VERMONT STATEWIDE DIGITAL PARCEL LIFECYCLE & MAINTENANCE PLAN

DRAFT V5

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2 EXECUTIVE SUMMARY

The positive results of the recent Return on Investment (ROI) Study for Statewide Parcels for the State of Vermont indicate that statewide parcel development and maintenance would be wise financial investment. The ROI report successfully answers the question of "Why should Vermont invest in a statewide parcel program?" and sets the stage for answering "How will this be achieved?" This Parcel Lifecycle and Maintenance Plan recommends a feasible path forward for Vermont that leverages the lessons learned in other states, respects the current political environment, and takes advantage of existing organizations skills and relationships. While relevant elements are borrowed from other states, this plan addresses the unique components that make up the parcel "ecosystem" of Vermont. As stated in the 2013 IAAO report *Building National Parcel Data in the United States: One State at a Time*:

> *"Each state has a unique culture, and finding the keys to successful management and implementation varies with each state. The common thread is a community of mutual trust and respect, regardless of whether this is gained through mandates, incentives, or voluntary participation."*[1]

While some states have opted to implement a centralized approach where a state agency assumes responsibility for the development, maintenance and distribution of digital parcel data, the report recommends a more distributed model that respects local governments as the authoritative source of parcel data while assigning coordination responsibility to a state agency. This model fosters a system of shared responsibility where all stakeholders are contributing resources – human, financial, information – to the ultimate goal of consistent, statewide parcels. A top-down, centralized approach would likely not succeed in a state where local control and authority are embedded deeply in the culture.

The first challenge for Vermont will be in securing the funding to support the initial development and compilation of standardized digital parcels as well as ongoing maintenance of this valuable asset. The Return on Investment Study estimates overall program costs to be $2.68M over the first five years, but the value of this investment is expected to far exceed this cost. In order to realize these benefits for all levels of government and the private sector, the state will need to identify agencies that are willing to support the investment and secure the necessary contributions.

[1] http://www.iaao.org/media/Topics/F&E_July13_National_Database.pdf. p.6

3 ALTERNATIVE MODELS

According to the IAAO feature article, *Building National Parcel Data in the United States: One State at a Time*, by 2013 most states had achieved at least a nominal level of parcel data stewardship. In order to catalog the progress toward parcel standardization across the states, this report defines five levels of stewardship, the lowest being a level at which the state has only begun to implement a plan for and the highest being a level at which a state has fully assumed a stewardship role and is maintaining the highest level of parcel standard. As of 2013 only the State of Montana was assessed to be operating at Level 5 (though Massachusetts since that time has approached Level 5 as well). The parcel data standard of a Level 5 state is summarized as meeting the following criteria:

- Data producers provide complete data sets to the state
- There is a standardized set of parcel attributes connected to the parcel geometry
- The geometry is reconciled and tied to a common cadastral reference with no overlap or gap between jurisdictional boundaries
- Geometry is spatially reconciled and registered to a commonly agreed-upon cadastral reference reducing the effort to reconcile the geometry between boundaries
- Attribute content is reconciled to a standard set of field names and types prepared by the data producer in standardized formats
- Attribute content includes the complete core data set
- Data producers have "bought in" to reconcile their parcel geometry to match agreed-upon reconciled boundaries between jurisdictions.

To place the State of Vermont in the context of this assessment, Vermont was categorized as a Level 2 state, having less stringent attribute standards, a looser relationship between the data producers (towns) and the steward (the state), and lacking in particular all of the criteria that address spatial data quality. The experiences of states that have achieved higher levels of stewardship can inform Vermont's decisions about how to maintain its own level or eventually leverage the current state of its parcel standard into a more robust one.

While the scope of this study does not include a deep comparative analysis of the approach, methods and outcomes in other states, it is useful to review the general approach taken by several states that have achieved and are maintaining standardized, statewide parcels. These can serve as models for Vermont to consider and context for the recommendations made in this report.

The "Responsibility Matrix" below compares the approach for three states (Massachusetts, Montana, and Tennessee) and indicates which level of government is responsible for each parcel program component. There are key similarities between these examples including the fact that in each case the state contributed major funding to the initial development/collection/standardization/aggregation

effort, but local governments contributed their own resources to produce the original source data. Also, in each case the state is responsible for maintaining the parcel standard and providing overall coordination for the effort. A key difference among these states is the fact that Massachusetts did not actually perform any of the initial parcel data development nor does it perform any maintenance. Both Montana and Tennessee perform these technical tasks for local governments that do not have the in-house skills to do this. Another key difference is that in Montana, the state, as the steward of the Public Land Survey System (PLSS) data, is considered the "authoritative source" for parcel data. The PLSS data serves at the framework and spatial reference for all parcel data in the state.

Each of these state programs is discussed in more detail following the table.

Statewide Parcel Development - Responsibility Matrix

Key Program Components

Responsibility	Funding	Coordination	Standards	Authoritative Source	Data Distribution	Production	Maintenance
MASSACHUSETTS							
State	X	X	X		X		
Muncipal	X			X	X	X	X
Regional						X	X
Private Sector					X	X	X
MONTANA							
State	X	X	X	X	X	X	X
Muncipal							
Regional/County	X					X	X
Private Sector							
TENNESSEE							
State	X	X	X		X	X	X
Muncipal							
Regional/County	X			X		X	X
Private Sector							

3.1 MONTANA

Montana was one of the first states to embark on a statewide digital parcel data set, or "The Montana Cadastral Framework". In 1998, the state established to collect and maintain tax parcel data statewide, in a standardized manner and statewide parcels were achieved in 2003. The Montana State Library acts as the steward for the parcel data.

Some key facts about the Montana approach:

- The State Library works closely with the state Department of Revenue (DOR) and nine counties to integrate the data into a statewide data set, linked to CAMA attributes, on a monthly basis.
- The state Department of Revenue (DOR) maintains the parcel geometry for 47 counties, while 9 counties perform this maintenance locally.
- Montana is one of the few states in the Country where parcels are seamless statewide; county border issues have been reconciled.
- The Public Land Survey System (PLSS) serves as the authoritative source and "backbone" for the state's parcel data. Custodianship of Montana's PLSS dataset lies with the Montana State Library having taking over maintenance responsibilities from the US Bureau of Land Management (BLM) in 2014.
- Stable funding is needed for a federated approach to data integration and enhancement of the parcel data which costs approximately $100,000 per year.
- Montana formed a working group to provide guidance and technical expertise during the early years of the program, but it is not currently active.
- Data distribution and web mapping are provided by the Montana State Library.

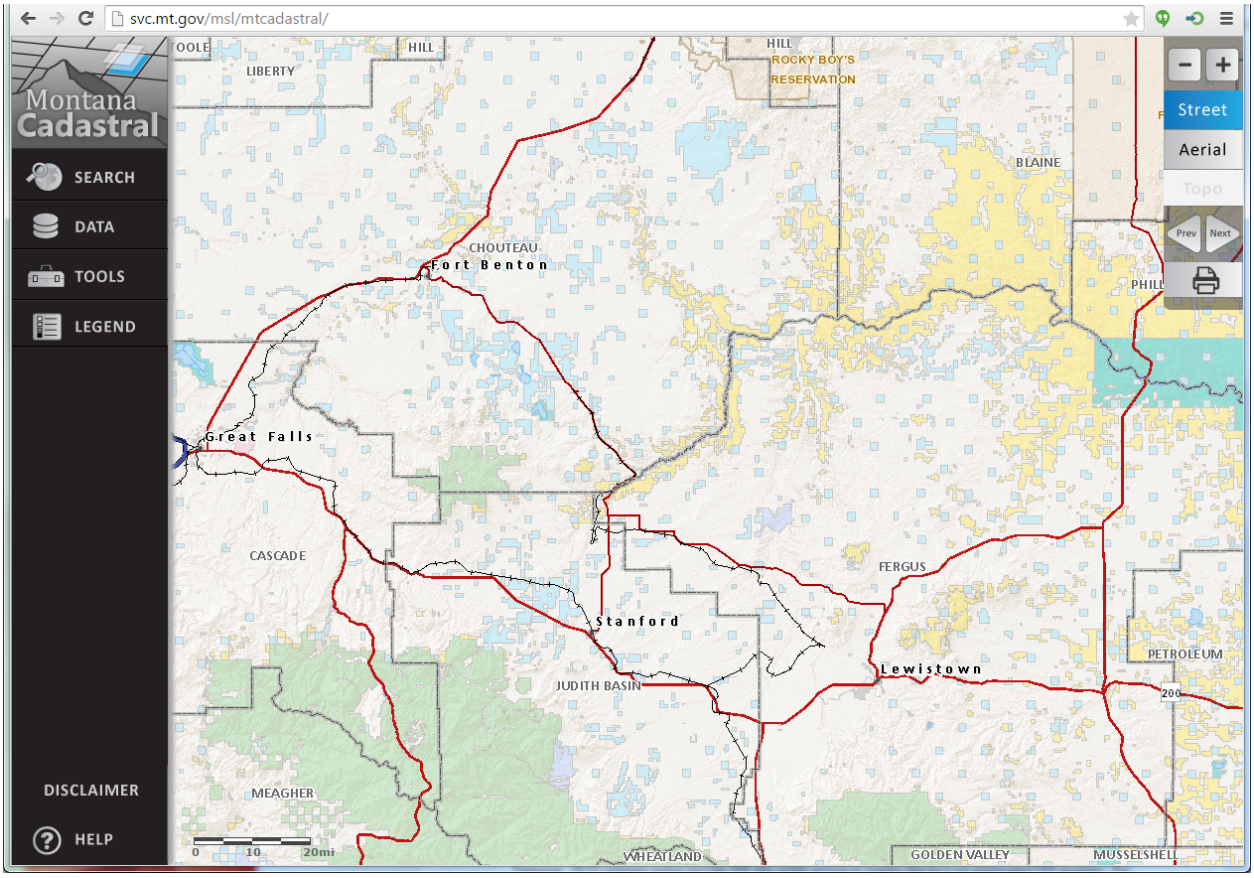

Figure 1. Montana's Parcel (Cadastral) Web Map Viewer: http://svc.mt.gov/msl/mtcadastral/

3.2 TENNESSEE

Tennessee's steward of parcel GIS data, the Office of Local Government (OLG) is responsible for overseeing the maintenance and distribution of the statewide parcel data produced through the state. The primary responsibility of this office is to offer assistance to local governments and support the use of GIS technology.

Some key facts about the Tennessee approach:

- The state's OLG provides GIS data update services to counties that do not have in-house GIS programs or technical skills. For the counties that do perform parcel maintenance, OLG provides "as-needed" technical services to support maintenance process.
- As both the OLG and the Real Estate Tax Division are within the state's Comptroller of the Treasury Office, integration of the geospatial parcel data with the real estate assessment data requires minimal coordination.

- OLG provides both mapping and technical services to Local Government Property Assessors throughout the State, allowing them to implement quality control procedures on the data set.
- The OLG distributes parcel data for nearly all of Tennessee's 95 counties to Local, State, and Federal Government agencies as well as the general public.
- Non-governmental entities may purchase the entire state data set for $80,000 (which includes all attribute data). The property assessment data is available for free, and has been for nearly 15 years, but the GIS data must be purchased.

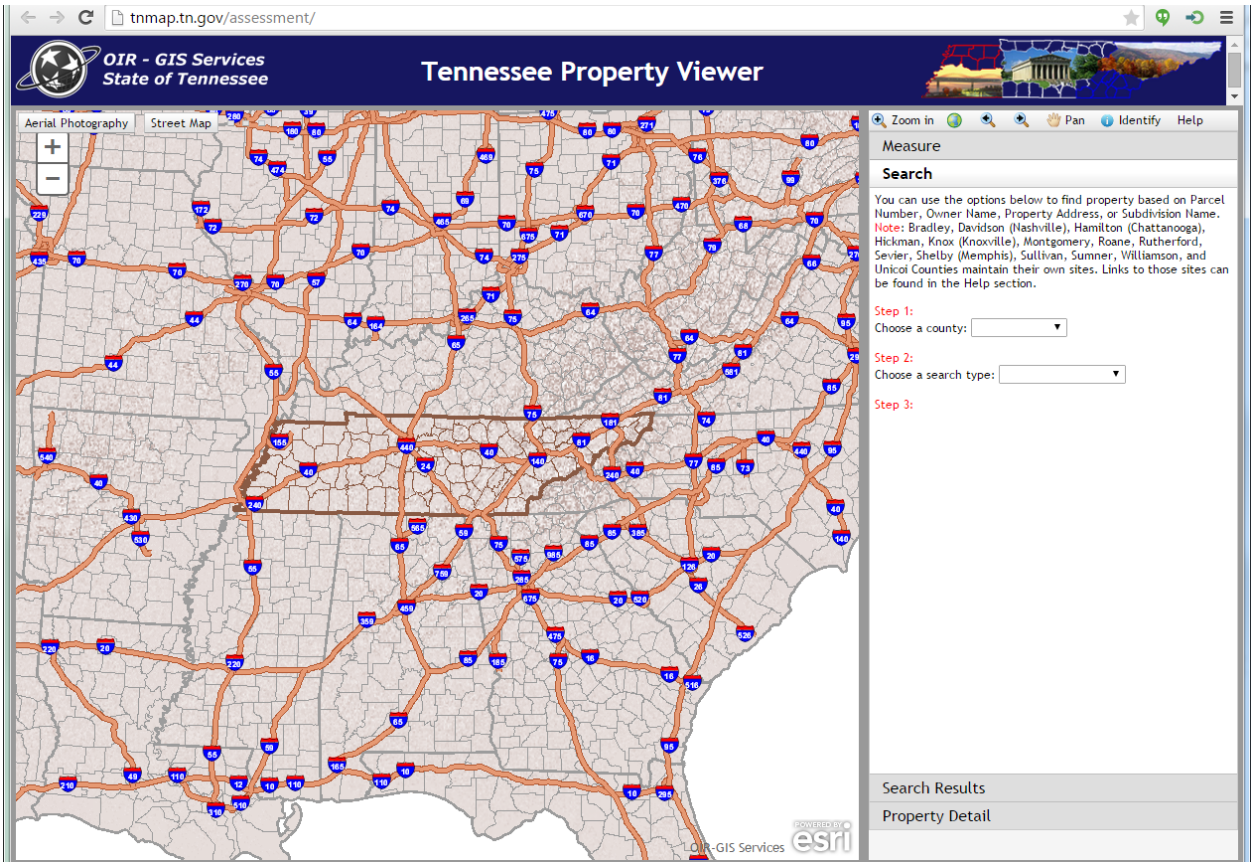

Figure 2. The Tennessee Property Viewer: http://tnmap.tn.gov/assessment/

3.3 MASSACHUSETTS

As of October 30, 2013 the Commonwealth of Massachusetts completed statewide, standardized digital parcels. The effort was coordinated by MassGIS, the Commonwealth's Office of Geographic Information, within the Massachusetts Office of Information Technology (MassIT). MassGIS facilitates coordination between state agency GIS efforts and collaborates with Regional Planning Agency GIS staff on many types of projects. MassGIS also tracks the status of municipal GIS

development and, as needed, communicates and coordinates with municipal GIS staff. MassGIS also promotes and guides spatial data development, including parcel development, through a set of data standards.

Some key facts about the Massachusetts program:

- MassGIS' parcel data set contains property (land lot) boundaries and database information from each community's assessor
- The original data development and standardization was achieved through a competitive procurement managed by MassGIS. Each city/town in the Commonwealth was bid on and the work was awarded by MassGIS directly to vendors. Over $2M was awarded and contracted through this process.
- The specification for this work was Level 3 of the MassGIS Digital Parcel Standard (http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/standards/standard-parcels.html)
- The primary driver for statewide parcels in Massachusetts was Public Safety and the data needs of the NextGen911 program. Parcels were deemed a first step in developing statewide address data to support the modernized call system. Funding for the parcels came primarily from the State 911 Office.
- Successful coordination of the program requires ongoing outreach to 351 individual cities and towns as counties are not involved in parcel maintenance in New England states. The towns have accurate municipal boundaries based on survey work funded by Mass DOT.
- Continued maintenance of the parcels and compliance with the standard is done on a voluntary basis by cities and towns; Most of the technical work is performed by Regional Planning Agencies and the private sector firms.
- A year after statewide conformance was completed, a second round of funding was distributed to promote the adoption of the standard. The funds, a total of $650,000, were awarded to vendors and Regional Planning Agencies to support 132 cities and towns. This round of funding fostered a better tendency toward cooperation among the towns that felt beleaguered by costs or technical hurdles. It also opened up the opportunity for MassGIS to leverage cooperation by asking for recipients of the funding to pledge their adoption of the standard in return for the data enhancements grant.
- The parcel data is freely and publicly available for download from the MassGIS website http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/l3parcels.html .

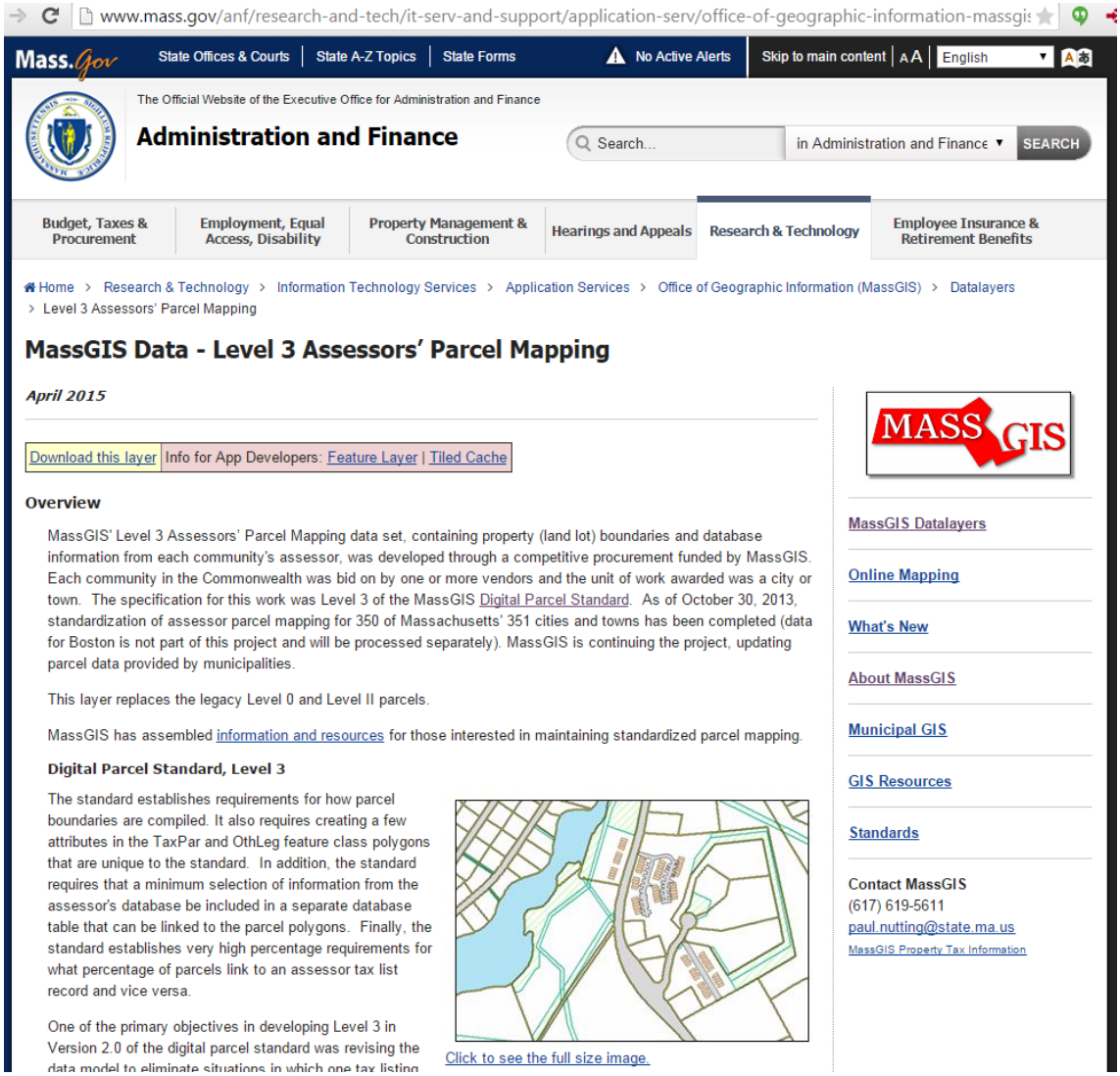

Figure 3. MassGIS Level 3 Assessor's Parcel Mapping data download page.

3.4 KEYS TO SUCCESS

3.4.1 LEVERAGE LOCAL AUTHORITY AND KNOWLEDGE

In 2012, the California Strategic Growth Council (CSG) through the University of California, Davis (UCDavis) funded a study to examine the best practices for statewide parcels, land use, and address-related data in other states either with conditions similar to or adjoining California:

"In general, this study found that aggregating and standardizing locally maintained parcel data is manageable and doable. These locally sourced data provide the most current and most accurate representation of land ownership and real estate values for the state."[2]

In most states, including Vermont, local governments are the authoritative source for parcel and property information and must engaged and involved in the process of creating and maintaining statewide parcels. It is local governments, for the most part, that manage property line and ownership changes, and who track related assessment data. For practical reasons, parcel data should ideally be managed at the local level and "rolled up" into aggregated statewide, or even nationwide data sets. A 2009 report by the Congressional Research Service, Issues Regarding a National Land Parcel Database, concluded that *"[a] truly national land parcel cadastre would likely require strong partnerships between the federal government and state and local governments."*[3] For political reasons, local governments should remain the "authoritative source" for this important data. Any perception that the state is "taking over" this process should be avoided. There will, of course, be cases where local governments do not have the resources to perform this work and in these instances, it is appropriate for state government to provide assistance, either technical or funding, to ensure inclusion by all communities.

3.4.2 COLLABORATION

In the "best practices" literature, there is one aspect of the strategy for building and maintaining a state-wide parcel database that stands out as the most important, and it is notably not a technical one. As noted in *Statewide Practices for Land Records in GIS*, a study done by the California Strategic Growth Council, "Technology was *not* identified as a challenge or impedance to statewide GIS programs." Instead, among the 12 states profiled in this study (which represented a range of stewardship levels), the most commonly cited key to success is collaboration. Here is a sampling of statements from the 12-state assessment that point out the importance of fostering cooperation, coordination, and collaboration:

- "…successful programs have engaged and convinced local government data producers to participate…"
- "…the most successful of the states focused on building community not just aggregating and standardizing data sets"
- "Coordinating… among many diverse local government data producers is at the top of most states' list of challenges."

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[2] http://www.iaao.org/media/Topics/F&E_July13_National_Database.pdf
[3] http://www.nsgic.org/public_resources/NSGIC_Advocacy_Agenda_101712.pdf

- "The common thread is a community of trust and respect."
- "Increasing the participation and sense of ownership in the program from the local data producers was often cited as an underlying goal…"

While collaboration is seen as a key to success, it is also cited as one of the most difficult things to achieve. The states that were profiled gave the following examples of what they perceived as challenges to their success:

- "County buy in"
- "Selling the idea"
- "Participation from local governments in the program is voluntary"
- "Coordinating data between political subdivisions"
- "Fostering cooperation and collaboration across the state agencies"
- "Organizational buy-in to the idea of spatially enabled data"
- "Convincing each county of the benefits of participating"
- "Developing partnerships of trust for data sharing"
- "Continually advocating for the project"

Building a collaborative "ecosystem" to support parcel development and maintenance in Vermont will be key to the success of the program in the near and long term.

3.4.3 OUTREACH - "PR, PR, AND MORE PR"

Outreach is an essential component of other state's successes and it goes hand in hand with the importance of a collaborative approach described above. In the case of Massachusetts, during the development of the business plan and the design of the data model, MassGIS held public forums, actively involving key stakeholders such as the Massachusetts Association of Assessors (MAAO), the Department of Revenue (DOR), the Association for Valuation Professionals, Regional Planning Agencies and municipalities throughout the state. As a direct result of this strategy, the MAAO issued an official statement of endorsement of the parcel standard. For other states as well, the priority of outreach activities is a common contributor to success. "The states in this study have an active coordination council or similar entity for local governments to participate in the development

of standards and guidelines. These forums also provided a means for feedback, outreach, and education."[4] The IAAO article continues:

> *"In the successful states there is a community approach focused on establishing trust, defining benefits for the local data producers, participatory standards development, and where needed, technical support or data hosting services."* [5]

The communication, sense of common purpose, and commitment to the economy of the state are seen repeatedly in states with strong GIS coordination programs. Local government programs appear to thrive in these states, building on the knowledge of their peers and benefiting from guidance and support from state programs.

3.4.4 MAKING IT WORK WITHOUT A MANDATE

Collaboration and outreach are critically important to a statewide parcel program if there is no compelling mandate to maintain parcels and/or comply with a standard. During initial development that is largely funded by a state, it is easier to exert control over the product and ensure its quality and completeness. At the development stage, a state is typically not technically beholden to any conditions or requests put forth by the local governments whose data is being aggregated and standardized. However, in order to set the stage for long-term maintenance and "buy in" to the overall program goals without a state mandate, a collaborative approach should be taken from the start. By involving locals in the quality assurance process, particularly matching parcels to CAMA records, and in resolving questions about property lines, the state creates "shared responsibility" for the end product. Once the statewide database is built the nature of the challenge changes. The next and ongoing phase is to secure longevity, in other words ongoing maintenance of the product which can only be achieved with the voluntary buy-in from local governments.

Parcel data is inherently challenging to model, automate and maintain. The translation of the legal description of a property to a map coordinate system can be imprecise. There are often ambiguous boundaries or overlapping properties found within a parcel map. In areas like New England right of way widths tend to be irregular and variable. There tend to be large sets of attributes with complex relationships. There can be gross variability in data quality even across a single jurisdiction. And

[5] Op.cit., IAAO.

aside from these technical challenges, parcel data can also be saddled with issues surrounding privacy.

3.4.5 PARTICULAR CHALLENGES FOR NEW ENGLAND STATES

As a New England state, Vermont has particular challenges with statewide parcel data development and maintenance that are not encountered by states outside this region of the country. Namely, the jurisdiction of property data is at the town level rather than the county level, and there is a much larger number of jurisdictional entities - there are many more towns than there are counties in even the largest states with the highest parcel counts. Coordination of a large number of jurisdictional entities poses a much greater challenge than the technical problem of handling a large parcel count. In addition, small towns often have widely varying styles of government and attitudes toward state enterprises.

Unlike many western states where parcel data is derived from Public Land Survey System (PLSS) data, New England parcel data can be particularly idiosyncratic, making it difficult to build an accommodating model, and making it difficult to "fit" all of the idiosyncrasies into a standard. Towns themselves also present challenges in their widely varying ways of managing property information and in their often individualistic way of dealing with state authority. The effort to build a collaborative product across many towns can be met with a stance that tends toward being insular.

Another significant challenge is that New England towns, most of which have small populations and limited tax revenues, have little room in their budgets for data upgrades. The reality of adopting a data standard, even when it's a state-funded initiative, results in collateral costs which are borne by the towns as the data providers. Acknowledging the potential for local costs and actively seeking to alleviate them through technical support or funding will be a key element of the Vermont program. This is the key to establishing greater trust and respect between levels of government.

4 RECOMMENDED PROGRAM DEVELOPMENT PLAN FOR VERMONT: SHARED MAINTENANCE RESPONSIBILITY

4.1 FUNDING

As described in the Vermont Return on Investment Study for Statewide Parcels, digital parcel data meets the economic criteria for what is a "public good" and, for all reasonable intents and purposes, parcel data must be publicly provided. In the absence of state support, the people of Vermont will forgo the net benefits that would result from complete, standardized digital parcel data made available for utilization all across Vermont and beyond its borders. The question is, where will government funding come from to finance the public provisioning of such parcel data?

In Vermont, there is already a substantial investment that has been made in parcel data, and that continues to be made by towns across the state. But the towns are primarily focused within their own jurisdictional boundaries, and demands on them to conform to a state standard to benefit the state need some level of additional state funding to finance the conformance effort. If the state was to leverage the existing investment made by the towns by adding funds to finance the editing of parcel data to match a state standard, and for maintaining the parcel data in conformance with the standard, Vermont would have the consistent and current data that it needs.

Many state agencies will need to contribute in order to meet the budget demands. While the Return on Investment Study resulted in a positive ROI based on a limited set of use case benefits, nearly all state agencies will benefit from statewide parcels in the form of cost savings, time savings, improved services and improved outcomes. Agencies should recognize the value that this initiative will bring to their work and their services and contribute commensurately. Achieving agency "buy in" to this shared responsibility and securing funding for the program will be the first step toward successful implementation.

4.2 ESTABLISH VCGI AS THE LEAD

In *Statewide Practices for Land Records in GIS*, which studied best practices in a sample of twelve states, it was found that state offices with GIS technology skills are a common element in each of the states that were reviewed.

> *"These GIS skills include the ability to support local governments with GIS data automation, data hosting, server management, and Internet publishing. Many states also have on-staff*

application development and programming skills. Skill levels and GIS capabilities of state agencies have grown rapidly in the past few years. This trend is expected to continue."[6]

The establishment of well-defined state stewardship is important because the task of standardizing data across many local operations will requires a strong level of state-wide coordination. Also, while parcel stewardship programs can succeed without a mandate, it's obvious that a model such as Vermont's, which is lacking official authority to dictate compliance, will require a strong lead. The Vermont Center for Geographic Information (VCGI), now under the Agency of Commerce and Community Development (ACCD), is the well-established entity that is already fulfilling this role, and it should be clearly established as the lead in developing Vermont's statewide parcel program. Currently, VCGI provides access to free digital geographic data, technical expertise to local governments, and coordination support for the ongoing "Vermont Statewide Parcel Data Project" and "Enterprise Geospatial Consortium Parcel Data Workgroup". VCGI is well positioned to continue in this role and act as the primary coordinator for the implementation and maintenance of statewide parcels.

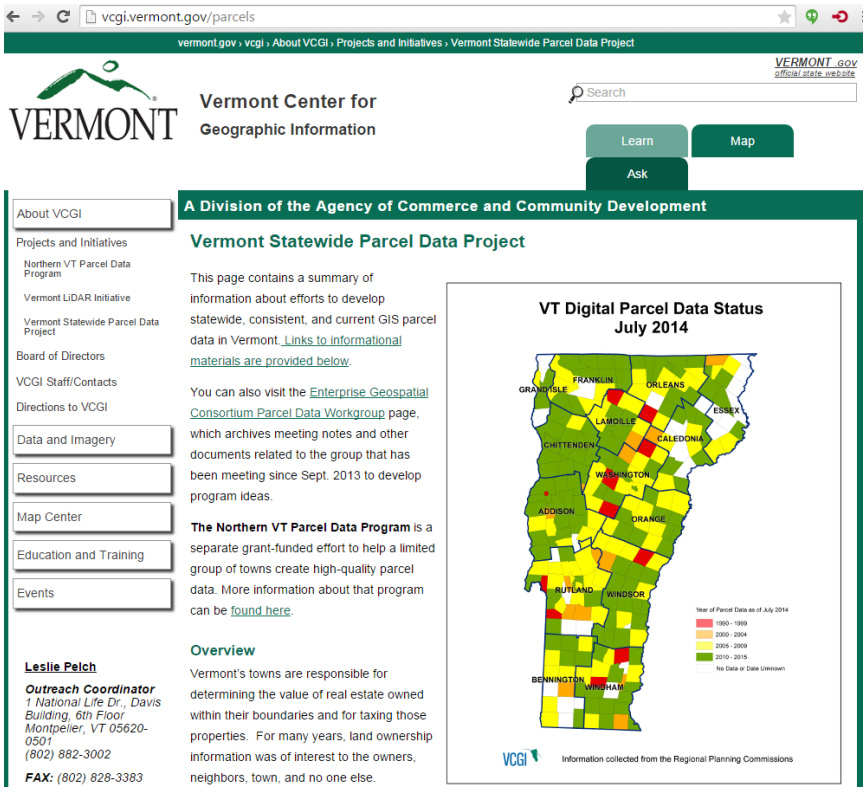


Figure 4. VCGI's current parcel page: http://vcgi.vermont.gov/parcels

[6] http://downloads.ice.ucdavis.edu/sgc_parcels/Statewide_Best_Practices_final.pdf

4.3 STRENGTHEN & PROMOTE THE PARCEL STANDARD AND MAPPING GUIDELINES

Compliance with Vermont's parcel standard is currently neither mandated nor funded, so outreach and promotion are the only drivers for voluntary cooperation, which is a somewhat tenuous situation. Nonetheless, in order to maintain movement in the contemplated direction, steady and consistent promotion of the standard and guidelines will be essential. The process of shifting towns to a new parcel "paradigm" has been underway for a number of years in Vermont, and will continue to take a long time at the current pace and level of funding, but the right intentions and committed people are at work.

The first recommendation for ongoing promotion is to strengthen the content and pairing of the GIS Parcel Data Standard and the GIS Parcel Mapping Guidelines. These two documents should reinforce each other. For example, the Mapping Guidelines do include a mention of the Parcel Data Standard in the purpose statement, but do not mention compliance with the standard in other sections where it may make sense, such as sections on deliverables, maintenance, mapping specifications, and evaluating mapping firms. Promotion should also include more prominent featuring of the web links to these documents and updating of the dated technical terminology (e.g. Arc/INFO commands and references to coverages which are now obsolete.

Other recommended methods of promotion, many of which are already being leveraged by VCGI include:

- Posting more information on the VCGI website
- Getting on the agenda of state and county assessing associations
- Using mailings and email
- Using list-serves
- Publishing articles in professional associations and newsletters

Building personal contacts:

- With the GIS coordinators, assessors and planners in individual municipalities
- With the CAMA software vendors, including heads of customer service and senior management
- With GIS contractors, as proponents of the standard

By strengthening and promoting the guidelines and standards as a resource to local governments, regional commissions, and the private sector, adoption of the standard can be feasibly accomplished.

4.4 USE THE PRIVATE SECTOR

Currently, many Vermont towns rely on private contractors or Regional Planning Commissions for all or part of their parcel data maintenance. There are few cities or towns that have the in-house technical capabilities to perform this work. Through web technologies, the ability to make spatial data readily accessible to inexperienced end users has become inexpensive and ubiquitous, but updating and managing spatial data still requires a threshold level of expertise that makes it impractical for most small towns to take on.

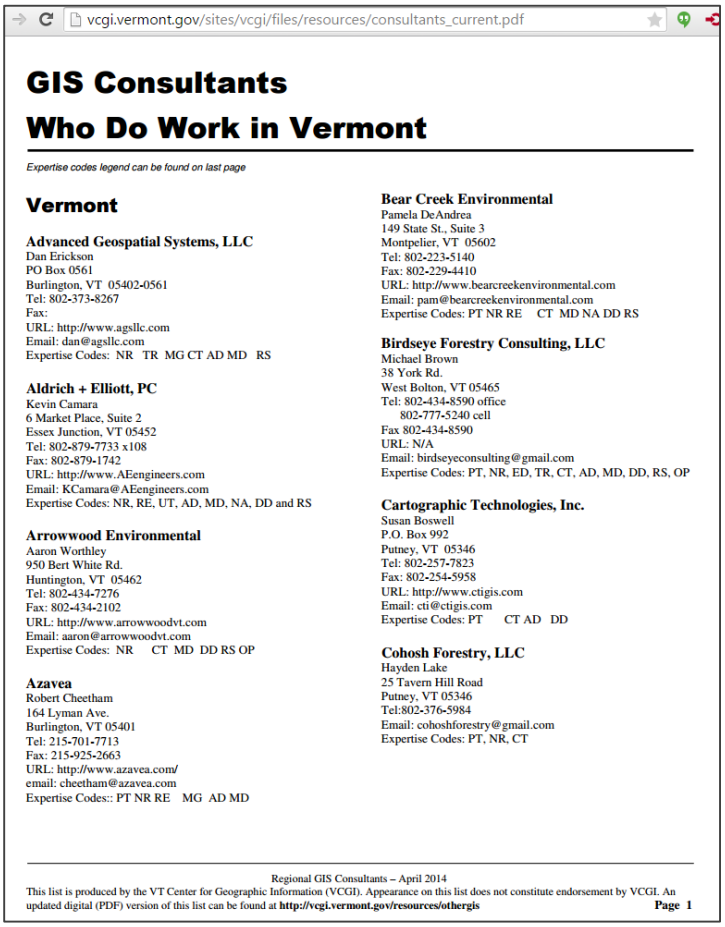
The need to contract out the maintenance of parcel data is common enough to warrant the development of VCGI's GIS Parcel Mapping Guideline which describes how towns should go about procuring this type of work. In addition to this resource, the VCGI website includes a link to a list of GIS consultants. This implicitly acknowledges that GIS expertise is available for hire in the private sector, but does not elevate the role of these contractors to include any contribution on their part to the maintenance of the state-wide parcel standard.

Bringing vendors and RPC's into the circle of collaboration will be important for Vermont in two ways:

1) As a logistical necessity in order to accomplish the development and standardization by supplying expertise and manpower
2) As an advantage to the long-term goal of maintaining standard by proselytizing the overall program goals and benefits to local governments

The State of Vermont has an opportunity to better leverage the private sector in both of these capacities. The first capacity, that of providing a service, can be approached by coaching towns to require that contractors work under the highest level of parcel standard possible. The current Guidelines make mention of this, but do not place a prominent or explicit emphasis on it. Contractors should be encouraged to make the maintenance of the parcel standard a part of their best practices. The second capacity, the role that contractors play in outreach, is one that results from treating contractors as collaborators. Many towns establish long term working relationships with their GIS contractors and are therefore willing to follow their lead on how parcel maintenance should be done and trust their advice about changing internal workflows where it makes sense to accommodate a parcel standard.

For practical purposes, it is also recommended that the state contract directly with vendors and RPCs rather than through funding managed at the local level. In this approach, the state manages a handful of contracts with technical experts rather than managing individual grants with potentially 255 municipalities, who then might need to manage individual contracts. Also, rather than parse the work out to vendors and RPCs into areas of specialty (automation, CAMA ETL, spatial conflation, mismatch resolution), it is recommended that contracts be awarded on a town-by-town basis. A vendor contract would be awarded with the requirement for the contractor to bring that municipality all the way through the full conformance, regardless of whether the starting point for that municipality was paper tax maps or a full-fledged GIS program. This strategy leverages pre-existing relationships between the vendors and the municipalities while streamlining the coordination process for the state.


vcgi.vermont.gov/sites/vcgi/files/resources/consultants_current.pdf

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Expertise codes legend can be found on last page

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Regional GIS Consultants – April 2014
This list is produced by the VT Center for Geographic Information (VCGI). Appearance on this list does not constitute endorsement by VCGI. An updated digital (PDF) version of this list can be found at **http://vcgi.vermont.gov/resources/othergis** **Page 1**

Figure 5. From the VCGI Website - Vermont GIS Consultant List

4.5 INTEGRATE WITH CAMA SOFTWARE

Each town's Grand List is a valuable database that is of interest in many parcel data use cases. Joining the Grand List to a Geographic Information System (GIS) allows town officials to use the Grand List more efficiently in many applications. Linking a statewide Grand List to statewide parcel data opens up tremendous possibilities in terms of statewide visualization and analysis. Examples of spatial queries include generating a list of addresses of abutters for a lot, creating a map of all properties owned by the state or creating a map of all lots with assessed values higher than a certain amount.

In order to facilitate the link to the Grand List, the GIS Parcel Data Standard requires inclusion of the SPAN (a state-assigned unique number) in the attributes. All properties must have a unique record in the Grand List with a corresponding SPAN. This includes non-taxable lots owned by municipalities, the State of Vermont and non-profit organizations such as religious groups and land trusts. This allows the link between the digital parcel data and the Grand List. Parcels associated with mobile home parks and condominiums may not be in the Grand List and therefore would not have a SPAN.

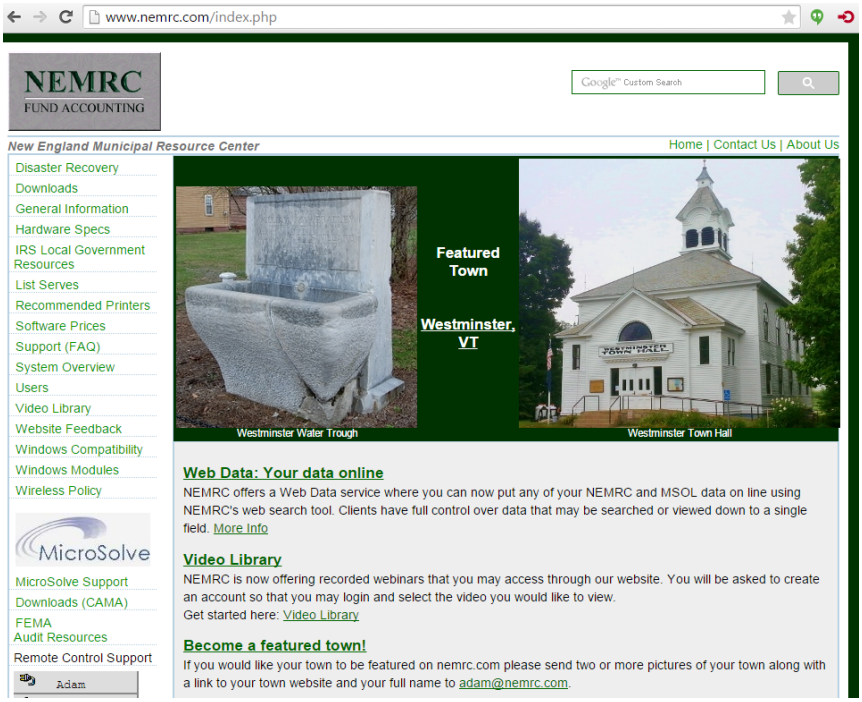

Figure 6. http://www.nemrc.com/index.php

Coordination with the New England Municipal Resource Center (NEMRC) to establish and maintain linking process will be key to the success of the program. There may be a need to develop additional export or transformation tools/reports that make the property data more useful and accessible.

4.6 ESTABLISH AND MAINTAIN QUALITY CONTROL

Massachusetts cites one of their key "lessons learned" to be the protection of the state's investment through quality assurance and quality control procedures. The ultimate goal for quality control is to shift it as much as possible from the top of the database maintenance chain down to the source of the data. Since when aggregating data from disparate sources (towns), the resulting dataset can only be considered as good as the lowest quality unit. Quality control, however, can be time consuming and repetitive, thus making the investment in process automation an important one. Aspects of parcel QA that can be automated include confirming attribute domains, verifying adherence to the data model, and checking for unwanted gaps or overlaps in the parcel geometry fabric. Automated tools can serve state staff tasked with quality control but also vendors who want to confirm compliance prior to submitting data to the state.

While the goal was to make the quality control as automated and repeatable as possible, some of what's required to assess quality on a dataset such as parcels involves the type of proofing that, by nature, is difficult to automate. Vermont will likely need to devote staff time for visual scanning and spot checking data. Making the 'human' part of the assessment as methodical as possible can help improve the effectiveness of this part of the quality control. A detailed checklist that is consistently used for every submission will help the state build a reputation for thoroughness and serve notice to contractors that the expectations for data quality are high.

But any data producer who has bought into the benefits of the standard and wants to be a participant can better understand and appreciate the quality of the dataset that they are contributing to if they are asked to make their own contribution measure up to a quality check. Going through the exercise of passing a quality assurance review supports the following:

- Reduces the larger context of the data standard (which is likely explained in a hefty document with technical language) down to those key aspects of it that are relevant and understandable on a practical level
- Reinforces the cooperative aspect of maintaining a statewide dataset
- Creates a better sense of the vested interest that a data producer has in the dataset
- Provides a useful spec when contracting for parcel maintenance work

These dynamics are at work regardless of whether the standard is a rigorous one or not. They also are at work whether the data submitter is a town with little expertise or a highly experienced vendor. Vendors seen as collaborators who have influence over their less technically-sophisticated municipal clients will have a trickle-down effect in terms of data quality.

4.7 ONGOING MAINTENANCE

Building consensus, doing continual and meaningful outreach, and fostering a sense of cooperation among stakeholders are key for an ongoing parcel maintenance effort that is operating without an official mandate for compliance. For towns that already contract or perform digital parcel maintenance, the shift toward doing tasks according to the parcel standard should not prove to be a significant hurdle. The state can expect that, with proper outreach, these towns would see the benefits of the overall program and willingly comply with the standard. For these cases, compliance simply gets embedded in a local process that is already taking place. Maintenance may be more challenging for towns that created or maintained digital parcels prior to the initial development effort. In order to keep these towns in compliance, the state may need to devote continued resources, either technical or financial, toward the annual update of these parcel datasets.

Continued outreach and support should remain a high priority for the state. Specific recommendations include:

- Develop and maintain cooperative relationship with the Vermont Assessors and Listers Association (VALA) as key conduit to local assessors and listers throughout the state. An endorsement for the standard and program from VALA would provide some leverage with towns.
- In support of towns, be responsive to questions, supportive with technical assistance, attentive to the idiosyncrasies within each town that affect their ability to implement the standard, ask for input, treat them as partners, and have a service-oriented stance.

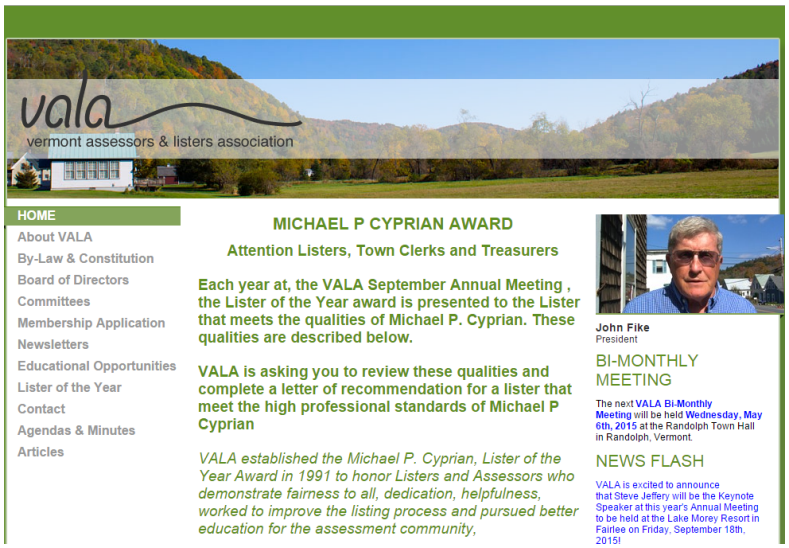

Figure 7. http://www.valavt.org/

- Use of vendors as promoters and get them to see that the standard makes things easier even though there is an initial hurdle. Rely on them as the source of expert advice that many towns look to. They recognize the value of the standard in their own work, and in the sense of the 'common good'. Disperse information to contractors and count on them to in turn distribute it to a wider circle.
- Use Regional Planning Commissions in a similar way as vendors.
- Maintain a good relationship with NEMRC to ensure parcels and property attributes can be delivered "hand in hand" for the long term.

4.8 POTENTIAL FUTURE INVESTMENTS

4.8.1 THE STANDARD

The state should commit to continuously improve the standard based on feedback from vendors, towns and other stakeholders. The document should be meaningful and relevant and serve as a valuable resource to all involved in the process. The state may also want to consider shifting the focus of the standard away from being a "tax mapping standard" and toward a "digital parcel

standard". The standard currently is self-described as, "This standard is for developing *digital versions of municipal parcel maps* for use in planning, property assessment, and *graphic map display*." The Return on Investment study indicates that digital parcels have value well beyond just the production of tax maps, yet if the standard is specifically tied to this output and use case, it will be somewhat limited in its utility. In many ways, a standard that's trying to standardize tax map components has to account for many more variances than one that's standardizing a data layer.

4.8.2 TOWN BOUNDARIES

One of the biggest challenges in "stitching" together a statewide parcel data set will be the inevitable issues that arise at town boundaries. As a longer term goal, the state may wish to consider developing an authoritative municipal boundary dataset. Vermont will not be able to implement rigorous spatial data requirements until such a dataset exists. As described by the IAAO:

> *"…only a few states had tackled the issue of a seamless, edge-matched statewide parcel dataset. Resolving the differences among counties and registering all parcel data to a statewide common base is still an emerging concept."*[7]

The first step toward seamless edge-matching is to establish what the seams are. Seamless state-wide data opens the door to a much broader range of functionality and rigorous analyses that are not possible to accomplish across discreetly-defined units of data, especially when the number of units (towns) is as high as it is in Vermont.

4.8.3 INCENTIVES

As implementation shifts into a maintenance stage, Vermont will want to pay close attention to challenges to compliance. While some impediments may be more attitudinal than logistical or economic, the state may want to consider creating incentives to comply. A strategy for awarding monetary incentives may have the following elements:

- Identify what the threats to the parcel standard are. Local governments - the data producers- are the most vulnerable link.

[7] http://www.iaao.org/media/Topics/F&E_July13_National_Database.pdf

- Use contractors who have working relationships with the towns to help articulate the threats in technical terms, and quantify them (e.g. how many of your clients are experiencing particular difficulties)
- Categorize the threats and decide which ones are worthy of funding assistance
- Use an equitable method of dispersing incentives
- Use a leveraging mechanism which places a sense of obligation on the funding recipients
- Place obligations on the contractors, both through the specs of the contracts and through a sense of collaborative responsibility

5 ALTERNATIVE APPROACH FOR ONGOING PARCEL MAINTENANCE: STATE MAINTENANCE RESPONSIBILITY

An alternative approach to ongoing parcel maintenance would involve shifting the technical data editing tasks to the State rather than the continued use of the private sector or Regional Planning Commissions to fulfill this role. As demonstrated by the cost comparison table in Section 6, data maintenance would require the employment of 2 fulltime GIS professionals working within VCGI and dedicated to the task of ongoing parcel data maintenance. As a starting point for this alternative approach, it is assumed that a complete, consistent, statewide parcel data set has been compiled using methods described in Section 4: Recommended Approach.

In this scenario, local lot line changes would be submitted to the VCGI – either digitally or by mail - by local Town Clerks when a deed or plat is recorded in the land records. This work flow and information flow change would require a new statute requiring that any deed or plat changing a boundary line would need to be sent to the state upon recording. To support the statute and additional burden on Town Clerks (see below), the recording fee collected by local governments could be increased accordingly. Upon receipt of the deed or plat from a clerk, the state GIS professional would scan the document (if not already digital), interpret the changes to be made, and make the corresponding edits to the digital parcel data set. As lot line changes often require consultation with or clarification from a local official, the state GIS professional would coordinate with locals as needed. Annually, when the Grand List is updated, the state GIS staff person would compare the dataset with the Grand List to confirm that all parcels can be linked to a Grand List record through the SPAN number and to identify changes not reported by local Town Clerks. The state GIS person would then follow up with local Town Clerks to obtain missing documents or clarify

lot line changes. Based on historical trends, it is estimated that the state should see an average of 3500 parcel changes a year.

While this alternative approach is certainly viable, it does present a significant workflow change and additional burden on local Town Clerks to supply the information to the state regularly. This process will also require a lot of coordination from state GIS staff and may require that state staff visit some Town Clerks in person to retrieve the necessary documents. The impact on the private sector and Regional Planning Commissions should also be strongly considered as the data updates are a source of reliable business for these entities, supporting existing jobs in Vermont. Most of the vendors that perform parcel data updates in Vermont are small, local businesses that rely on municipal business to stay afloat. As the cost table in Section 6 shows, there are potential cost savings[8] with this alternative approach but, in the end, rather than creating a system of "shared responsibility" where local towns and cities work with vendors and RPCs to update data, this approach centralizes parcel maintenance and distances locals from the process. There could potentially be pushback from local governments who view this approach negatively.

[8] It should be noted that the potential loss of existing jobs is not included as a cost for this alternative, nor is any cost assessed to the perception of a "takeover" by the state.

6 ESTIMATED PROGRAM COSTS

The table presented on the following 2 pages shows the estimated costs for both the recommended approach “Shared Maintenance Responsibility” as well as the alternative approach, “State Maintenance Responsibility”. Costs are broken down by year with the first 3 years devoted to developing the statewide parcel data and years 4 and 5 shifting into maintenance of that data. High level tasks, required state staff (FTE = Full Time Employee), and associated costs are also presented.

Vermont Statewide Parcel Program - 5 Year Program Cost Estimate Comparison Table

Shared Maintenance Responsibility (Recommended Approach)

Year 1: Data Development

Tasks	State % FTE	Annual Cost
Data collection (from vendors, RPCs)	0.1	$ 9,097
Data extract, transform, load	0.15	$ 10,652
QA/QC tool development and data review	0.3	$ 27,291
State Outreach, education, training, coordination	0.15	$ 13,646
RPC project management	n/a	$ 23,000
Digitize/standardize 1/3 parcels by vendor/RPC	n/a	$ 500,000
Year 1 Subtotal	**0.7**	**$ 583,686**

Year 2: Data Development

Tasks	State % FTE	Annual Cost
Data collection (from vendors, RPCs)	0.1	$ 9,097
Data extract, transform, load	0.15	$ 10,652
QA/QC data review	0.15	$ 13,646
State outreach, education, training, coordination	0.15	$ 13,646
RPC project management	n/a	$ 23,000
Digitize/standardize 1/3 parcels by vendor/RPC	n/a	$ 500,000
Annual maint. by vendor/RPC (1/3 total parcels)	n/a	$ 63,155
Year 2 Subtotal	**0.55**	**$ 633,195**

State Maintenance Responsibility (Alternative Approach)

Year 1: Data Development

Tasks	State % FTE	Annual Cost
Data collection (from vendors, RPCs)	0.1	$ 9,097
Data extract, transform, load	0.15	$ 10,652
QA/QC tool development and data review	0.3	$ 27,291
Outreach, education, training, coordination	0.15	$ 13,646
RPC project management	n/a	$ 23,000
Digitize/standardize 1/3 parcels by vendor/RPC	n/a	$ 500,000
Year 1 Subtotal	**0.7**	**$ 583,686**

Year 2: Data Development

Tasks	State % FTE	Annual Cost
Data collection (from vendors, RPCs, Clerks)	0.2	$ 18,194
Data extract, transform, load	0.15	$ 10,652
QA/QC data review	0.15	$ 13,646
Outreach, education, training, coordination	0.15	$ 13,646
RPC project management	n/a	$ 23,000
Digitize/standardize 1/3 parcels by vendor/RPC	n/a	$ 500,000
Annual maint. for year 2 (1/3 total parcels)	0.38	$ 31,032
Year 2 Subtotal	**1.03**	**$ 610,170**

Year 3: Data Development			Year 3: Data Development		
Tasks	State % FTE	Annual Cost	Tasks	State % FTE	Annual Cost
Data collection (from vendors, RPCs)	0.1	$ 9,097	Data collection (from vendors, RPCs, Clerks)	0.3	$ 18,194
Data extract, transform, load	0.15	$ 10,652	Data extract, transform, load	0.15	$ 10,652
QA/QC data review	0.15	$ 13,646	QA/QC data review	0.15	$ 13,646
State Outreach, education, training, coordination	0.15	$ 13,646	Outreach, education, training, coordination	0.15	$ 13,646
RPC project management	n/a	$ 23,000	RPC project management	n/a	$ 23,000
Digitize/standardize 1/3 parcels by vendor/RPC	n/a	$ 500,000	Digitize/standardize 1/3 parcels by vendor/RPC	n/a	$ 500,000
Annual maint. by vendor/RPC (2/3 total parcels)	n/a	$ 125,058	Annual maint. for year 3 (2/3 total parcels)	0.77	$ 62,881
Year 3 Subtotal	**0.55**	**$ 695,099**	**Year 3 Subtotal**	**1.52**	**$ 642,019**
Year 4: Ongoing Maintenance			**Year 4: Ongoing Maintenance**		
Tasks	State % FTE	Annual Cost	Tasks	State % FTE	Annual Cost
Data collection (from vendors, RPCs)	0.05	$ 4,549	Collect/scan change documents from Towns	0.25	$ 22,743
Annual maintenance by vendor/RPC	n/a	$ 189,483	Perform parcel data edits (approx. 3,500)*	1.15	$ 81,664
QA/QC data review	0.08	$ 7,278	QA/QC data review	0.15	$ 13,646
Data extract, transform, load	0.08	$ 5,681	Compare to Grand List; Follow up w/Towns	0.25	$ 22,743
State Outreach, education, training, coordination	0.08	$ 7,278	Outreach, education, training, coordination	0.15	$ 13,646
Year 4 Subtotal	**0.29**	**$ 214,267**	**Year 4 Subtotal**	**1.95**	**$ 154,441**
Year 5: Ongoing Maintenance			**Year 5: Ongoing Maintenance**		
Tasks	State % FTE	Annual Cost	Tasks	State % FTE	Annual Cost
Data collection (from vendors, RPCs)	0.05	$ 4,549	Collect/scan change documents from Towns	0.25	$ 22,743
Annual maintenance by vendor/RPC	n/a	$ 189,483	Perform parcel data edits (approx. 3,500)*	1.15	$ 81,664
QA/QC data review	0.08	$ 7,278	QA/QC data review	0.15	$ 13,646
Data extract, transform, load	0.08	$ 5,681	Compare to Grand List; Follow up with Towns	0.25	$ 22,743
State Outreach, education, training, coordination	0.08	$ 7,278	Outreach, education, training, coordination	0.15	$ 13,646
Year 5 Subtotal	**0.29**	**$ 214,267**	**Year 5 Subtotal**	**1.95**	**$ 154,441**
SHARED RESPONSIBILITY GRAND TOTAL		**$ 2,340,514**	**STATE RESPONSIBILITY GRAND TOTAL**		**$ 2,153,852**

Cost Comparison Table Assumptions:

- Fully loaded salaries: Coordinator to perform outreach, coordination, development of QA/QC tools, etc. = $90,971; Technician to process data, make edits = $71,012
- Total number of VT parcels assumed to be 318,341
- Estimated cost to pay mapping contractors to create initial version of statewide parcel data: $1.5 Million (divided over 3 years = $500,000/year in either model above)
- Shared Maintenance ongoing maintenance cost assumes state will pay approximately 1/2 of cost to update data annually to meet the standard for each town.

7 TIMELINE AND CONCLUSION

The planning, preparation, execution and ongoing maintenance of the statewide parcel program is envisioned to take place over a five year period. This time period was chosen as it is feasible for a program that impacts so many stakeholders and also aligns with the time period presented in the Return on Investment study. The state may choose to pursue implementation more aggressively or may realize that aspects of the plan will take additional time.

The first phase (occurring in year one) is envisioned as a planning and preparation period where funding is secured, VCGI is established as the lead coordinator, a detailed outreach and coordination plan is developed and the standard and guideline documents are strengthened. This first phase puts in motion and sets the tone for the program as a whole. It will be essential that VCGI assign adequate staff resources to this important phase.

The second phase (also occurring in year one but continuing on to years 2 and 3) focuses on the procurement of the private sector and RPCs for technical support and the human resources required to complete the initial collection, development, aggregation. It is envisioned that approximately 1/3 of the state's parcels would be integrated during each of these years. The state would provide ongoing outreach and coordination throughout these years.

Phase 4 (years 4 and 5) transition the program to a maintenance and stewardship phase where parcels are presumably maintained at the local level using local resources as well as state contributions and overall program coordination and support to Towns.

The table on the following page provides a very general overview of this sequence and phasing over the five year timeframe.

Phase/Task	Year 1	Year 2	Year 3	Year 4	Year 5
Secure Funding					
Establish VCGI as Lead/Coordinator					
Strengthen & Promote the Standard/Guidelines					
Plan Outreach					
Conduct Ongoing Outreach					
Establish QA/QC Procedures and Tools					
Phase 1: Procure Technical Support from Vendors/RPCs (first 1/3 parcels)					
Phase 1: Development/Collection/Aggregation					
Phase 1: QA/QC					
Phase 1: Lessons Learned/Recalibration					
Phase 2: Procure Technical Support from Vendors/RPCs (second 1/3 parcels)					
Phase 2: Development/Collection/Aggregation					
Phase 2: QA/QC					
Phase 2: Lessons Learned/Recalibration					
Phase 3: Procure Technical Support from Vendors/RPCs (last 1/3 parcels)					
Phase 3: Development/Collection/Aggregation					
Phase 3: QA/QC					
Phase 3: Lessons Learned/Recalibration					
Phase 4: Ongoing Maintenance & Stewardship					