a GIS Coordinator who will report to Valerie Roman and the Steering Committee.

Councillor Sullivan noted that there will have to be interdepartmental cooperation.

James Maloney stated that one of the benefits to the city is the increased interdepartmental cooperation that comes from planning and implementing a GIS project.

Ann Daughaday explained that each department will have responsibility to update its own data.

Councillor Duehay asked who checks the quality of work and makes sure deadlines are met. Valerie Roman said that the GIS coordinator will do this.

Councillor Sullivan noted that it is ultimately the responsibility of the City Manager.

Sally Powers said that a piece of this project is working to standardize all of the addresses used by various city departments. In response to a question from Councillor Sullivan, Valerie Roman said that the City has been working with the Post Office on this issue.

Councillor Duehay moved that the Committee recommend authorization of the requested funds for adoption by the full City Council. On a voice vote, the motion was passed unanimously.

The meeting was adjourned at 6:17 p.m.

For the Chair,

Councillor Michael A. Sullivan, Chair

d

c.

F- 34

COMMITTEE REPORTS

Finance Committee Report for a hearing held on February 9, 1995 to receive a report on the Citywide Geographic Information System.

for original communication see 1995 Finance #16.

In City Council,

February 27, 1995

Report accepted

Appropriation order adopted 9-0-0

Transfer order adopted 9-0-0.