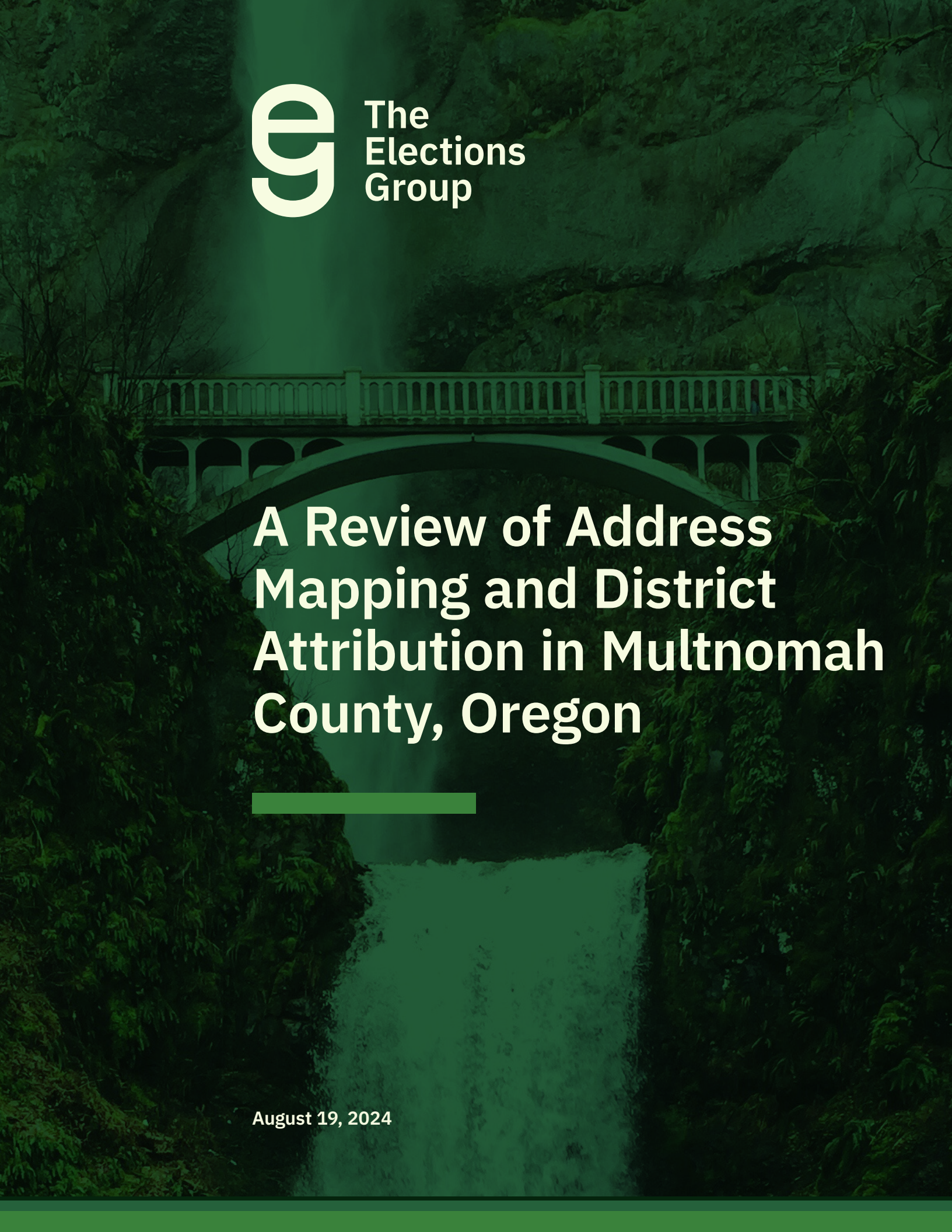


The Elections Group

A Review of Address Mapping and District Attribution in Multnomah County, Oregon

August 19, 2024

Executive Summary

During the 2024 Primary Election, Multnomah County experienced two errors in ballot creation. In one, roughly 9,000 voters received ballots without a referendum they were entitled to vote in. Troubleshooting efforts prompted by recognition of the first revealed another 170 ballots for which districts had not been updated with redrawn district boundaries. In both situations, corrected ballots were immediately mailed to voters. The purpose of this report is to look at the causes of these mistakes in district attribution and recommend procedures that will prevent such issues from arising in the future.

The Elections Group, an election administration consulting firm, conducted the review of address mapping and districting procedures, while Election Data Services, a firm that specializes in election mapping, was responsible for a reanalysis of address and district data. All work was done in conjunction with Multnomah County staff.

This report's findings and associated recommendations focus on data governance, data attribution and mapping.

Multnomah County electoral district attribution has been a shared intragovernmental responsibility:

- There is a GIS unit in the IT division of the Department of County Assets, and a different GIS unit in the Department of Community Services, which map addresses to districts and their boundaries.
- They rely on RLIS address to parcel data supplied by Metro.
- The Multnomah County Elections Division inputs and maintains voter address data, loads the district information provided by GIS staff, and manually adjusts some address-district relationships that cannot be generated by GIS staff.

GIS staff plot voter addresses, placing them inside district and zone boundaries. To place them accurately, staff match them to a "reference dataset" of addresses and parcel identification numbers (PINs or "pins," because they pinpoint the address on the map). As a reference dataset, Multnomah County uses the

Regional Land Information System (RLIS) dataset developed by Metro. This is consistent with the pattern in other jurisdictions of this size, which often use datasets from local property tax, land use or planning agencies, for which data are rapidly updated as properties are developed.

Our review has found that the differing address standards and purposes of property address and voter address data can lead to address discrepancies – addresses in one file without a clear, unique and accurate match in the other file. Limited time and the "noise" generated by a large number of "difficult addresses" (described below) leads to near matches being accepted, rather than being researched. Some such near matches are accurate, but others are in error.

The overall accuracy of the RLIS reference dataset focused attention on election addresses, masking the need to explore signs that some RLIS addresses might be wrong, and some RLIS pins might be misplaced.

We note that both GIS staff and the Elections Division had already made strides to correct many of these deficiencies at the point we began our analysis. In addition, the Elections Division expects that a new voter registration management system being developed by the Oregon Secretary of State (ORVIS, or the Oregon Registered Voter Information System) will provide substantial GIS capabilities within the interface used by Elections staff.

Importantly, we emphasize that in no case has the Elections Group and EDS team made decisions about which districts which Multnomah voters should be voting in. The review team has pointed to addresses with evidence of mistaken districting. Multnomah staff must make final determinations on behalf of their voters.

Findings and Recommendations

We find the following factors are **proximal causes** of discrepant data and mismatched districts:

- Both Elections address data and RLIS address data are insufficiently normalized.
- Incomplete address matches are sometimes accepted without further investigation.
- Some RLIS geocodes point to the wrong location.
- Discrepancies arise during manual updating of district attribution for addresses that could not be handled digitally by GIS staff, because of failed normalization or the insufficient information in the "descriptive" addresses described above.

We found these **secondary causes** allowing address mismatches to occur and persist:

- Failure to maintain the relationship between verified address and GIS location, so that difficult addresses once matched must be reanalyzed and manual updates once completed must be manually updated again with each new iteration of districting.
- Diffuse accountability for new address creation in the Elections Division.
- Insufficient allocation of GIS staff time and resources to the Elections Division.
- Unfamiliarity between GIS staff and Elections staff with the dataset and procedures of their counterparts due to:
    - Limited ongoing interaction between GIS staff and Elections staff outside decennial redistricting.
    - Minimal cross-training in aspects of the other discipline.
- Insufficient post-districting review and quality control.

Our recommendations focus on the following areas:

- Improved normalization of election data, including "descriptive" addresses and other non-residential address to support GIS analysis and proofing of district relationships
- Correction of Elections data as needed.
- Assessing reliance on RLIS geocoding vs. commercially available databases; and/or
- Improving the reliability of RLIS data by working with Metro staff to update inaccurate geocodes.
- Permanent resolution of the relationship between "difficult" addresses and their location.
    - Adopting a troubleshooting approach to near matches rather than an acceptable low-rate-of-error approach.
    - Maintenance of proofed geospatial relationships for difficult addresses so they do not need to be reanalyzed for future districting efforts.
- Minimizing manual handling of address-district relationships by standardizing non-standard addresses, possibly to be held in a table separate from the registration system.
- Using a boundary map version checklist both before and near the end of each districting effort.
- Adopting quality control techniques, including:
    - A visual interface for Elections staff, allowing them to view address pins and boundaries for each district.
    - Re-import of election data so that GIS can confirm the successful update by Elections of all district attributes GIS recommended.
- Improved documentation of Elections and GIS procedures related to districting.
- Committing sufficient GIS staff time and resources to Elections needs.
- Building cross-team relationships and understanding through ongoing mapping projects and cross-disciplinary training.

Sources of Map Complexity in Multnomah

Multnomah County is a large county of overlapping governmental jurisdictions that create a complex set of district attributions. Multiple units of local and regional government use zoned representation following different lines, cutting the county into more than 250 different slices of geography with unique combinations of districts.

Two additional factors provide challenges for mapping Multnomah voters not found in most urban jurisdictions of similar size. Registration forms may provide only "descriptive" addresses – for instance, "around 2nd and Madison, Portland," with insufficient information for a definitive location and well-defined district attribution. Multnomah registration records include many such addresses, which have required manual district updating.

Houseboat residences present a different form of complexity. Those who've drawn district and zone lines often follow "natural boundaries," which should simplify mapping. In Multnomah, however, a line drawn at the shore often separates houseboats from the shore address of the pier, adding complication to the map. In addition, some districts have followed one river bank, some the other, and some the middle of a river. As a result, houseboats may have a different set of districts not only from their pier's shore address, but also from the far shore and even from a houseboat on the opposite side of the river.

Causes of Error in District Attribution

The Elections Group's evaluation focuses on three distinct areas of districting operations: data, procedures and staffing.

Data Issues – Normalization, Geocoding, Mapping Splits to Boundaries and Manually Updating District Assignments for Splits

The proximal causes of redistricting issues in Multnomah County are problems in four data assignments.

- Both election address data and RLIS data are insufficiently normalized.
- Incomplete address matches are sometimes accepted without further investigation.
- Some RLIS geocodes point to the wrong location.
- Discrepancies arise during manual updating of district attribution for addresses that could not be handled digitally by GIS staff, because of failed normalization or the insufficient information of the "descriptive" addresses described above.

We would note that most districting efforts experience these kinds of issues. Greater attention to each will reduce the chance of miscodings, but ultimately, expanding and improving quality control procedures should facilitate the identification and correction of miscodings before publication, ID printing or ballot production.

Normalization

Normalization is the process of standardizing data so that a given address will always appear in the same standard form, a process that enables matching between different datasets. Matching election addresses to GIS addresses is the core method for voter addresses to be located and compared to district boundaries.

In Multnomah County, voter registration addresses come to the Elections Division from a number of government agencies, voter-submitted digital registrations and handwritten paper forms.

Errors and discrepancies from standardization can arise in many ways – voter error, voter omission of (seemingly) unnecessary information, or data entry error at the registration agency level or the election office.

Discrepancies may also arise through a voter or agency choice to adhere to differing postal, utility or tax parcel definitions of a given address.

- Elections address data usually adheres to postal standards in order to mail voter notification cards and ballots.
- GIS address data comes from an agency that focuses on property parcels and standardizes addresses based on those needs.

These different standards create a need to normalize across the domains of Elections and GIS.

Though outright errors in the Elections address data exist, they are a subset of the larger group of unnormalized addresses and addresses normalized to different standards. Notably, normalization makes it easier to recognize errors. Conversely, large numbers of discrepancies resulting from unnormalized data can hide errors that would otherwise be caught.

Normalization Issues Found in Multnomah County

During the course of research, a large number of normalization issues became apparent, though most are successfully recognized and managed by Elections

and GIS staff. A notable set of examples are those non-standard addresses from voters who give what we describe as "descriptive addresses" of the intersection nearest where they sleep – for instance, "near the intersection of 252nd and SE Telford Rd." Because such an address doesn't offer sufficient definition to place a geocoded pin on a map, they are dealt with manually by Elections staff.

A small number of normalization issues arise from business addresses that for policy reasons have been entered into the non-standard address field rather than the parsed fields for standard addresses (House Number, Direction, Street Name, Street Type, etc.). As a result, these addresses have nothing to be matched to the GIS data unless they are re-entered.

Another set of normalization issues, frequently benign, are addresses where the GIS standard differs slightly from the Elections standard, perhaps because the post office recognizes a different spelling for an address (Hogg vs. Hogue Rd., for example). With long street names, different data sets may abbreviate in different ways (Historic Columbia River Hwy vs. Hist Columbia River Hwy).

In addition, the Elections Division maintains some voter-provided addresses unnormalized to postal standards, in some cases in order to reflect the mapping point better. These addresses do not generate discrepancies between Elections and GIS, but require some exception management each time addresses are analyzed for mailing purposes.

RLIS addresses have significant normalization failures as well, including non-standardized addresses and one-to-many relationships between address and parcels.

Descriptions	Address details	Explanations
Unnormalized address - Elections	XXXX NE HOGAN DR STE XXXX	Moving suite number to "Unit" field would allow routine geocoding
Unnormalized address - RLIS	XXXXX S NORTHGATE AVE	Unit A in Tax Parcel Address makes match fail
Descriptive address manually assigned	6TH & WEIDLER	Manual Precinct Split assignment wrong; geocode finds it accurately
Descriptive address manually assigned	ALBINA & MISSISSIPPI	Manual Precinct Split assignment wrong; geocode finds it accurately
Insufficient address	SE 180TH & MILL CT	Streets do not intersect. Insufficient address info from voter; or error by voter or data entry

Unexplored address error	XXX NE LUCAS RD	Only SE LUCAS exists. Likely typo or voter error
RLIS geocode points to incorrect parcel	XXXX SW BEAVERTON HILLSDALE HWY APT XX	RLIS locator points to on wrong side of highway
RLIS geocode points to incorrect parcel	XXXX SE UMATILLA ST. APT. XXX	RLIS locator (some apts) points to an address on SE STEELE
RLIS geocode points to incorrect parcel	XXXX OLD SKYLINE	RLIS locator points to different section of OLD SKYLINE
RLIS geocode points to incorrect parcel - subaddress	XXXX SW 1st AVE	RLIS locator (some sub-addresses of the address) points to wrong parcel
RLIS one-to-many relationship between address and parcels	XXXXX SE DEVERELL	RLIS locator points to nearby parcel with same parcel address; inaccurate for voting purposes
Non-Standard Address Manually Assigned	XXX E POWELL, GRESHAM	Manual precinct assignment made incorrectly
Non-Residential Address Manually Assigned	XXXX NE 47TH AVE	Manual Precinct Split assignment wrong; geocode finds it accurately
Large Discrepancy RLIS / ARCWORLD	XXXX N JANTZEN AVE SLIP XX	RLIS points to wrong parcel, ARCWORLD finds accurate address.
Small Discrepancy RLIS / ARCWORLD	XXXX NW 53RD DR	ARCWORLD points to the residence, while RLIS point on same property gives wrong districts

Geocoding

Geocoding is the use of a base or reference layer in GIS (in this case, the RLIS layer) to pinpoint addresses in the dataset you're trying to update (the Elections residential address file).

Address data errors and failures of normalization described above are often benign, because staff recognize and resolve them. However, the large number of imperfect matches that need to be reviewed makes it necessary to move quickly through the resolution process, leading to some inaccurate placement of pins. Such problems are essentially data errors, but they result in inaccurate geocoding.

There are also times when a base layer itself may have errors. The RLIS base layer provides a locator – an x- and y-coordinate related to each address, to place the pin on the map. By comparing the RLIS data to ARCGIS, an independent data set, our analysis found instances where RLIS pins are inaccurate.

We would note that it's not easy to recognize such mistakes without an external

dataset. RLIS comparisons may give a match a "99% rating," giving staff false confidence, because some such matches nonetheless yield inaccurately placed pins.

One large set of inaccurate geocodes is subaddresses. Subaddresses that clearly relate to different properties in the same building can have different location data in RLIS that point to parcels blocks away.

Another source of incorrect geocoding is double-matches, where RLIS ties two parcels to the same address, and the residence is in one of them (sometimes a lawn/garden area or other related property on an adjacent parcel). However, the two parcels have slightly different district assignments, and the voter has been placed on a parcel that does not hold the residence, so their district assignment is incorrect.

Mapping Splits to Boundaries

Once addresses are geocoded, the next step is to define the various districts associated with each address based on the boundaries it falls within. Using this information, GIS staff define precincts and "splits" (areas with a unique combination of districts) for the Elections Division. Geocoding mistakes and misalignments of boundaries can lead to precinct splits being mapped on the wrong side of one or more district boundaries. If this happens, GIS will notify elections to update a split incorrectly, or not to update a split in need of updating, leading to one or more voters with an incorrect district assignment.

Manual Updating of Precinct Splits

Once GIS has completed its work, it provides the Elections Division with updated relationships between addresses and precinct splits, in a table that can be uploaded directly into OCVR. In addition, they provide a table of precinct splits and the districts they should be attached to. In OCVR, this data has to be manually generated (in the case of completely new precinct split codes) or updated (in the case of existing precinct split codes whose district assignment has changed.) Elections staff open an interface in OCVR, create a new precinct split code and then one-by-one add districts to that precinct split until it matches what is found in the GIS-provided table. It is unsurprising that discrepancies show up in this large-scale manual operation.

Procedures – Maintenance of Data Relationships and Post-Update Quality Control

Omissions of procedure in this section were not primary causes of districting error, but they ensured that error-prone operations would need to be repeated, or allowed errors to slip through that should have been identified and corrected.

Maintenance of Data Relationships

Because OCVR is not GIS-enabled, it was considered difficult to maintain address geocoding relationships from one districting effort to another. This meant that research done to pinpoint difficult addresses would have to be redone with each new districting effort. In a work setting of tight time constraints, deeper research to ensure accuracy could not be done, in part because of the need to rematch the geocodes each time.

Post-Update Quality Control

Quality control of districting assignments was described by Elections staff as a limited review done by looking at lines in data tables and assessing whether the assigned districts seemed to match what maps showed. It is to their credit that this QC was accomplished. However, post-entry data was not returned to the GIS unit, nor did the GIS unit provide reports or GIS interfaces that might have allowed Elections staff to conduct a more comprehensive review.

Street Range Management and Documentation

For a time, the Elections Division allowed a range of staff to create or update street ranges, with little or no documentation of appropriate procedures for standardizing addresses or editing to the precinct split with appropriate districts. Recognizing that this was a source of discrepancy, the Elections Division has tightened access.

Staffing – Resource Allocation, Experience and Training

The staff in the GIS units and the Elections Division of Multnomah County are dedicated professionals committed to getting things right. Multnomah is a large county with multiple overlapping boundaries for districts at varying levels of government.

Allocation of GIS Resources

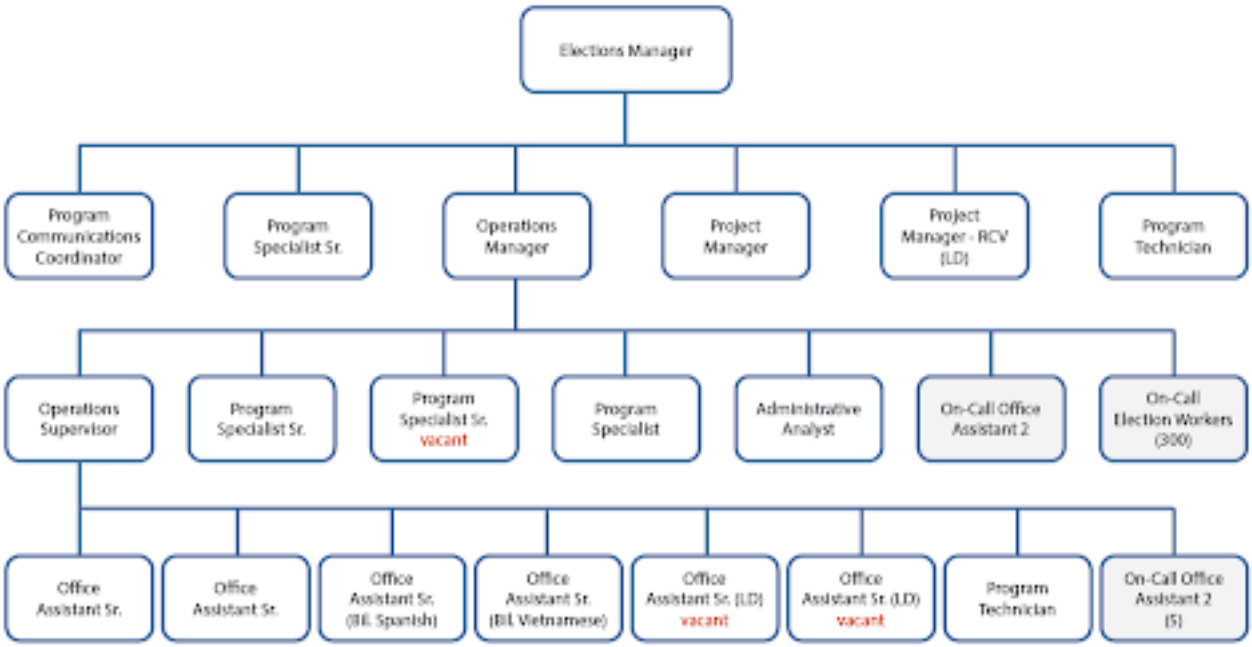
Mapping districts and geocoding addresses using different formats accurately is a time-consuming task. Insufficient GIS staff time was allocated to the task – in particular, time that might have been used for post-districting review/QC.

Experience and Training

The loss of experienced staff who had gone through the previous decennial census and ensuing redistricting effort in 2010-12 hindered Multnomah's efforts, a challenge that could have been mitigated by cross-training. Without cross-training, GIS staff were not knowledgeable about how elections used the data returned to them, and may not have been aware of gaps in quality control. In turn, Elections staff had no insight into ways that GIS staff might have supported their QC efforts with user-friendly GIS interfaces.

Multnomah County
ELECTIONS DIVISION

Multnomah Votes



January 2024

Accountable Procedures for Street Range Updating

For a time, due to staff change-overs and pressing demands, multiple data entry staff were allowed to update "street ranges" to accommodate new addresses on voter registration forms. Staff less experienced and familiar with address issues may create unnecessary non-standard address ranges or treat errors in voter registrations as valid new addresses. Election managers recognized the issue and have since restricted street range updating to an experienced staff member trained in using the street file, serving under the operations manager.

Recommendations for Improving Address Mapping and District Attribution

Recommendations follow the outline from the previous section, focusing on data, procedures and staffing.

Data Recommendations

Normalization of Election Data

The Elections Division should normalize all possible address data and maintain it in the residence address field of the registration database. Normalization of existing standard addresses will allow better matching with geocoded addresses. Normalization of non-standard addresses will minimize or eliminate the need for manual handling of district attributions.

Entry of Non-Residential Addresses in Standard Address Fields

The Elections Division sometimes is able to validate the residence of a voter at a registration address that is technically non-residential. Because voters are not meant to register from business addresses, Elections has held these addresses in a non-standard address field outside the street range and the standard address fields, so that once the validated resident moves, the address will no longer be considered a valid registration address without new investigation. As a result, such addresses are not included in the OCVR download provided to GIS

staff, and are not given geocodes. Their district attribution has been handled manually and separately by Elections staff.

OCVR provides another option – a yes/no field to indicate non-residential addresses. We recommend that non-residential addresses be entered in the standard address fields, passed to GIS for routine geocoding and district updating with the bulk of the registration file.

Tracking Exact Slips for Houseboat Addresses

Registrations for houseboats sometimes come without slip numbers, making exact placement difficult or impossible. This can cause a variety of issues. In some cases, geocoding will place a boat without a mooring at the shore address. In other cases, the location of the mooring could affect district attributes today or after future changes. While it is not appropriate to reject a registration without a slip number, Elections should develop a standard letter, with OCVR triggers for sending it, asking the voter or the moorage operator for the slip number.

Setting Standards for Descriptive Addresses

Descriptive addresses should be kept in a standard address format for efficient geocoding and proofing. If necessary due to statute and the normal data handling practices of Oregon counties, the relationship to the standardized address can be kept in a data table outside OCVR. We note that the new ORVIS system will record a GIS location, making this dataset unnecessary.

Currently, descriptive addresses are entered into the non-standard address field in various ways. Consider this sequence of actual registration addresses:

- Corner 6th and Irving St.
- Near 6th and Irving
- 7th and Irving
- Around 7th and Irving St
- Around 7th & Irving St

At a minimum, Elections staff should be trained to use the same wording and

address nomenclature, with standards such as use of:

- Direction (NE)
- Street type (Ave)
- Ampersands (&)

Thus, "NE 7th Ave & Irving St." would be the appropriate format.

Such an address can generate a geocode sufficient to provide consistent district attribution.

Pinpointing Descriptive Addresses for GIS Purposes

Many descriptive addresses as provided are insufficient to provide an exact location. The Elections Division makes a significant effort to determine real residence in these cases. But the vagueness of some will ensure they can not be definitively resolved, and Multnomah will necessarily assign some locations without perfect certainty

With the introduction of a new GIS-enabled voter registration system, the difficulty of ongoing mapping of these addresses will become less prominent, because assigned locations will be saved in ORVIS. In the interim, the Elections Division and Multnomah County GIS should consider determining geocoded locations for unresolved addresses in existing OCVR data. Again, if necessary due to statute or normal data handling practices of Oregon counties, such addresses can be maintained in a separate holding table discussed below..

We recommend training or providing guidance to registration partners on the handling of descriptive addresses, asking them to provide as much detail as possible.

- Ask for the street direction based on Portland neighborhood (NE, SW, etc.)
- Ask for a cross streets or some indications of where on a street the voter stays
- When given a cross street, ask which corner (is the voter on the NE corner of NE 6th Ave and Irving St.)

Correction of Election Address Data

We found instances of incorrect Elections Division address data. Implementing a troubleshooting approach as described below for all mismatches between election addresses and GIS addresses will turn up others. Rapidly remedying will facilitate smooth, accurate geocoding.

Assessing Reliance on RLIS GIS Data Against Available Commercial GIS Data

One of the data sets handed over to Multnomah County as part of this report is a comparison of ARCWORLD GIS data to RLIS data, showing the distance between geocoded addresses as coded by each. (GIS and Elections staff are already reviewing addresses pinned at different locations to determine which is more accurate.)

Correction and Normalization of RLIS Data

County GIS staff should develop a feedback loop with Metro to refer inaccurate pins and addresses for correction, both for election purposes and because public-facing map tools currently give inaccurate results for some addresses identified in this analysis.

Several particular categories comprise a large proportion of those in need of correction.

- "Sub-addresses" are RLIS addresses typically representing condos or other unit types that form part of large buildings.
    - In many cases, one or more sub-addresses have RLIS locations at odds with other sub-addresses or the main building address.
- One-to-many relationships between address and parcel. These seem to reflect lots with some relationship to a "main" lot with a house.
    - These may reflect farms, the garden and grounds parcels of larger estates or other similar "related landholdings."
    - We are unaware of any legal relationship between such parcels, and suggest that they might be given unique street addresses to

better distinguish locational relationships.

Suggested corrections in RLIS will take time to be reviewed and incorporated. RLIS data has different uses than the needs of Elections, so there may be reasons agencies interested in RLIS data will reject some changes in RLIS. To ensure Elections' data needs are met, Elections should maintain the data for any voting addresses not updated in RLIS, by establishing a separate holding table described in a section below.

Resolution of Difficult Addresses

Inevitably, difficult addresses will show up – those for which RLIS or other GIS data do not match perfectly with the Elections address. The analysis provided with this report highlights such addresses, but new cases are likely to occur as property is developed, as some voters provide imperfect registrations and as data sets are edited.

We recommend a troubleshooting approach, through which addresses without perfect matches are set aside for investigation. When this shows that the address is non-existent, the voter should be contacted to provide corrected information. If the issue is address formatting (missing direction or different spelling of street, etc.), either elections or Metro should update the relevant address.

Procedures for Address Mapping and District Attribution

Minimizing Manual Handling

A primary goal of many of the recommendations above is that addresses should be updated in ways that minimize or eliminate the need for manual changes to the address-district relationship via the street range table. Moving non-residential addresses to the standard fields, normalizing descriptive addresses so they can be geocoded and even assigning standard house number and street-based addresses for them will help push nearly all addresses through the GIS process, generating a geocode for them and using that to determine districts and upload them through the auto-upload process.

Maintenance of Validated Address to Geography Relationships in a Holding Table

When Elections and GIS staff investigate any mismatched addresses or inaccurate pins and finalize a validated relationship between difficult addresses and their locations, the best outcome is that the data be updated, normalized or corrected so that RLIS and Elections data match. In the interim, until all data sets can be updated, validated relationships of address and geocode should be kept in a holding table to be used in any necessary reanalysis, rather than running these addresses against RLIS and duplicating the original imperfect match process.

If RLIS data is not updated to match county GIS/Elections suggestions, it may be necessary to maintain the holding table for the long term.

We note again that Oregon is in the process of replacing OVRS, the statewide voter registration management system that all counties use, with a new system, ORVIS, which will incorporate a GIS module for immediate research on new addresses. It will allow a field for holding geospatial information, whether derived from the ORVIS module or analysis done outside the system. In other words, it may provide the holding table. State officials expect to implement ORVIS in 2025, but until actual implementation, Multnomah staff should plan to keep such information in a holding table they create.

Map Version Handling Checklist

To ensure up-to-date boundaries are always used, a list of all map layers including every districted unit of government in Multnomah County should be incorporated in the address mapping and district attribution procedures document. Prior to any districting effort, each district on the list should be contacted to verify that Multnomah GIS staff are using the most updated map of district lines, and to clarify whether and when any changes might be expected that the Elections Division would need to incorporate for upcoming elections.

Quality Control Procedures

After each round of districting, two methods of quality control should be exercised. First, GIS staff report they can provide an easy-to-use interface that would allow Elections staff to view address pins and district boundaries. Elections can light up a given district boundary alongside those address pins that belong to that district and verify visually that all pins are within the boundary. By doing so for each of the relevant districts, all addresses can be vetted rapidly. A simple form of such an interface would use precinct-splits and their attributes rather than address pins.

We also believe that the residential address file should be routinely downloaded from OCVR after Elections has completed its updating, to allow GIS staff to confirm that the changes they recommended have been implemented appropriately.

Documentation of All Procedures

A recent staff change was the impetus for creation of a procedures guide for address mapping and district attribution. We recommend expanding this guide to cover all phases of redistricting in Elections and on the GIS side, including steps suggested here.

Personnel and Resources

Recently, GIS work for Elections has been moved to a new GIS team that is said to have greater availability and fewer competing demands. Our experience shows that Multnomah Elections staff have good working relationships with both GIS teams, so we believe that any arrangement that provides the Elections Division with consistent and sufficient GIS staffing can be successful. What is needed is a commitment of greater ongoing GIS time and resources to Election projects. That commitment of resources should include cross-training time and ongoing collaboration. This would help Elections and GIS staff familiarize themselves with the work of their counterparts, allowing them to better interpret data coming to them and work with it effectively.

Commitment of GIS Time and Resources

Our primary recommendation is that Multnomah must allocate the necessary resources to a complex intra-governmental challenge. GIS staff should have time to complete basic address mapping, trouble-shoot difficult addresses to generate validated relationships and conduct quality control operations before closing the books on a round of districting.

We recommend that Multnomah County formally allocate GIS staff time to Elections work. This could take the form of hiring someone within Elections with GIS training – likely with a range of responsibilities that included mapping and other technical or voter registration-related tasks.

Alternatively, Multnomah could budget a fixed portion of a GIS staff member's time to Elections projects. The bottom line is that other pressing GIS needs cannot be allowed to encroach on Elections work or to deny Elections the involvement of GIS staff in all phases of the address mapping and district attribution project, including troubleshooting difficult addresses and performing quality control.

Staff Designation, Cross-Training and Ongoing Collaboration

To facilitate understanding between Elections and GIS staff, we recommend building an inter-unit team, cross training them and using routine mapping and address-definition work to promote collaboration and interdepartmental understanding. Staff in each unit should be selected as main collaborators and primary points of contact.

- The designated Elections point person should be given basic GIS training, which might include an introduction to GIS course available online or locally.
- Elections should develop a daylong intro to Elections tutorial to familiarize the GIS point person with OCVR (or ORVIS when adopted), addressing the following:
    - The format and data quality of different voter registration sources.
    - How they are entered.
    - How district information is stored and updated.

- How district information is used to create ballots.

The predominant phase of districting work happens only in the years following the decennial US Census – too infrequently to build much institutional memory. However, Elections faces the ongoing need to map new addresses. GIS staff assistance would promote accuracy while nurturing the collaborative spirit of the two units.

GIS support could benefit the Elections Division in multiple ways, including:

- Mapping the routes used by oversight staff during early voting or by drop-box collection staff.
- Generating public-facing maps of turnout based on precinct, legislative district or other units relevant in a given election.
- Plotting the relationship between voter addresses and the drop-boxes or early voting sites used to optimize placement decisions.

These projects would not be time-consuming, but they would foster an ongoing collaborative environment and institutional awareness of the procedures, timelines and needs of the partner unit. This mutual awareness and understanding will provide a solid foundation for future redistricting efforts.

Data Handoff and Recommended Handling

We emphasize that in no case has The Elections Group or Election Data Services teams made decisions about which districts Multnomah voters should be voting in. The review team pointed to addresses where there is evidence of mismatched geocodes, mis-attributed districts or substantial distance between the geocodes found in RLIS and those found in a commercial dataset. It is appropriate that Multnomah County staff make the final determination on behalf of their voters.

In particular, the review team has handed off two data sets. For the first data set the review team used RLIS locations and district boundaries to highlight addresses that might have an incorrect district attribution. For the second data set, the review team compared ARCWORD geocode for each residential address to the RLIS geocodes for the same address and calculated the distance between the locations.

Each dataset informed the foregoing analysis. The Elections and GIS teams have nearly completed analysis of the first dataset, and made appropriate changes. We recommend that Multnomah County look at addresses in the second dataset in an incremental way.

For Immediate Review:

- All addresses with a discrepancy of 200 feet or greater between ARCWORLD and RLIS.
- Addresses with a discrepancy between 50 feet and 200 feet, where

preliminary analysis provided by the review team shows different precinct splits, and a district relevant to the November 2024 election could be affected.

For Post-Election Review:

- All addresses with discrepancies between 50 feet and 200 feet that were not analyzed in the period before the November election.
- It is expected that the need to correct will fall with diminishing distance between the ARCWORLD and RLIS locations. Multnomah staff should look at the results in the 50-200 feet dataset, using 10-foot categories of diminishing distance, to determine a point at which discrepancies are no longer substantial and relevant to placement within appropriate district boundaries.